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Placing Refuge: Shell Mounds and the Archaeology of Colonial Encounters in the San Francisco Bay Area, California

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Placing Refuge: Shell Mounds and the Archaeology of Colonial Encounters in the San Francisco Bay Area, California

By

Tsim Duncan Schneider

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Committee in charge:

Professor Kent G. Lightfoot, Chair
Associate Professor Junko Habu
Professor Margaret W. Conkey
Professor Kerwin Klein

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Abstract

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Spanish missions were established in the San Francisco Bay Area beginning in A.D. 1776 with the founding of Mission San Francisco de Asís (Mission Dolores). Native American accommodation and resistance to colonial settlements has been studied in a variety of contexts in California, including mission sites, but only recently have scholars challenged preconceptions of culture change to examine the range of sociocultural consequences that resulted from colonial encounters. With the present research I seek to identify the places beyond the mission quadrangles where hunter-gatherers both maintained cultural practices and negotiated the adoption of new ones, as well as the processes of cultural change and persistence.

I examine a cluster of three shell mounds—CA-MRN-114, CA-MRN-115, and CA-MRN-328—located on the Marin Peninsula in the hinterland of Mission Dolores for evidence of long-term patterns of hunter-gatherer residence before, during, and after Spanish settlement (1776 -1830s). I critically evaluate whether hunter-gatherers returned on permissible leave from the missions or illicitly to these "places of refuge" to supplement introduced diets with traditional subsistence pursuits; practice seasonally-defined ceremonies and rituals; and to refashion social identities. I argue that periodic occupation of some shell mounds by runaway Indians over time both mirrors Coast Miwok subsistence routines that predate colonial settlement and would have reaffirmed connections to ancestral territories among mission Indians.

My dissertation research contributes to the growing body of scholarship dealing with culture contact and colonialism. I frame my research within theories of landscape, resistance, practice, identity, and materiality, and I employ a combination of archaeological methods—digital mapping, surface collection, geophysical survey, augering, and targeted excavation; specialized analyses, including X-ray fluorescence spectrometry, AMS radiocarbon dating, and obsidian hydration dating; historical documents; and oral interviews with Coast Miwok descendants. My results suggest that, despite missionization efforts, hunter-gatherers continued to occupy shell mounds likely reinforcing connections to ancestral territories throughout subsequent periods of Mexican and American settlement in the San Francisco Bay area.

For my parents

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CHAPTER ONE

INTRODUCTION

Thus, while the history of the shellmounds of this region probably reaches back more than a thousand years into the past, it must have extended almost to the threshold of modern times. The fact that their roots reached far back into the prehistoric period of California does not prevent our seeing the tops developing almost to the present day.

–Max Uhle (1907:36)

Apostasy began as soon as conversion began...

–Sherburne Cook (1976:57)

In the spring of 1783, a Coast Miwok couple—*Juluio* and *Olomojoia*—travelled from their village located near present-day Sausalito on the Marin Peninsula to Mission San Francisco de Asís (Mission Dolores). Accompanying them was their six year old daughter who would be baptized at Mission Dolores and given a Spanish name, Rosenda. She was the first Coast Miwok-speaker to enter a Spanish mission (Milliken 2009:21). Rosenda's baby sister—Manuela Antonia—was baptized three months later in June of 1783, and both parents would soon enter the mission in 1784 together with a third daughter (by a second wife) named Jacinta who was eleven (Milliken 2009). While their motivations and the conceivable benefits of participating in the mission are unknown, *Juluio* and *Olomojoia* probably viewed Mission Dolores as an opportunity for their three daughters to thrive in a rapidly changing world. Like many parents too, in addition to their greatest hopes, *Juluio* and *Olomojoia* carried their worst fears and each trip across the Golden Gate—between the mission and their home—embodied a mixture of intrigue and apprehension. Just as quickly as they had joined the mission, seven year old Rosenda died in 1784 and would not live to see her sister Manuela Antonia turn one. Four years later *Olomojoia* passed away at the age of forty-nine, and was followed closely by her husband *Juluio* who died in 1794. He was fifty years old. Unlike their parents, Manuela and her step-sister, Jacinta, would not live past their twenties and they too passed away in 1806 and 1796, respectively.

The emotional story of *Juluio*, *Olomojoia*, and their three daughters is characteristic of the lives of many Indians who encountered, enrolled in, or evaded Spanish missions in colonial San Francisco between 1776 and the 1830s. By 1832, when missions in the San Francisco Bay area were transitioning to secularized spaces, 2,828 Indians from the Marin Peninsula had—either through their own volition or by recruitment—entered missions at San Francisco, San Jose, San Rafael, and Sonoma (Milliken 2009). In the space of only forty-nine years, over three-quarters of Coast Miwoks who entered Spanish missions perished (Milliken 2009). Viewed from a different perspective however, nearly one-quarter of Coast Miwoks who entered the missions survived, finding opportunities—both permissible and surreptitiously—to endure within and beyond the mission quadrangle.

Revisiting the story of *Juluio* and *Olomojoia*: between Rosenda's baptism in March of 1783, Manuela Antonia's baptism in June of 1783, Jacinta's baptism in February of 1784, and the baptisms of *Juluio* and *Olomojoia* in May of 1784 (Milliken 2009), this family made at least four trips between Marin and Mission Dolores over the course of one year and two months. What happened during this period of time at and away from the mission? Did *Juluio* and

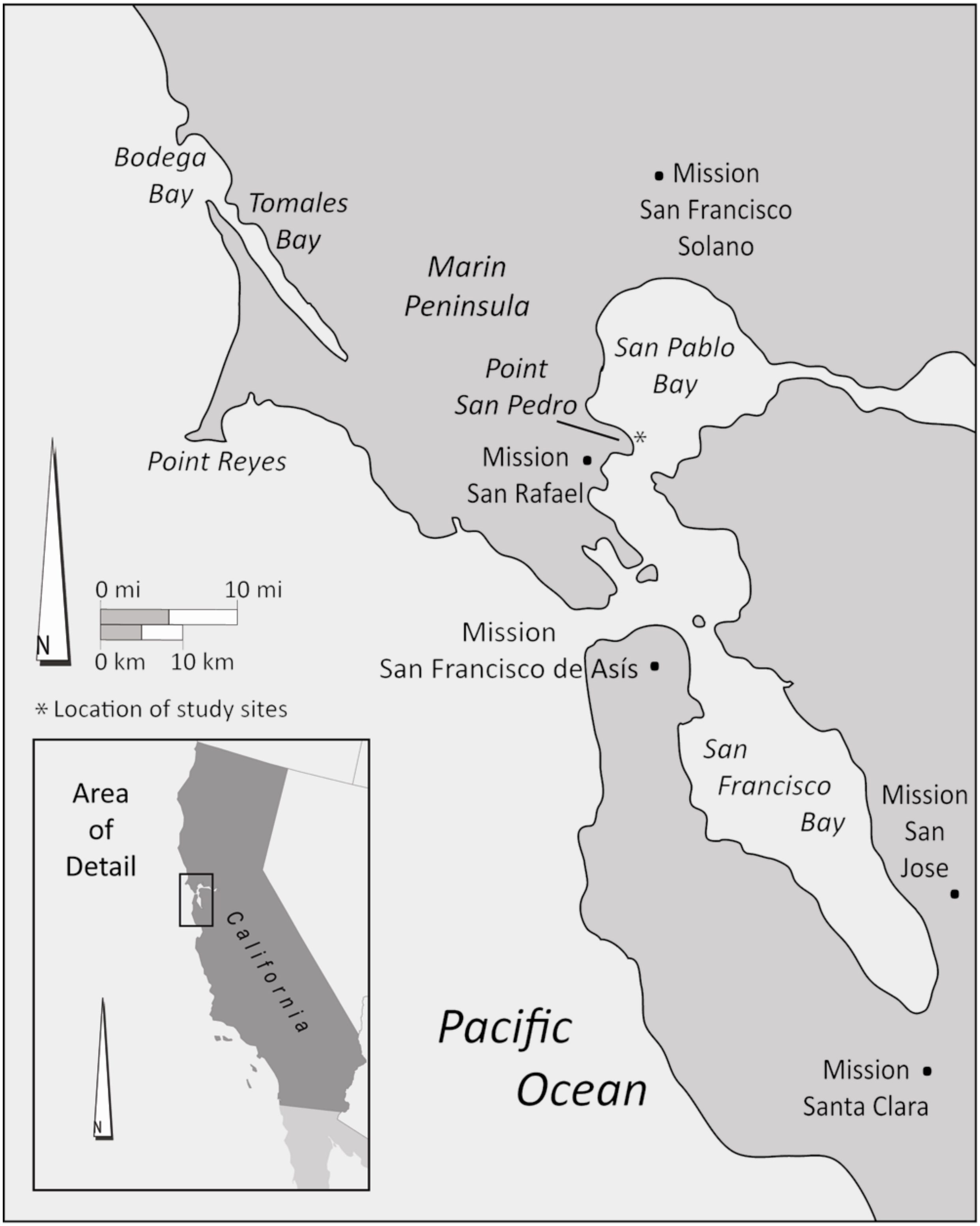
Olomojoia leave their daughters at the mission—perhaps in the care of an Indian from a different tribelet, a godparent, or a priest—before finally returning permanently a year later? Or, did they make their trips across the Golden Gate as a family, returning to their village each time bearing news of their new neighbors to the south? How was it possible for Indians to come and go from the mission if they were required to remain there once baptized? Looking beyond the tragedy of *Juluio*, *Olomojoia*, and their three children, their story is illustrative of the lives of other Coast Miwok who maintained subsistence and settlement pursuits while coping with irrevocable social and environmental changes before, during, and after Spanish missionization, and balanced new opportunities with the persistence of place.

Project Background

In this dissertation I discuss the places to which Coast Miwok refugees returned after leaving Spanish missions, with or without permission, in the San Francisco Bay Area (A.D. 1776-1830s), as well as long-term patterns of culture change and persistence before and after this period of time. Often containing dense mixtures of shell, stone tools, animal remains, and other prehistoric archaeological components, three shell mounds—CA-MRN-114, CA-MRN-115, and CA-MRN-328—are presented as case studies to illustrate persistent connections between people and places into historical times. This suggests connections that both span divisions between *prehistory* and *history* and challenge preconceptions of *native* and *colonial* spaces and associated material culture. Two fundamental research questions addressed in this dissertation include: *when* and *how* were shell mounds inhabited by Coast Miwok? Specifically, how were shell mounds occupied leading up to, during, and possibly even after the period of Spanish missionization; what kinds of social practices took place at bay mounds over time; and can shell mounds be reconceptualized as both sites of "prehistoric" residence and places of refuge where Coast Miwok reworked and maintained cultural practices during historic times? My analysis of material remains, historical documents, ethnography, and oral sources collected during interviews with Coast Miwok and Southern Pomo descendants demonstrates that, despite missionization efforts designed to recruit and confine Bay Area hunter-gatherers, Coast Miwok continued to re-occupy shell mounds likely reinforcing connections to ancestral territories throughout subsequent phases of Mexican and American settlement.

Similar patterns of refuge among indigenous groups are found around the world and in other areas of California, and my interest in studying the practices of Coast Miwok refugees stemmed from my experience working at Fort Ross State Historic Park with my advisor, Kent Lightfoot whose research examines the daily practices of California Indians, Native Alaskans, and others living *outside* the Fort Ross stockade (Lightfoot 2005a). Flowing from this research, my initial dissertation project addressed the practices of company employees and Indians inhabiting ranches located several kilometers from Fort Ross and situated between Russian and Spanish colonial footholds. My focus on one ranch in particular—the Kostromitinov Ranch—developed into an opportunity to explore the intersection of colonial interests, the intermingling of several different California Indian tribes at the ranch, and the outcomes of native accommodation and resistance to colonial policy on the margins of European settlements. The only problem I encountered was not being able to find any architectural remains or artifacts associated with the ranch, so I set aside this project in the interest of time. A subsequent meeting with E. Breck Parkman (State Park Archaeologist) and Kent Lightfoot resulted in identifying an alternative project site to explore my research interests: CA-MRN-115, or the Thomas site. Seemingly unlikely candidates for examining colonial encounters, MRN-115 and two satellite

Figure 1.1. Location of study sites on Point San Pedro and the Marin Peninsula, California.



mounds—MRN-114 and MRN-328—present an opportunity to study the interplay of colonial policy and indigenous interests in the Spanish hinterland, as well as the role of "prehistoric" places as indelible reminders of cultural tradition and spaces where Coast Miwok identity was continually remade.

My study sites are located in China Camp State Park, which is on Point San Pedro in eastern Marin County, California (Figure 1.1). Archaeological field operations at MRN-114, MRN-115, MRN-328 took place over the course of two years and involved systematic mapping and geophysical survey, surface collection, systematic augering and, at MRN-114, targeted excavations. Laboratory analysis was conducted at the California Archaeology Laboratory at the University of California, Berkeley. Here, lithic artifacts, faunal remains, botanical remains, and artifacts of glass and metal and ceramics were sorted, cleaned, and catalogued. Additionally, material remains collected during Clement Meighan's excavations at MRN-115 in 1949 were transferred to the lab on loan from the Phoebe A. Hearst Museum of Anthropology at UC Berkeley. Animal (mammal, bird, and fish) and plant remains underwent further analysis by faunal and paleoethnobotanical specialists, who identified many of the species discussed in Chapter Five. Further subsamples were set aside for specialized analyses, including multiple organic specimens for AMS radiocarbon dating and samples of archaeological obsidian, which underwent obsidian hydration dating and X-ray fluorescence spectrometry. My analysis of lithic artifacts collected from each mound site focuses on morphological attributes of flaked stone and groundstone tools as proxies for understanding production techniques and continuities or changes in technological traditions. The entire suite of artifact, temporal, and obsidian source data suggest long-term cycles of site residence extending from several thousand years ago to the early nineteenth century, even in the absence of artifacts typical of many colonial archaeological sites such as glass beads.

In the absence of "colonial" artifacts, historical sources provide additional context and support my hypothesis that Coast Miwok villages were continuously occupied and re-inhabited during the mission period. My study of the *paseo* system—a practice of approved leaves of absence for baptized Indians—adopted at many missions in California, firsthand accounts of mission life, and sworn testimonies from recaptured runaways suggest opportunities for Indians to depart missions secretly or with permission to collect wild foods and to continue other threatened cultural practices despite a system created to enculturate them (Lightfoot 2005a). In this sense—and contrary to viewpoints of missions as rigidly patrolled institutions where "Indians were forcibly detained… [and] because the landscape around the missions was quickly altered… a return to a native way of life soon became impossible" (Allen 1998:2)—my research shows many missions in California exhibited considerable flexibility in adhering to prescribed policy, especially on the matter of congregating and permanently retaining Indians at missions.

A growing body of research investigating colonial encounters and theories of landscape and resistance offer points of departure to further examine the practices of mission runaways at places of refuge. Just as the missions exhibited considerable fluidity in the manner of gathering together and retaining Indians at missions than previously supposed, so too do the daily practices of Indians residing at missions reveal a spectrum of participatory behavior. Simply put, "in the process of protecting the fundamental fulcra of their world, Native societies confronted and redefined the boundaries of the divine" (Wade 2008:7). While some Indians participated in the church, others elected not to join at all. Traditionally understood as a *reaction to* colonial aggression, native resistance to missions is also expressed in a range of behaviors and material practices. Yet, following Given (2004:11), "resistance is multifaceted and complex, more a range of decisions and negotiations than a single activity." Other forces, besides the missions and dispositions of the missionaries, pulled Coast Miwok towards home. Departures from missions, I argue, provided opportunities for refugee Coast Miwok to reassert elements of their culture by their engagement with socially salient places and the broader landscape of the Marin Peninsula. Shell mounds in particular were ideally suited as *places of refuge*. They offered Coast Miwok opportunity for social continuity and reinvention, providing succor in trying times and anchoring contingent social identities.

My dissertation results are important in at least three ways. First, my research addresses temporal boundaries between prehistoric and historic time periods. Despite a wealth of prehistoric archaeological data from most shell mounds, the details of mound occupations just before the Spanish *entrada* into California remain clouded. European accounts from initial voyages into San Francisco Bay are silent on the matter of whether shell mounds were occupied this late (Lightfoot and Luby 2002), and scholarly explanations for the apparent disuse of Bay Area mounds include the possible spread of epidemics in advance of Spanish landfall in the area (Preston 1998). Indians may have fled villages to avoid confrontation with Europeans, and seasonal occupation of inland villages may also explain the absence of people at bay shore sites at certain times of the year (Lightfoot and Luby 2002:275-276). Cultural and natural damage to most shell mound sites also hinder the study of late components (Ceci 1984; Lightfoot 1997). Yet, contrary to the belief that some prehistoric subsistence and settlement practices ceased with colonial settlement, some prehistoric shell mounds such as those presented in this dissertation probably retained social significance for native groups in the San Francisco Bay area well into historic times. In fact, some have argued missions and other colonial settlements fit into prehistoric cycles of "seasonal transhumance" (R. Jackson 1984:228; see also Silliman 2004:30). This is important for the study of artifact assemblages from other Bay Area shell mounds, and it has potential implications for underrepresented Native American communities in the twenty-first century, who are making claims to ancestral territories; requesting the repatriation of museum collections; and filing for federal recognition.

Second, my research expands culture contact scholarship to examine sites of refuge located in the hinterland of colonial settlements. In doing so, I set aside the notion of a monolithic colonial settlement to explore the porosity of mission operations. As frontier institutions with limited funds and minimal staff, artifacts and architecture from Spanish settlements in the Bay Area are emblematic of other pluralistic social settings where official decrees emanating from the church and state were often abbreviated to suit the needs of the moment (Lightfoot 2005a; Voss 2005). Just as architecture, tools, and dietary needs took on new forms and new meanings, the missions also maintained a "warmed-over version of the sixteenth century colonial policy of *congregación*/*reduccíon*, modified by two hundred years of practical experience in missions throughout northern New Spain and the rest of Spanish America" (Jackson and Castillo 1995:6). The administration of *paseos* is especially exemplary of the ebb and flow of colonial policy, as well as priestly and native agency within California missions. Third, my dissertation contributes to the growing body of literature examining identity, memory, and landscape. I argue refugees' continuous movements across ancestral landscapes reaffirmed senses of place and identity, and the act of returning to, inhabiting, and using places suggests a dual process of summoning memories and creatively inscribing places with meaning.

Conceptual Issues

From their nostalgic literary and cinematic representations in the late nineteenth century and early twentieth century to more recent manifestations in fourth grade classrooms in California public schools, Spanish missions have long-maintained a particular romance among citizens and scholars alike. Three key narratives have impacted the ways anthropologists and the public conceive of missions, California Indians, and California prior to European settlement. The first narrative pertains to the impact of missions on California Indians in terms of the conversion and demographic collapse among native communities associated with the missions, and is often divided between two interpretive camps: those who extol the missions and missionaries and those who disparage them (see Jackson and Castillo 1995:4; Sandos 2004:xiii). A second narrative addresses the extent to which Indians integrated into the mission environment and took on elements of other cultures. Studies of acculturation and culture contact in particular laid groundwork for understanding the parameters of contact, processes of culture change, and the consequences of cultural transfer in many parts of North America. Dissatisfied with culture change as an exclusive product of European contact however, theories of resistance offer a counterpoint and approach for examining the range of activities mission Indians participated in as they reacted to colonial settlement. The third narrative addresses the long-term timing of colonial settlement and its impact on native groups, specifically the possibility for social continuity before, during, and after European settlement, as opposed to disjuncture between prehistoric and historic times in California.

Moving beyond narratives of good versus evil and dominance versus resistance, I explore the conditions that allowed, or compelled, Indians to leave missions and were creative of contexts for social change and continuity. My primary focus on Coast Miwok runaways expands the scale of colonialism to examine distant places of refuge as opportune locations to illicitly convene on a periodic basis, make decisions, gather nourishing foods and other raw materials, and to maintain old traditions while also integrating new cultural practices. Although not explicitly addressing coastal shell mounds, scholarship (e.g., Buikstra and Charles 1999; Mann 2005; Pauketat and Alt 2003; Rodning 2009; Wilson 2010) dealing with social memory and the long-term significance of persistent occupations of mounded spaces give comparative support for evaluating the magnetism of ancestral landscapes for Coast Miwok navigating colonial intrusions, as well as for claims to place and identity by subsequent generations of Coast Miwok inhabiting the Marin Peninsula.

I also examine the machinations of daily life at the missions that supported Indians' periodic departures from them for the purposes of returning to home villages, recuperating, and supplementing rations with locally available foods. Research from various North American mission contexts suggest Native Americans maintained forms of traditional subsistence and other cultural practices while residing at the missions (Deeds 2003:75; Engelhardt 1930:583-584; Geiger and Meighan 1976; Hackel 2005:274; Lightfoot 2005a:206; Margolin 1989:90; Newell 2009:56-58; Panich 2009; Sandos 2004:55; Wade 2008:172-173), and at times this behavior was encouraged. For example, shortages of protein at some missions precipitated in allowing Indians to avail themselves of wild game, in at least one instance leading to the creation of professional *venaderos*, or deer hunters (Johnson 2005:73). While archaeology suggest some indigenous practices took place in the isolation of neophyte quarters (Lightfoot 2005a), other activities were generally tolerated and both explicit and illicit forms of native agency generated needed physical and spiritual nourishment for mission Indians.

Yet, where did they go, those Coast Miwok who were able to depart Spanish missions? Furthermore, what are the material indices of *paseos* and apostasy when examining archaeological sites located in the hinterland of mission communities? Research on the material culture of runaway communities in other areas of California (Bernard 2008) and around the world (La Rosa Corzo 1988; McNiven 2000; Singleton and Souza 2009; Weik 1997) provide helpful insights for understanding the archaeology of and motivation behind refuge, as well as for interpreting continuities in shell mound residence prehistorically and during colonial times by Coast Miwok refugees. Presented in greater detail in Chapter Four, I developed a set of five research expectations to which material, chronometric, and historical data related to coastal shell mounds (MRN-114, MRN-115, and MRN-328) are brought to bear. Structured around multiple research questions, I expected distinct prehistoric and historic deposits at the three shell mounds with mixed deposits of colonial and native artifacts, similar those deposits studied by Bernard (2008) at a southern California refuge context. However, as I will discuss later in this dissertation, my findings indicate a more complicated association between colonial encounters and the material evidence recovered from the three shell mounds.

Structure of Dissertation

This dissertation is divided into eight chapters and organized around specific research questions examining long-term residence at bay shell mounds before, during, and after Spanish missionization. Throughout the following chapters I utilize multiple lines of evidence to understand the practices of Coast Miwok hunter-gatherers on the Marin Peninsula's San Pablo Bay shore, and the practicalities of mission life between 1776 and the 1830s that created opportunities for Coast Miwoks to depart from missions and reengage in a hunting and gathering existence in the hinterlands of colonial San Francisco. Archaeological data collected from MRN-114, MRN-115, and MRN-328, historical accounts, ethnography, and oral sources are used to argue some prehistoric shell mounds were re-utilized by Coast Miwok during historic times as places of refuge and venues of long-term cultural practice.

In Chapter Two, I present the theoretical underpinning of my dissertation. Building on fruitful dialogues related to the study of culture contact and colonialism, my study of colonial encounters in the San Francisco Bay area stresses new means to evaluate the complexity of social interactions and sophisticated entanglements of agents and objects in the hinterlands of colonial settlements. Taking a landscape perspective, I present an overview of anthropological studies of power, inequality, and social dominance and resistance as a basis for understanding *places of refuge*, which I also define and outline. Additional theoretical influences discussed in this chapter include theories of practice, materiality, and identity. Drawing from this literature, I argue landscapes are active; reciprocally providing social meaning for people who, in turn, attach meaning to significant places. Considering ancient shell mounds, in particular, for Coast Miwok the physical act of returning to these sites—as places of refuge—at once transmitted cultural traditions, legitimated social orders of the time, maintained past cultural practices, and renewed life in a new, changing world.

In Chapter Three, I discuss the settlement and subsistence practices of Coast Miwok speakers who inhabit the Marin Peninsula. As hunter-gatherers, I describe the seasonal movements of Coast Miwok inhabiting the eastern Marin Peninsula (on the San Pablo Bay). Periodically occupying inland camps, Coast Miwok living along the bay shore exploited an array of species from marine, estuarine, and terrestrial habitats, which supported sustenance throughout the year. With this framework in place, the second part of the chapter discusses shell mounds in the San Francisco Bay area with an eye towards various interpretations of their function and meaning, the seasonal timing of their occupation, and their ecological context. I then introduce my three study sites—MRN-114, MRN-115, and MRN-328—in the final part of the chapter. I view this cluster of sites as part of a much broader mounded landscape with which Coast Miwok engaged during prehistoric times, providing requisite strategies for navigating subsequent waves of European settlement.

In Chapter Four, I outline my research questions, five key research expectations, and summarize my dissertation field operations at MRN-114, MRN-115, and MRN-328 in China Camp State Park. A suite of archaeological field methods was employed to be able to capture an array of spatial and diachronic data. Spatial analysis of archaeological assemblages from the three study sites suggest distinct areas of activity at each site, and intrasite stratigraphic comparisons provide important information on the relationships between each site and the timing of their occupations. Assessing fluctuations in the quantity of lithic artifacts and mussel shell from zero to 100 centimeters in depth from auger units are used to document changes and continuities in site use through time. For example, increases in mussel shell between 20 centimeters and 40 centimeters appear to reflect a period of resource intensification visible at other bay mounds dating to A.D. 900-1800. That all three mounds appear to have been inhabited contemporaneously, suggests development of a mounded community where living arrangements and daily tasks were arranged across different site areas.

Archaeological remains collected during my field work are presented and interpreted in Chapter Five. Analysis of botanical remains collected from two features at MRN-114—as well as my study of faunal remains, lithic artifacts, and artifacts of glass, metal, and ceramic from other contexts across all three sites—are described and the results are presented. Additional findings are presented from my study of artifacts excavated from MRN-115 in 1949 and currently housed at the Phoebe A. Hearst Museum of Anthropology. Throughout this chapter, ethnographic data are presented to contextualize archaeological finds, while diagnostic artifacts—projectile points, shell artifacts, metal artifacts, and others—suggest late prehistoric and late historic occupations at the three shell mounds. Unexpectedly, mixtures of native and colonial artifacts were not encountered and required additional chronometric analysis of specific materials and stratigraphic deposits.

In Chapter Six, I present results from specialized analyses of materials collected from the three project sites. X-ray spectrometry of archaeological obsidians reveals a shift through time in the use of space within the shell mound cluster and in the acquisition of obsidian raw material from either Napa Valley or Annadel obsidian sources in northern California. I argue such shifts mirror fluctuations in social and economic constellations on the Marin Peninsula before and after colonial settlement; more specifically, the reoccupation of MRN-114 and MRN-328 by Coast Miwok from other areas of the peninsula and a tightening of territorial boundaries prior to European settlement. Three obsidian hydration values and an assay of eight AMS radiocarbon determinations further refine the temporal sequence of the three shell mounds. In addition to strong prehistoric components, radiocarbon values and obsidian hydration dates indicate site use during the period of Spanish missionization in the San Francisco Bay.

The previous five chapters are then synthesized in Chapter Seven, which will address Indian fugitivism and the *paseo* system. Native forms of subsistence, world views, and other daily practices were continuous among Indians living at Spanish missions, and I examine how a combination of food shortages, labor regimes, and punishment motivated Franciscan priests to provide allowances for baptized Indians to go on short hunting trips or to return to home villages on *paseo*. Still others fled missions without priestly consent. In light of both forms of departure—*paseos* and running away—missions exhibit more flexibility than previously supposed and compel anthropologists to consider the places beyond missions where hunter-gatherers retained elements of their pre-contact existence during historical times. Persistent returns to ancient sites like MRN-114, MR-115, and MRN-328 and constant engagement with ancestral landscapes reinforced long-term ties to particular areas. Following the secularization of Spanish missions in the 1830s, Native Americans confronted consecutive waves of European settlement although managed to retain title to some land or, in other nearby locales, found new economic means to survive a rapidly changing world. Historical and cultural data collected during my ethnographic interviews with Coast Miwok and Southern Pomo elders from the Federated Indians of Graton Rancheria further showcase long-term connections between descendant communities and the places frequented by their ancestors.

In Chapter Eight, I conclude my dissertation and restate core themes discussed throughout my study. After summarizing my field and laboratory methods and the results of my analysis, I address the implications of my findings relative to the broader field of study examining hunter-gatherers, shell mounds, and Spanish missions. I conclude with a discussion of future research that I will undertake to refine aspects of this dissertation, and I offer some suggestions for comparative research exploring places of refuge at other contexts of colonialism within and outside California.

CHAPTER TWO

LANDSCAPE AND RESISTANCE IN COLONIAL CALIFORNIA

Under the soft glow of moonlight on the evening of August 5, 1775 the *San Carlos*, commanded by Lieutenant Juan Manuel de Ayala, rounded Land's End, sailed through the Golden Gate, and entered the calm waters of the San Francisco Bay. On the 6th of August, the ship anchored in Richardson Bay just north of Angel Island. For forty days the ship and crew remained in the area mapping the San Francisco Bay. Encounters with the local inhabitants—not the first in central California by any measure—were unavoidable, but good natured (Milliken 1995:40-51). General curiosity among the crew of the *San Carlos* and Indians alike underscored exchanges of fish, shellfish, and seed meal for glass beads and small metal objects. This stay was also a precursor to a much longer period of colonial encounter between Europeans and Indians in the Bay Area that would begin the following summer in 1776 with the establishment of Mission San Francisco de Asís.

The study of long-term change in human societies places archaeological studies of colonialism in an important position to identify social change through time, generate cross-cultural comparisons, and establish regional sequences of change and development. To understand the practices of California hunter-gatherers navigating waves of colonial settlement requires an awareness of antecedent cultural practices: settlement and subsistence practices whereby hunter-gatherers moved periodically between villages to access seasonally available foods. Conversely, to be able to evaluate the consequences of hunter-gatherer practices requires a strong understanding of their employment beyond the arbitrary barrier that so often separates prehistoric and historical archaeological research (Lightfoot 1995).

This chapter is divided into four parts and will provide the theoretical underpinning for interpreting the interactions of Europeans and Indians in the San Francisco Bay area. Part one discusses the terms "culture contact" and "colonialism" as they are applied in archaeological practice. Both terms are sometimes used interchangeably even though they connote very different conditions and consequences of encounter. Part two of this chapter outlines a framework for interpreting resistance to colonial dominance, and a model for evaluating places of refuge where hunter-gatherers returned to continue cultural practices beyond the gaze of the Spanish padres. In the third part of this chapter, I present the study of landscapes as one approach to understand the physical act of leaving missions and the social experience of returns to familiar places to continue the very cultural practices that were in danger of being erased. I discuss how archaeologies of landscape can be used to interpret a dual process of ascribing meaning to significant places and features on a landscape and also reinforcing personal or group identity by engaging with culturally meaningful places. Part four elaborates on the topic of landscape and provides brief discussions on three additional theoretical influences—practice theory, materiality, and identity—helpful to understand how and why natives visited sites of refuge, as well as how these visits reinforced connections to place.

Culture Contact and Colonialism

The present research builds upon two conventional models that have been used to study and interpret cultural interactions, colonialism, and historical change: acculturation and core-periphery models. Early acculturation research by Redfield et al. (1936), Herskovits (1938), Linton (1963 [1940]), Beals (1953), Broom et al. (1954), and Spicer (1961, 1962) examined parameters of contact, processes of culture change, and the consequences of cultural transfer in many parts of North America. With the Columbian Quincentenary in 1992 and a fluorescence of research dealing with forgotten identities and resistance to European conquest, criticism of acculturation research addressed depictions of culture contact as dichotomous encounters between dominant European colonizers (donor cultures) and subordinate (recipient) indigenous groups (Stein 2005a:16). However, the adoption of European material culture, traditionally identified by some archaeologists as a benchmark for cultural transfer and "acculturative pressures" (e.g., Farnsworth 1989, 1992), did not always mean assimilation to the donor culture.

The second approach, world-systems theory (also, 'core-periphery' or 'center-periphery' models), addresses the rise of Western capitalist societies in a global context of economic, political, and cultural expansion (Wallerstein 1974). World-systems theory is employed to understand contact and colonialism on a global scale. As with models of acculturation however, some have faulted the model's global breadth and top-down (core-centric), unidirectional orientation as masking small-scale change in colonized regions. The model's breadth overshadowed its capacity to understand how colonized populations and the "mass of small processes" shape colonial outcomes and policy emanating from a core (Champion 1989; Gosden and Knowles 2001:xix; Hall 1986; Rice 1998; Schortman and Urban 1994; Urban and Schortman 1999). Although acculturation and world-systems approaches remain a topic of intellectual debate (e.g., Cusick 1998; Dietler 1998; Gosden 2004; Rubertone 2000; Stein 1998, 2005a), retooled versions of these approaches continue to provide useful interpretive frameworks for evaluating culture change at broad scale of analysis (e.g., Champion 1989; Chase-Dunn and Hall 1991; Crowell 1997; Cusick 1998; Deagan 1982; Stein 1998, 1999).

Studies of culture contact and colonialism have developed from acculturation and world-systems theory and cross-cut several archaeological research topics, including social identity and ethnogenesis (Byrne 2003; Harrison 2002; Loren 2001; Rodríguez-Alegría 2005; Voss 2005, 2008a, 2008b), agency and daily practice (Lightfoot et al. 1998; Silliman 2001a), labor (Saita 2005; Silliman 2001b, 2004), sex and gender (Voss 2000, 2008a, 2008b), resistance (Given 2004), landscapes (Byrne 2003), and materiality (Hayes 2008; Liebmann 2008). Similarly, colonialism is studied in almost every corner of the world and in a variety of time periods.

One important function in the archaeology of colonialism is the use of multiple lines of evidence, in which oral sources, historical sources, and archaeological data are compared to one another. In this historical anthropological approach, "intended" colonial perspectives often relayed through documents are balanced with the broader, diachronic vantage of archaeological material studies, oral sources, and ethnographic writings to yield a more inclusive discussion of past events (Lightfoot 2005a:16). This approach is critical to our understanding of the causes and outcomes of cultural interactions, and provides an opportunity to listen to the voices of those without history (Wolf 1982). In framing my work within events that unfolded in the north San Francisco Bay area following the establishment of Mission San Francisco de Asís in 1776, I draw upon these theoretical approaches to colonialism. To better understand the social conditions in which California Indians moved between home villages and Spanish settlements and the long-term consequences of cultural interactions, I first examine similarities and differences between episodes of culture contact and colonialism.

Here I define the terms "culture contact" and "colonialism" as they have been applied within the past ten years (e.g. Cusick 1998; Gosden 2004; Lightfoot 2005a, 2005b; Lyons and Papadopoulos 2002; Silliman 2005a; Stein 2005, 2005a). In creating this distinction, I recognize that uncritical application of the terms "culture contact" and "colonialism" generates ambiguity in how archaeologists understand cultural interactions, and also poses dire political effects on contemporary Native American descendant communities who often utilize archaeological information to become empowered and economically viable (Rubertone 1989, 2000; Silliman 2005a, 2009). As Lyons and Papadopoulos (2002:2) state, "archaeology is enmeshed with colonialism," and economically, politically, and geographically to this day the profound and transformative impact of cultural contact remains.

Culture contact is often used to describe basic interactions between two or more different individuals or groups for any length of time. One ambiguous definition of culture contact was put forth by Gosden (2004:5) to describe the ubiquity of cultural interaction. Culture contact is a "basic human fact," and "there is no such thing as an isolated culture" (Gosden 2004:5). "Culture contact" is specific to a particular time or place. It existed in the past, and it exists in the twenty-first century. However, the range of social attributes, creative cultural products, economic and political dimensions, and the duration of interaction are missing from the generalized definition of culture contact as a simple fact of human life or "predisposition" (Cusick 1998:4). Borrowing from Lesser's (1961:41-42) concept of the "social field," or the web-like connections of societies, and Curtin's (1988:1) view of cross-cultural trade as playing a pivotal role in social interactions, Cusick (1998:4) refines the definition of culture contact to include human agents and the diverse social motivations of contact.

According to Cusick (1998:4) culture contact is "a predisposition for groups to interact with 'outsiders'—a necessity created through human diversity, settlement pattern, and desire for exchange—and to want to control that interaction... [and is] a continuum of human social and geographical relationships that involve outsiders and that induce change and adjustment." Cusick (1998:6) also outlines four generalizations that can be used to frame culture contact studies, namely: interactions are structured by agential motivations and overarching systemic factors such as the balance of power, demography, and geography; there are directed and non-directed contact situations; cultural differences emerge from conflicting or non-conflicting situations; and frontiers offer an ideal arena to analyze cultural interaction.

While it is important to consider culture contact in terms of the social impetus of human groups, its specificity or relation to precise points in time appears ephemeral, and the term does not fully grasp the causes and consequences of contacts. Following Silliman (2005a:58), colonialism is a type of culture contact. To mistake clearly colonial contexts as culture contact places emphasis on short-term encounters and downplays the violent nature of colonialism, as well as the entangled sophistication of much longer periods of cultural exchange.

Following Cusick (1998) and Silliman (2005a), I understand culture contact as a spectrum of long- and short-term encounters that involves two or more groups of people often with different motivations. Contact can take place within a context that produces an uneven balance of power and can lead to several consequences, including the permanent departure of one group, repeated visits, or longer stays that may lead to settlement and colonization. This definition helps understand the variety of contacts that took place in the greater San Francisco Bay area, but requires further information regarding the genesis of culture—change and persistence—resulting from culture contact. For that, I focus now on colonial encounters.

A colonial understanding of cultural interactions identifies processes of interactions, not framed events; shared histories, not isolated trajectories; and shared identities, not models of acculturation and assimilation (Silliman 2005a). Our inheritance of a unilinear, frontier history, Silliman (2005a) cautions, enables us to present contact events as severed, fleeting moments in history. The idea that those who are "contacted" fall victim to this singular trajectory is solidified in California, the terminus of a Manifest Destiny. Moreover, Silliman (2005a:61) employs an analogy used by Wolf (1982) who likens culture contact to a set of billiard balls torn apart instantaneously by a *white* cue ball. Silliman (2005a:61) argues common usage of culture contact "manipulates process into event," compacting creative cultural responses and developments into bounded moments in time rather than intricate cultural entanglements. Silliman (2005a), Gosden (2004), Stein (2005, 2005a), and Lightfoot (2005a, 2005b) present helpful theoretical frameworks for analyzing colonialism in archaeological contexts.

Silliman (2005a:59) defines colonialism as a "dual process (1) of attempted domination by a colonial/settler population based on perceptions and actions of inequality, racism, oppression, labor control, economic marginalization, and dispossession and (2) of resistance, acquiescence, and living through these by indigenous people who never permit these processes to become final and complete and who frequently retain or remake identities and traditions in the face of often brutal conditions." This definition is helpful in that it considers colonialism in terms of occupation of a foreign landscape by either formalized states *or* settler groups, and it accounts for initial encounters and subsequent manifestations of colonialism.

A second approach to the study of colonialism views colonialism as "a particular grip that material culture gets on the bodies and minds of people, moving them across space and attaching to them new values" (Gosden 2004:3). A valuable perspective, objects have "social lives," or an active role in the structuring of everyday life and in the consumption practices that build relationships between and within cultures. This philosophy is present in Gosden's (2004:24-40) three models of colonialism—colonialism in a shared cultural milieu, the middle ground, and *terra nullius*—which focus on a spectrum of relationships between people, power, and material culture.

Colonialism within a shared cultural milieu is "colonialism without colonies," or contact within overlapping spheres of interaction (Gosden 2004:41). In this sense, colonialism is understood as something akin to culture contact. However, within the shared cultural milieu one group or person maintains a symbolic center of reference that affirms their power. The "middle ground" is borrowed from the study of Algonquian refugees in the North American Great Lakes region (White 1991). Accordingly, the model underscores native peoples' creative responses to colonial rule. They are neither entirely acculturated into a settler culture nor entirely resistant, rather they are agents in sophisticated processes of cultural and identity refashioning. The third model, *terra nullius*, is a brief encounter with overpowering physical consequences stemming from the effects of onerous colonial policies, disease, and dispossession (Gosden 2004:28).

Useful only as a comparative framework for assessing variation in colonial programs, I believe the tripartite model proposed by Gosden (2004) leaves little room for evaluating changes in different colonial programs through time. For example, models of conversion employed in the Spanish missions were dynamic, such that conversion practices and the treatment of Native Americans by Franciscan missionaries in eighteenth century Alta California was quite different from models implemented in Texas and other parts of American Southeast centuries earlier (Wade 2008).

A third approach, endorsed by Stein (2005a:4), proposes a cross-cultural look at "the dynamics of symbolic, political, and economic interaction in relation to identity in colonial encounters." Colonialism is something unique to complex societies and is characterized by a metropol, a host polity, and a colony. A colony is a site whose "architecture, site plan, and material culture assemblage are identical to those of another region but are located as spatially discrete occupations surrounded by settlements of the local culture" (Stein 2005a:14). Stressing the colonial *encounter* and departing from a traditional dependency on Greek, Roman, and European colonial analogies, Stein brings to bear bidirectional and multidirectional influences, as well as cultural continuities, which impact the creation, stagnation, and re-fashioning of colonial identities.

A final approach from which I draw influence addresses colonialism as an entanglement of new identities, social, political, and technological innovations, social forms, and cultural relationships (Lightfoot 2005a). To disentangle these multiple intersections, Lightfoot (2005a, 2005b) proposes a comparative approach to studying the outcomes of colonialism and variation in colonial encounters. Lightfoot (2005b) argues—and I agree—we cannot continue to view European colonialism in North America as monolithic, that variation existed and colonial policies changed over time, and we must not continue to rely on traditional models for evaluating such variation because of a tendency to pigeonhole subtle attributes in the mechanics of colonialism. At the same time, these models should not be completely abandoned when making cross-cultural comparisons (Lightfoot 2005b:210-211).

Archaeological approaches to the study of culture contact and colonialism have traditionally emphasized places of contact or sites of colonial settlement (e.g., forts, missions, mercantile outposts, etc.), but often to the detriment of long-term understandings of cultural persistence among native populations who often still identify with culturally meaningful places (Rubertone 2000:435; Schneider 2003, 2007a; Silliman 2009:213). As I discuss in the second and third parts of this chapter, recent research considers the spatial dimensions of colonialism, including the continuum of living conditions for colonial subjects inhabiting spaces near and far from settlements, variations in the responses to colonial settlement, and the pivotal role of landscapes in shaping encounters and colonial identities.

As a case study for examining colonial encounters in California, Lightfoot (2005a) compares the Russian mercantile outpost of Colony Ross to Spanish missions along seven dimensions of colonial encounter: enculturation programs, native relocation programs, interethnic unions, demographic parameters such as health and mortality, labor programs, social mobility, and the duration of the colonial program (Lightfoot 2005a). Isolating a single dimension from Lightfoot's (2005a) comparative approach, the Franciscan enculturation and *reduccíon* (relocation) programs reveals a controlled system of limited mobility and social restrictions for mission neophytes, compared to a more flexible social existence for Indians residing at Colony Ross.

Lightfoot (2005a:206) argues the combined effects of tribal amalgamation at northern missions, like Mission Dolores, and the cultural implosion experienced by Indians torn from their home territories contributed to a highly malleable and more generalized "pan-mission" Indian identity. With time, Lightfoot argues, second and third generation neophytes raised in the mission atmosphere lost touch with their homelands and "vested the broader landscapes of the missions with new meaning and symbolism" (Lightfoot 2005a:206). The caustic impact of colonialism on tribes cannot be underestimated. Yet for some, identities were reshaped and connections persisted. Administrative decisions in missions that allowed neophytes periodic leaves of absence and illicit escape provided opportunities to reconnect with home territories, and new meanings for places did not always necessitate losing touch with them.

Building upon acculturation and world-systems scholarship, archaeologists such as Cusick (1998a), Gosden (2004), Lightfoot (2005a), Silliman (2005a, 2009), and Stein 2005a) champion refined models to assess the causes, conditions, duration, and consequences of unique cultural interactions. Acculturation theory is bound to the study of culture contact and was initially used to describe the nature of contact between two different cultures and the outcomes of refusing, mixing, or losing cultural practices. World-systems theory provides a second approach to understand how cultures interact on a global scale, as well as the economic and political consequences of colonialism for peripheral societies. Contemporary studies of culture contact and colonialism build on these two approaches despite the shortcomings described above.

I understand culture contact as a spectrum of generally short-term encounters that involve two or more groups of people often with different motivations. Contact can take place within a context that produces an uneven balance of power and can lead to several consequences, including the permanent departure of one group, repeated visits, or longer stays that may lead to settlement and colonization. Colonialism is discussed as unfolding over a much longer period of time and inclusive of multiple agents who have the ability to accept, decline, and shape situations to suit their needs. Another approach useful for grasping the spatial dimensions of colonialism that took place in the San Francisco Bay area involves the careful study of the places where encounters unfolded and where cultural identities were shaped and maintained.

Conceptual Frameworks for Evaluating Resistance

Before examining the spatial dimensions of colonial encounter and the role of landscapes in shaping these encounters, I provide a conceptual framework for examining resistance to colonial dominance. The greater San Francisco Bay area presents a unique opportunity to explore and compare multiple episodes of colonial settlement in California and the spectrum of indigenous responses to European encroachments. After the founding of the first Spanish mission and presidio in San Diego in 1769, a protracted period of confrontations ensued between hunter-gatherers and colonial soldiers, missionaries, fur traders, ranchers, miners, and other foreigners who increasingly established settlements in their ancestral homelands (Lightfoot et al. 2009b). Each period of colonial settlement in California in turn carries case-specific variables—geographic, historical, demographic, and otherwise—which must be understood to be able to examine relationships of power and resistance in different colonial contexts.

Power, inequality, dominance and resistance: these concepts are employed variously to describe imbalances in social relationships; the mechanisms of social dominance and reproduction; and the conditions of and reactions to asymmetric social arrangements. These concepts also imbricate with discussions of colonialism and are considered within this context. Paynter and McGuire (1991:1) note anthropological archaeologists generally draw from two analytical constructs to view inequality in the past: tradition, a normative approach stressed by cultural historians, and the deterministic relationship between society and nature supported by cultural ecologists. A third field of scholarship—and the approach adopted by Paynter and McGuire (1991)—views the struggles of members of society, the exercise and control of power, and the use of social asymmetries as resources in exercising power as the realm of political economy (Paynter and McGuire 1991:1).

Elaborating on this third perspective, Paynter and McGuire (1991:5-13) describe three broad research themes in the study of social power, which collectively form the *dyadic problematique*, the steps and consequences associated with the exercise of social power. The first theme, "heterogeneity of power," refers to the multiplicity of domains and strategies in which power is exercised. The ability to exercise "power to" (transformative capacity) or "power over" (relationship of domination) is one approach used to express the permeation of power in social life (Miller and Tilley 1984:5-8). The second theme, "creation of subjectivities through discipline," suggests the ability of individuals and institutions to manipulate and enforce power over other members of society. Landscapes (as material culture) are often manipulated by elites to control and structure movement and to surveil everyday activities (Foucault 1979). When considering the Spanish mission system, physical manipulation of space—the dormitories, fields, and other neophyte spaces—is power-laden, impacts knowledge of being-in-the-world (Voss 2008a:148), and reinforces "an orchestrated discourse of punishment" implemented to mold daily practices and cull rebellious acts from potential native converts (Wade 2008:142).

The third theme, "the dialectic of domination and resistance," refers to the interplay between acts of domination and resistance as mutually constitutive and creative of one another on a daily basis, as well as inseparable from our role as researchers and participants in the creation of knowledge (Paynter and McGuire 1991:12). In sum, Paynter and McGuire (1991) offer a helpful framework for analyzing social power and inequality in archaeological contexts and, apropos of the present research, within the Spanish mission program. The authors are also careful to note the material manifestations of social inequality, and they encourage scholars to look beyond traditional realms of inequality (e.g., architectural differences among commoners and elites) to examine a wider range of day-to-day forms of social power and resistance (Paynter and McGuire 1991:13; Scott 1985). Turning from frameworks analyzing social inequality and power, I now focus specifically on resistance.

Miller et al. (1989) provide one the first comprehensive discussions on the subject of resistance and dominance as applied to archaeological contexts. They identify theories of dominance and resistance as closely linked to ideas of social complexity and inherent social asymmetry (Miller et al. 1989:2), but avoid the term inequality—the conditions of rank or status ordering, or the relative distribution of power in society—for its inability to account for the complexity of social forms. Instead, 'dominance' and 'resistance' are applied to "elaborate a comparative study of all forms of social complexity" and to avoid pitfalls of ethnocentrism and reductionism associated with superficial categorization (Miller et al. 1989:2). The concept of dominance emerged from structural-Marxist thinking, mainly the work of Althusser (1984), who identified political and ideological strategies involved in the reproduction of systems of social inequality as preexisting (Miller et al. 1989:7-9). Miller et al. (1989:11) also apply Gramsci's (1971) concept of hegemony—the process of ideological domination, and rule of dominant group by physical and symbolic production—to understand forms of resistance that could potentially lead to the overthrow of a dominant group.

Although Miller et al. (1989) stress the unequivocal permeation of power within forms of social organization; I believe scholars should shoulder caution when using concepts such as "domination" and "resistance." The terms encompass a wider range of variability and exceptions than originally conceived and fail to identify geographic, social, and temporal nuances of human social interactions. Miller et al. (1989) provide an important contribution for theorizing and identifying asymmetry in social relationships, but they also create a binary by which societies express *either* dominant *or* resistant behavior; societies are not evaluated on the basis of social relationships present in different parts of the world, the differential reactions of individuals, groups, or institutions within the same social group, and changes in these power imbalances through time.

Ortner (1995:174) addresses the seemingly unambiguous nature of the term resistance, and the simple binary of dominance and resistance by which domination was often conceptualized as a relatively fixed and institutionalized form of power and resistance as organized opposition to institutional power. Lightfoot and Martinez (1995) also note the simplicity of arranging cultures into categories of dominators/resistors, and Bernard (2008:13) comments on the circularity of archaeological arguments which tie assumed materials of "resistance" to categories of resistance.

In an attempt to bypass this binary, Scott (1985:xvi) examines everyday forms of resistance taking place in secret arenas, such as "foot dragging, dissimulation, desertion, false compliance, pilfering, feigned ignorance, slander, arson, sabotage, and so on," which required little formal organization among subordinate social groups and are less easily identified. The "practical politics" involved in daily negotiations of social position and identity yield profound effects on creating new identities in contexts of dominance (Silliman 2001a:194). Further research examined "hidden transcripts" among subordinate groups (and dominant groups), which counter public transcripts and critique the power exercised by dominant groups (Scott 1990:xii). Accordingly, transformations of dominant belief systems from everyday, individual acts of resistance "multiplied many thousand-fold, may, in the end, make utter shambles of the policies dreamed up by [the] would-be superiors in the capital" (Scott 1985:xvii).

Unconvinced of attempts to refine studies of resistance intended to examine the myriad ways—organized and hidden—groups resisted dominant power, problems remained with fitting any given act "into a box called resistance" (Ortner 1995:175; see also Given 2004:10-12). "Resistance is multifaceted and complex, more a range of decisions and negotiations than a single activity" (Given 2004:11). Following this scholarship, the examination of social resistance requires careful attention to "the logic of a group's own locally and historically evolved *bricolage*" of politics (within and between groups), individual motivations, gender distinctions, and religious constellations (Ortner 1995:176). To do so otherwise, provides an ethnographically "thin" understanding of the depth of cultural motivations to resist, accommodate, or collaborate in colonial contexts (Ortner 1995).

> One can only appreciate the ways in which resistance can be more than opposition, can be truly creative and transformative, if one appreciates the multiplicity of projects in which social beings are always engaged, and the multiplicity of ways in which those projects feed as well as collide with one another (Ortner 1995:191).

Before examining cultural landscapes as important arenas to examine resistance, I look at the variety of forms in which resistance to colonial settlement can take, with an eye towards understanding the intersection of these forms with unique and dynamic cultural, historical, and geographic circumstances of hunter-gatherers in the San Francisco Bay area.

Resistance and Runaways

Jackson and Castillo (1995) present a refined analysis of resistance in their study of Spanish missions and social control in Alta California. The array of tactics employed by California hunter-gatherers to oppose colonial settlement and Franciscan proselytizing efforts and to retain pre-contact social practices is accounted for in their discussion of primary and secondary resistance (Jackson and Castillo 1995:73). The authors also establish temporal depth in their analysis, such that forms of resistance are nuanced and modified by the circumstances of social control and social relationships as these change through time. Accordingly, primary forms of resistance, such as open warfare, represent initial responses to the Spanish presence. Deeds (1996:54-58, 1998a, 1998b:50, 2003:34) would call these first-generation rebellions, which were shaped by different historical and geographic variables but occurred within a generation or two of the first penetration of Spanish settlers into a particular region.

Secondary resistance is viewed as either *active* or *passive*, and occurred "a generation or two following the establishment of the missions" (Jackson and Castillo 1995:73). Examples of passive, secondary resistances are vague and might include "hidden transcripts" of foot-dragging, graffiti, name-calling, petty theft, and sabotage. Examples of active, secondary resistance include revolt and flight. Examples of revolt abound. Attacks on missions in southern California include those led by Chumash speakers at Missions Santa Inés, La Purísima, and Santa Barbara in 1824 (Jackson and Castillo 1995:77). Native uprisings are also well-documented in northern California missions, including three well-known examples: an attack on Mission Santa Cruz by Indian fugitives in 1793 (Milliken 1995:115-120); the 1812 attack on Mission Santa Cruz, which resulted in the infamous castration and death of Padre Andrés Quintana (Allen 1998:13; Voss 2000:46; Wade 2008:179); and a string of rebellions led by *Huicmuse*, or Marino (a.k.a., Chief Marin) (Goerke 2007). Flight from the missions and fugitivism is also considered an active and prevalent form of secondary resistance (Jackson and Castillo 1995:78-80), an act of defiance which helped hunter-gatherers, especially women, to "maintain important tribal traditions and [create] alternatives to dependency on white economic, political, and religious systems" (Brady et al. 1984:141; see also Tveskov 2007).

Some may fault Jackson and Castillo (1995) for merely replacing one dichotomy of dominance and resistance with another dichotomy of *active* and *passive* resistance, which potentially downplays the agency and potency behind seemingly "passive" acts of rebellion. However, the authors open the dialogue of resistance to include a variety of forms and allow for a spatial approach that is tailor-made for archaeology. In such an approach, research areas and specific sites can be selected for investigation to answer questions about culture change and persistence both near and *far* from colonial centers (Lightfoot et al. 2009b). Additionally, recognizing the mechanisms that forced, or allowed, hunter-gatherers to leave mission sites, as well as understanding the places to which they returned will add important dimensions to studies of colonial encounters and resistance.

Anthropological perspectives on human migration, transnationalism, and the impacts of political upheaval on local populations provide a useful starting point to approach archaeological patterns of flight and refuge (e.g., Krulfeld and Camino 1994; Colson 1987; Hammond 2004; Malkki 1995; Peteet 2005; Waters 1990). Diaspora studies—or researching the dispersal of human populations across the world—may also overlap with the study of refugees, but will not be considered in this work. From the United Nations High Commissioner for Refugees (UNHCR), a definition of a refugee is someone who:

> owing to well-founded fear of being persecuted for reasons of race, religion, nationality, membership of a particular social group or political opinion, is outside the country of his nationality and is unable or, owing to such fear, is unwilling to avail himself of the protection of that country; or who, not having a nationality and being outside the country of his former habitual residence as a result of such events, is unable or, owing to such fear, is unwilling to return to it (UNHCR 2007:16).

In spite of the difference of scale (i.e., migration across national boundaries versus movements within bounded geographic regions), I believe this definition can be applied to specific examples of refugeeism in colonial contexts, especially those in California.

A strong theme in the study of human migration and refugee scholarship is what Elizabeth Colson (1987:3) labels the "life cycle of resettlement," or the cycle of displacement and readjustment, and use of strategies at different phases in this cycle to cope with stress and to "emphasize continuity with the past." Stein (1981:320) also proposed a model for identifying "stages of the refugee experience," which includes "perception of a threat; decision to flee; the period of extreme danger and flight; reaching safety; camp behavior; repatriation; settlement or resettlement; the early and later stages of resettlement; adjustment and acculturation; and residual stages and changes in behavior caused by the refugee experience." As models, Stein's (1981) stages of refugeeism and Colson's (1987) cycle of resettlement offer useful frameworks for an archaeological study of resistance. However, Malkki (1995:508) notes—I believe correctly—the functionalist nature of the models, their normative tendencies, and an implicit "assumption that to become uprooted and removed from a national community is automatically to lose one's identity, traditions, and culture." In the next part of this chapter, I argue theories of place, space, and landscapes provide useful tools to build more robust explanations of human displacement and refugeeism that account for changes and continuities in social identity.

Theories of identity and landscape have also influenced more recent scholarship on human population displacement and transnationalism. For example, Krulfeld and Camino (1994:x) view the painful process of refugeeism as also a creative process of exploration and experimentation because in the process of being displaced and "losing community, family, status, property, culture, and even a sense of personal identity, replacements for these losses must be created." Identifying the dynamics of ethnic identity in the process of flight is critical. To understand how identity is shaped in relation to place and memory is equally germane, as Hammond (2004) and Peteet (2005) document in their research.

Hammond (2004) studies Sudanese refugee populations in Ethiopia and the process of "emplacement," or transforming unknown spaces such as refugee camps into personalized, socialized places and homes. Hammond (2004:9) views this transformation in everyday social practices (e.g., house building, cooking, farming, and tea drinking), and in conscious reflections about places which build relationships to unfamiliar environments. Spaces are also *emplaced* differently by members of a social group. That refugees are not simply making the best of a dire situation, but purposefully forming relationships to familiar and unfamiliar locations alike supports an understanding of social identity—how people indentify with and create meaning from features on the landscape—as flexible and dynamic, with constant improvisations as celebrations of human ingenuity and creativity (Hammond 2004:12). Flight, as a form of resistance, is more than a mechanical reaction to oppressive contexts, but a significant force in guiding the course of culture change (Bernard 2008:15). That relationships between humans and their environments are meaningfully constituted and constitutive is further demonstrated in Peteet's (2005) research of place-making among Palestinian refugees, and, as I discuss momentarily, in Spanish California.

Ortner (1995) reminds us that the circumstances of flight and how people build and maintain relationships with the places to which they flee will have unique historical, geographic, and cultural parameters that are fluid and vary between and within groups. To understand this variability is essential to explain long-term patterns of resistance, and equally important for interpreting the personal subtleties—social networks, sanctuary opportunities, class, gender, traditions of mobility—which motivate individuals to return to particular places (Waters 1990:250). I apply this framework in my analysis of Spanish missions, runaways, and places of refuge in California.

Spanish missions witnessed an ebb and flow of fugitivism, attributed to the "transactional and transitional" nature of missions as social and political crossroads (Deeds 2003:8). Up to 1831 an estimated one out of every twenty-four neophyte Indians fled California's missions, amounting roughly to 4 percent of neophyte losses, or 3400 of an estimated 81,586 baptisms (Cook 1976:59), and Sandos (2004:162) estimates approximately 10 percent stayed away permanently. The motivations for Indians to escape and to seek refuge are countless, as mission records can attest. In Chapter Seven I explore the historical context and mechanics of mission life that produced scenarios in which flight was a lucrative option. For example, the transcribed interviews from José Argüello's formal inquiry into the departures and subsequent recaptures of 280 neophyte runaways from Mission Dolores in 1795 provide revealing information about motivations for fleeing mission sites (Beebe and Senkewicz 2001). At the moment however, what is less clear from such documents are the places to which hunter-gatherers fled. I seek to understand how these isolated areas were used and how social identity and practices were shaped and maintained at *places of refuge.*

Places of Refuge

Places of refuge are documented in a variety of geographic contexts: including *crannogs* (artificial islands) used as hideouts, prisons, and hospitals by Irish resisting land grabs by the English Tudor government (O'Sullivan 2001:97); cave sites used among Native Hawaiians to escape warfare and to carryout ritual practices, such as burial of the dead and communing with supernatural realms (Kennedy and Brady 1997); natural rock "forts" and defensive sites along the Pacific Coast of North America and "impassible" lava beds of Northeast California (Kroeber 1925:342; Moss and Erlandson 1992; Palmquist 1977); various inland sites where natives of Newfoundland, the Beothuk, developed new subsistence strategies beyond their traditional maritime economy (Holly 2008); Maroon sites in the Caribbean and North, South, and Central America to which enslaved Africans escaped to avoid forced labor, heal wounds, locate food, and to relocate or build social networks (Weik 1997); earthen mounds of the Mississippi Valley used to evade periodic flooding (Kidder 1926); isolated regions of canyons and tule marshes frequented by Indian runaways fleeing the Spanish missions of southern California (Bernard 2008; Phillips 2004:1); and offshore island shell mounds occasioned by Australian Aborigine couples to elope and, later, to preserve cultural traditions threatened by colonial pastoral enterprises and demographic collapse (McNiven 2000). Considering models of resistance, discussed above, and runaways from Spanish missions in California, I am obligated to define the scale of analysis.

Diverse living options for hunter-gatherers at and away from colonial settlements demand new frameworks for evaluating spatial dimensions of colonial encounter. For example, flexible living arrangements at Colony Ross created opportunities for the Kashaya Pomo to return periodically to their homes and re-immerse themselves in coastal hunter-gatherer practices (Lightfoot 2005a:186). This pattern is noted at missions in California and elsewhere most often due to an inability to feed all native converts in residence (Deeds 2003:75; Sandos 2004:55; Wade 2008:172-173), but residential mobility was generally less fluid at missions and leaves of absence required official permission from Spanish padres (Sandos 2004:94). For those able to leave, I argue, the ability to mesh old traditions with new practices and home villages with new jobs reinforced social identities and senses of place, which would later be prerequisites for maintaining political organization and for securing federal recognition in the twentieth century. This "zone of opportunity" (Haley and Wilcoxon 2005:436)—where Indians and Europeans alike took advantage of afforded liberties to become socially mobile and politically and economically resolute—is a salient quality of frontiers.

Scholarship related to frontiers, boundaries, and borderlands abounds since Frederick Jackson Turner's initial 1893 "frontier hypothesis" used to explain westward expansion of the United States (Billington 1967). In depth discussion on frontiers is beyond the scope of the present study as numerous definitions exist (Parker 2006), but I acknowledge renewed research which underscores the complexities and socially charged nature of frontiers. I agree with Lightfoot and Martinez (1995:474) who view frontiers as neither homogenous nor fixed by unchanging boundaries, but as zones of "cross-cutting social networks" continuously negotiated, transformed, and recontextualized to suit the needs of individuals at any given moment. Furthermore, this position mirrors historical dialogues, which distinguish *frontier-as-place*—a geographic area with few people and abundant resources enabling economic and social benefits without external aid—from *frontier-as-process*—the process by which individuals and institutions are changed in the process of engaging with a frontier (Billington 1967:7). The frontier is the arena in which my analysis of refugeeism unfolds, and while intended perhaps as a boundary between two colonial domains, frontiers are liminal and polysemous intersections crafted by colonial and indigenous agents and loci of variable rates and kinds of interaction (Rothschild 2003:8). "If the border grates, bleeds, hemorrhages, edges, distinguishes, and divides… it is also a place of intimacy where identities touch" (Klein 1996:206), and is well-structured for multicultural dialogue (Klein 1996:210).

Another approach to the study of frontiers outlines a continuum of living conditions and spatial dimensions (Lightfoot et al. 2009b) with emphasis on spaces beyond core colonial settlements (see also McCarthy 2008). This continuum includes colonial settlements; proximal zones, or areas immediately adjacent to settlements and within a radius of approximately 5 to 10 kilometers; hinterlands; and the interspaces of colonial regimes, which lie outside the control of either colonial power. Colonial interspaces are similar to borderlands, or places with clear boundaries between colonial domains, where intercultural relations are contingent and complex (Adelman and Aron 1999:814). In the case of Colony Ross, boundary zones are sometimes buffered by fugitives to prevent Spanish military forays (Lightfoot et al. 2009b). An alluring example of the Spanish-Russian interspace comes from the observations of Baron F.P. Von Wrangell who travelled from Bodega Bay to Colony Ross in 1833:

> [W]e came upon an old woman, who was gathering seeds in a basket woven of fine root fibers. She was scared stiff. We learned from her, not without difficulty, that several Indian families were living beyond the next thicket, who without doubt had already noticed us and had hidden, fearing to fall into the hands of Spaniards who quite often go out to hunt Indians in order to convert their prey to Christianity (Wrangell 1974:2).

The dense maze of tule marshes and cluttered web of sloughs in California's Central Valley also suggest an interspace for runaway Indians at the margins of Spanish California and a venue to maintain and reshape strategies of cultural survival. Here, displaced Indians would journey to reorder fragmented worlds through a "process of mutual invention" that possibly involved intermarriage, gift exchange, and shared rituals, often between different native groups (see White 1991). However, baptized Indians were considered legal wards of the church and—in the eyes of the paternal padres—forfeited personal freedoms once converted to Christianity (Sandos 2004:102). Punitive raids attempted to recapture Indians who fled to remote locations without permission and the broader terrain swiftly became an area of rebellion and refuge (e.g., Hurtado 1988:32; Milliken 2008). The broad Central Valley region—and even the "interspaces" of colonial settlements—are unwieldy for understanding the practices of refugee Indians at individual archaeological sites, and require further resolution.

In the broadest sense, a place of refuge can refer to an entire continent. Diasporas and transnational movements of displaced human populations tell us some countries are places of refuge for those seeking new opportunities or perhaps to escape religious persecution, political upheaval, or economic plight. On a smaller scale, I consider a landscape of refuge as a general terrain composed of multiple sites and conducive to hiding out for brief or extended moments of time. Examples include the tule marshes of the San Joaquin Valley, or the rugged Lassen foothills with "a hundred hiding places" where Ishi and his kin concealed themselves from Anglo settlers into the early 1900s (Kroeber 1925:342).

A more recent approach (Bernard 2008) promulgates long-term ethnic and cultural variability within "regions of refuge." These are vibrant areas of social intersection and:

> protected and less-accessible geographic areas into which people have escaped, fled, or otherwise maintained physical separation from sustained political conflict, domination, or enslavement. A refuge need not be occupied solely by remnant populations but may also include people from a variety of ethnic and cultural identities and experiences seeking separation from domination (Bernard 2008:21).

The smallest scale of refuge includes sites of refuge, which are individual sites that demonstrate long-term cycles of use and reuse and can include older village sites recast as new arenas of cultural practice. I define *places of refuge* as: familiar places, such as villages and other features on the landscape, and unfamiliar locations to which people, of similar or varying ethnic backgrounds, return to illicitly or with permission to evade persecution through the maintenance and refashioning of social practices in relationship to those places as both meaningfully constituted and constitutive of identity.

Places of refuge are witnessed globally and have spatial variability in terms of differing scales of refuge. They also cover a wide array of time periods, because, as Holly (2008:172) makes clear, encroachment onto alien lands by others is "at least a ten-thousand-year-old problem." In my research I emphasize places of refuge as a consequence of colonialism, although familiarity with pre-contact patterns of mobility and flight are not only important but unequivocally bound to interpretations of diachronic and contextual patterns of social practice and culture change (Lightfoot 1995). In the next part of this chapter, I present a discussion of landscapes, space, and place as equally influential to my study of refuge.

The Give and Take of Cultural Landscapes

Landscapes figure prominently in shaping and maintaining social identities, and landscape studies are deeply embedded in the discipline of archaeology (Stoddart 2000). While my study of landscape focuses on an individual's perceptions of and engagement with their natural surroundings, others stress the physical impacts of past human practices on the environment and the importance of understanding these ecological relationships to evaluate environmental issues and to create meaningful policy (e.g., Balée 1998; Braje 2009; Erlandson 2005; Fisher and Feinman 2005:62). From its early conception as a backdrop to the study of spatial relationships and settlement pattern studies (Ashmore 2002:1173), landscape approaches in archaeology includes a range of theoretical points of view that consider gender (Kearney 2008; Lemaire 1997:25), practice (Pauls 2006; Robin and Rothschild 2002), and phenomenology (Bradley 1998; Casey 1996:14; Jackson 1988; Tilley 1994, 2008), as well as dwelling, inhabiting, or "being-in-the-world" (Barrett 1999; Thomas 2001:172, 2008), memory (Van Dyke 2008), place (Basso 1984, 1996a, 1996b; Bender 2001a; Casey 1996, 2008; Nash 2000; Seamon and Mugerauer 1985; Thomas 2001; Tuan 1977), households and architecture (Bourdieu 2000; Upton 1988, 1990; Voss 2005), symbolism (Bradley 1997:39-42), identity (Kealhofer 1999; Voss 2005), perception (Bradley 2003; Johnston 1998), and cognition (Johnston 1998; Thomas 2001). As Layton and Ucko (1999:3) suggest with the impact of postmodern thought, "there is no environment, only landscape."

The term landscape is used by artists, architects, ecologists, geographers, archaeologists, and even in daily conversation. A dictionary definition alone is representative of the "semantic ambiguity" and broad application of the term (Ingold 1997; J. Jackson 1984:147). Similarly, the use of the term within the field of archaeology varies geographically and depending on intellectual traditions. While British and American archaeologists generally study land use and culture change through time, the distinct philosophical heritage of British and American science led to different research methods used to interpret landscapes (Sherratt 1996).

The intellectual beginnings of contemporary landscape studies can be traced back to the 1920s, although Anschuetz et al. (2001) see little or no agreed upon definition of what landscape studies entail. Sherratt (1996) suggests this confusion rests in the historical dialectic produced by the Enlightenment and the Romantic movements, namely the Enlightenment is characterized by comparative, scientific, and rational thought, while the Romanticism offers contextual, relativist, and experiential attitudes towards the past. Sherratt (1996:143) suggests the Enlightenment ideology of stability influenced nineteenth century Positivism, twentieth century processual archaeology in North America, the propensity for excavation, and an emphasis on deep structures and regional projects that focus on settlement systems.

By contrast, the Romantic tradition most characterizes archaeology in some parts of Europe. Here an ideology of revolt fostered a sense of hermeneutic particularism, relativism, postprocessual archaeologies, and the propensity for archaeological survey, observation, and mapping the actual appearance, or surface, of archaeological landscapes (Sherratt 2001:143). Sherratt's (2001:156) botanical metaphor is especially helpful in defining these binary classifications: "we can either pick our flowers and mount them, suitably pressed, in Linnean taxonomies, in the manner of the Enlightenment; or we can follow the arch-theoretician of the Romantic movement, Johann Gottfried Herder, in 'leaving each flower in place and contemplating it there just as it is, according to time and kind'."

Citing influences to the study of landscape in the United States, Groth and Wilson (2003:3) note awareness among German geographers in the nineteenth century that everyday surroundings, including landscapes and architecture, could provide insight to social life and cultural values. Through Carl Sauer, the German concept of *landschaft*, or "a discrete area defined by a uniform, harmonious interrelationship of physical elements" (Groth and Wilson 2003:4), was introduced into American geography and the study of cultural landscapes.

Sauer's influence shifted the study of landscape in the United States from the careful dissection of landscape paintings to the place itself, including vernacular landscape elements such as buildings, fences, and roads, which impact our physical and cognitive engagement with landscapes on a daily basis and often unconsciously. Sauer (1963[1925]:321) defines landscape as "an area made up of a distinct association of forms, both physical and cultural," and, just as the concept of period is composed of “time facts” in the study of history, the concept of landscape in the study of geography is composed of “place facts.” A key component to Sauer’s interpretation of landscape is that every landscape is individually unique relative to other landscapes and is beyond the scope of scientific organization. “Geography is based on the reality of the union of physical *and cultural elements* of landscape” (Sauer 1963[1925]:325, emphasis added). Cultural expression is one of the shaping forces of landscapes.

This observation is central to Sauer’s definition of landscape morphology: “The cultural landscape is fashioned from a natural landscape by a culture group. Culture is the agent, the natural area is the medium, the cultural landscape is the result” (Sauer 1963[1925]:343). From this definition, we understand the central role of culture and humans agents in the transformation of the environment, while Sauer also hints at the idea of successive landscapes, or landscapes as palimpsests of history (e.g., Conzen 1990). By the 1980s, landscape studies moved beyond the realm of spatial science to critically examine cultural landscapes as complex, experiential, and an “emotional anchorage” for humans (Butzer 1978:11). Cultural geographers provided inspiration to seriously reevaluate landscape as “not merely technological constructions, but *dwelling*; not merely homogenous and mathematized space, but *place*; not merely planetary raw material, but *environment*” (Seamon and Mugerauer 1985:1, emphasis in original).

I believe three broad currents are present in the study of archaeological landscapes in North America. The first theme addresses the experience of landscapes. Space and place are examined as integral components of landscapes, especially monumental landscapes and the social experience of these places, or “being-in-the-world” (Thomas 2001:172). The second theme examines the vernacular landscape. I argue that the vernacular landscape has transformed from a discussion of the routine features of a landscape to incorporate the study of contested landscapes, especially colonial landscapes. This particular topic of study has been instrumental in archaeologies of landscape as a means to develop collaborative research designs. The third theme therefore addresses sacred landscape and the role of oral traditions in developing an understanding of places within the landscape as culturally meaningful, as well as powerful loci of social reproduction.

The Experience of Landscape

Anderson (1991:6) views nationalism as a transplantable, cultural artifact that is also historically contextual and imaginary in the sense that “the members of even the smallest nation will never know most of their fellow-members, meet them, or even hear of them, yet in the minds of each lives the image of their communion.” While Anderson specifically examines the nation’s imagined sense of nation and the willingness of its members to die for this community, the more general idea of an imagined community is useful to examine how people imagine, or create, meaningful cultural landscapes and memorialized *places*.

Tuan (1977), a cultural geographer, contributed greatly to the study of space and place. Tuan (1977) defined place as a recognized geometric pattern in the landscape, or as an objectified place. In contrast, Ingold (1993:155) understands places as embodiments of the entire landscapes, owing to the experiences of those who dwell within this place for a period of time. Ingold’s (1993:157) particular interest rests in the temporality of landscape—the variable duration and suite of seasonal, annual, and daily time frames—and the taskscape. To Ingold, what we see as landscapes are actually congealed “taskscapes,” or what we hear (Ingold 1993:162). In this sense, the taskscape opens up other ways of understanding landscapes that do not assume place-as-object, but an array of different senses and temporalities. To dwell and to experience place is a temporal act experienced through the duration of time spent in a particular place; cyclical processes of use and reuse of specific places. This is a critical theme developed later following my discussion of hunter-gatherer settlement patterns and interpretations of shell mound function and meaning.

In his overview of phenomenological approaches to understand how humans experience and engage with landscapes, Casey (1996:14) argues space is a "neutral, pre-given medium, a *tabula rasa* onto which the particularities of culture and history come to be inscribed, with place as the presumed result." Casey (1996:26) further suggests place is defined as more than objectified space or monumental features upon the landscape, but rather "generative and regenerative on its own schedule [and from which] experiences are born and to it human beings return for empowerment." Here we see a distinction between passive and active landscapes, with space viewed as passive and place viewed as active. A similar duality is presented by Bender (2002), who distinguishes "landscape as materialized time" and "landscape as time materializing," such that peoples' "attempts to interpret time or place are created out of (and creative of) an experience of 'things in place'" (Bender 2002:S104). I develop this theme of active and passive landscapes later in my discussion of materiality and memory.

<u>Vernacular and Contested Landscapes</u>

A second current in the study of landscape archaeology focuses on the vernacular, or everyday landscape. Landscape, John Jackson (1984:156) states, "is never simply a natural space… [but] the place where we establish our own organization of space and time." Jackson (1980) offers perspective on vernacular landscapes in a discussion of monumentality, historical preservation, and the "necessity for ruins." The tendency to preserve reminders of the past—monuments, buildings, shell mounds, etc.—creates two kinds of monuments: one which has the power to recall specific historical events and remind us of our contract with that memory, and another anonymous monument—the ruin—that reminds us of no obligation to uphold contracts with the past. Ruins, Jackson (1980:102) argues, "provide the incentive for restoration, and for a return to origins" or an agreed upon past. This past is a mixture of imagination and nostalgia for an everyday vernacular past, or golden age, and provides a sense of the way things used to be. I argue this past is not agreed upon, but highly contested.

Following Upton (1988, 1990) and Voss (2005, 2008), the everyday architecture of colonial settlements are socially reproductive *and* divisive features within a contested landscape. Voss (2005) examines identity and colonial encounters in Spanish colonial San Francisco. Through the archaeology of foodways, material culture, and architecture, Voss (2005:461) discerns a "double material strategy" at the Presidio of San Francisco that masked ethnic differences among the inhabitants in the eyes of visitors, foreign or otherwise (Voss 2005:470), but also supported the creation of a distinct *Californio* ethnic identity.

Upton (1988, 1990) also examines how architectural form can crystallize the social relations of a contested landscape in colonial Virginia. Upton (1990:71) contends a complete account of a historical landscape "must take into account its evanescent qualities and the differences in the ways it was experienced." The architectural features of colonial Virginia in particular represent contentious but often overlapping social realms of enslaved Africans and gentry. At Howard's Neck, a nineteenth century plantation with several enslaved African homes, Upton examines the areas between households, such as gardens and stock pens, as places where enslaved Africans engaged and socialized with one another in an otherwise controlled environment. These places suggest a fragmentary landscape as opposed to the idea of a “unified” one where architecture was meant to be experienced dramatically and reinforce racial and class distinctions. While different social groups shared similar landscapes, they constructed very different mental landscapes for the structures within (Upton 1990:72). The vernacular landscape of colonial Virginia suggests an intersection of the structured landscape of slave owners and the prerogatives of enslaved Africans living at the plantation (Upton 1988:63).

The colonial contexts of the two examples above provoke a renewed understanding of the vernacular landscape, and hint at my previous discussion of dominance, resistance, and the structuring of space to control movement and thought. Voss and Upton allude to the everyday aspects of the landscape, as well as how these features are engaged, experienced, perceived, and contested. The study of colonial encounters offers an especially ideal framework to re-examine the vernacular landscape as composed of both contested and pluralistic places, or, as Silliman (2005a) suggests, a social landscape comprised of both places and the social relations between colonists and native groups that structured those places.

For example, Harrison (2004) studies the construction of pastoral landscapes and the colonial encounters between aboriginal station workers and settler pastoralists at Old Lamboo Station in NW Australia. In describing the shared experiences of settlers and aboriginal laborers in rural Australia, archaeologically “in many instances it becomes impossible to talk about ‘Aboriginal’ and ‘European’ things on these pastoral stations because of the thorough entanglement of material objects and places through the specific historical circumstances of living and working together, and the constant recontextualization of indigenous and European objects and concepts” (Harrison 2004:140). Material goods, such as tea drinking paraphernalia, were “Aboriginalized” to become part of the lifestyle of residents at Old Lamboo Station. Pastoralists borrowed from the Aborigine world view; incorporating place names and ways to “map on” to important resource areas (Harrison 2004:141).

The new pastoral landscape created from this cultural exchange is viewed as “the product of a shared re-imagining based on the cultural building blocks and social trajectories of both indigenous and settler culture” (Harrison 2004:141). In this example, the contested place involved two seemingly separate social groups who, through the engagement of particular features within the landscape on a daily basis over a long period of time, demonstrate how experience can overlap. Frequent movement around places like the Australian pastoral stations, Harrison (2004:139) argues, involved intimate physical contact with the land over different seasons of the year enabling all parties to gain ecological and spatial knowledge of the areas in which people lived and labored (see also Ingold 2004).

Given (2004:8) gives allowances for perception and individual creation of meaning by adopting a “resistance-agency-landscape-narrative” approach that reconsiders the term ‘resistance,’ while identifying acts of resistance across the whole landscape. Accordingly, resistance is a term with little precision in meaning and glosses over an entire range of explanations such as survival strategies, collaborations, or seeking refuge (Given 2004:11). Given’s analysis of the distribution of illicit whiskey distilleries across the landscape of Highland Scotland views this latent ‘landscape of resistance’ as a known landscape comprised of dispersed individual distilleries responsible for different distillation stages. In this sense, the landscape becomes a compilation of strategies and motivations of resistance.

Bender (1999) builds on the idea of known places in her critique of the “western gaze,” or a controlling, Cartesian method of organizing and understanding unknown colonial landscapes often seen in map-making. An extension of Bender’s attention to “local knowledge” addresses places within the landscape as culturally meaningful, as well as powerful loci of social reproduction. The study of senses of place at once allows for the culturally unique ways in which people engage with and extract meaning from the landscape, as well as for collaborative research that considers places as multivocal and, most important, considers the people who maintain connections to those places.

As one approach to understanding how landscapes and place can be understood through multiple voices, anthropologists have addressed the importance of oral narratives and ethnography. Feld and Basso (1996:9) agree that "to be in place is to know, is to become aware of one's very consciousness and sensuous presence in the world." Basso (1984:22) addresses the semiotic barrier between how landscapes are talked about cross-culturally. With words, however, "a massive physical presence is fashioned into a meaningful human universe" (Basso 1984:22). Oral narratives promote enduring bonds to places as well as social behavior and moral misconduct, while ethnography can provide "instructive statements about places and their role in human affairs through the close contextualization of a handful of telling events" (Basso 1996b:57; see also Feld and Basso 1996:6).

Basso's research among the Western Apache is pivotal in its critique of systems thinking and anthropological studies that stress environmental adaptation. To disavow cultural meaning, Basso (1984:49) argues, "would have the effect of 'removing' the Apache from the world as they have constructed it. This, in turn, would obliterate all aspects of their moral relationship with the land... this relationship is crucial to the Apaches—quite as crucial, I expect, as any that deals with subsistence or economics—and for us to lose sight of it could only have damaging consequences."

Though some have faulted Basso for his view of landscapes as layers of cultural significance and not a process (e.g., Ingold 1993:171), I find Basso's (1996b:55) concept of "interanimation" to be useful for understanding the significance and value that resides within the form and arrangement of observable characteristics of a landscape and the incessant mutual molding of landscapes by individuals who dwell within that landscape. Among the Western Apache, for example, significant places are used by people who are down on their luck or morally destitute, but more importantly as places of wisdom or loci for relating social norms and values. "Sacred places" often demonstrate this quality. What is known about such places, Carmichael et al. (1994:3) write, includes "a whole range of rules and regulations regarding people's behavior in relation to [them]."

Sacred Places

Within the discipline of archaeology in North America, place has become an especially important area of study to reexamine spatial arrangements and to incorporate the thoughts and concerns of Native American descendant communities. Anschuetz et al. (2001:187) make an important point that archaeology is only one part of the "landscape paradigm" and cannot alone address "all parts of a truly integrative understanding of the anthropology of place." They propose a broadly encompassing framework for analyzing landscapes that addresses settlement ecology, ritual landscapes, and ethnic landscapes in order to facilitate dialogue between archaeologists and "traditional land-based communities."

Similar to Basso (1996a, 1996b), Anschuetz et al. (2001:190) argue "the 'language' of landscapes is much more readily accessible to people from traditional communities than that suggested by the usual archaeological terminology used in scientific research or legislation designed to protect natural resources." By recognizing the quantifiable archaeological resources and qualitative cultural properties, especially the ethic and anthropology of place, archaeologists can build bridges between their interests and those of descendant communities who often view places as living processes, not bounded geographically and linear in time (Anschuetz et al. 2001:185; see also Basso 1996a:33).

In her discussion of the shortcomings of conceptual models that have marginalized Native Americans and excluded analyses of post-contact change, Rubertone (2000:435) argues the study of landscape enables archaeologists to move beyond reconstructing places of colonial encounter (e.g., forts) to explore the "accumulated knowledge" within landscapes of tradition. In doing so, archaeologists can address the appropriateness of criticizing the cultural authenticity of Native American groups in the twenty-first century (see also Silliman 2009:213), to instead stress spatial variability in colonial contexts and the "remarkably complex histories of survival and enduring attachments to community and place" (Rubertone 2000:435; see also Schneider 2003, 2007a). Rubertone (2000:436) underlines the sustaining and stabilizing power of places for Native American communities and, just as Basso astutely notes above, "reservoirs of accumulated and ongoing history."

Life Histories and Persistent Places

Theoretical approaches to understanding the embodied experience of landscapes, vernacular and contested places, and sacred places are identified as three major currents in the study of archaeological landscapes. My final discussion in this part outlines another theoretical approach I use to interpret shell mounds in the San Francisco Bay area as complicated places of "decision and disposition" (Ashmore 2002). Here, I call particular attention to the scholarly contributions of Schlanger (1992), Barrett (1999), and Ashmore (2002).

Schlanger (1992) outlines a model for linking dispersed archaeological finds and sites to those yielding denser artifact inventories. "Persistent places" link periods of use and abandonment and are suggestive of repeated and persistent use of an array of sites "during the long-term occupation of a region… [and stress] the archaeology of repeated abandonments and reoccupations, of population retreats and population returns" (Schlanger 1992:92). More than archaeological sites and features on a landscape, persistent places structure mobility across a landscape, including the settlement of resident populations, as well as providing "a temporary shelter" for other hunter-gatherers moving across the landscape (Schlanger 1992:92). In this sense, mechanical scenarios of occupation and abandonment can oversimplify the role of persistent places in long-term land use patterns. Such places "were maintained within the cultural repertoire even when residents had moved," but, as Ashmore (2002:1177) argues, "not *all* places are persistent in human recognition." As I discuss next, landscapes—much like material things—also reveal complex trajectories of avoidance, desecration, modification, and reuse by different people for different purposes under different conditions.

In my research I emphasize the complex trajectories of establishment, persistent cycles of site use and disuse, and the afterlife of shell mounds in the spirit of Ashmore (2002:1178), who views the *life history of place* as evidence of "human recognition, use, and modification of a particular position, locality, or area over the full life span of its existence," including present-day contexts. Specifically, Ashmore (2002) presents three key points that overlap with other themes presented in this chapter and resonate with discussions in the remainder of my dissertation. First, in the life history of place, places acquire histories and carry "profound, potent social and symbolic meaning" for the people who inhabit them (Ashmore 2002:1178). That mounded sites across North America often functioned as village sites *and* cemeteries, is a visceral example of this. Interment of the dead at distinct locations indicates a claim to places, commemoration of place and social continuity, and affirmations of kinship ties between generations (Buikstra and Charles 1999; Joyce and Gillespie 2000; Mann 2005:6). "Material reiterations," such as repeated construction on sites—placing house pits on top of a centuries old shell mounds—and inhabitation also carry important social implications (Ashmore 2002:1178).

Second, once recognized, places become part of a "socially cognized" landscape. (Ashmore 2002:1178). Memories, Ashmore (2002:1178) writes, accrue and materialize as people make daily, seasonal, and annual visits back to specific venues providing, reciprocally, social salience for people. Flight across ancestral landscapes to engage in cultural practices such as hunting, fishing, and carrying out ceremonial rites—bodily practices—sediment and keep the past in mind (Connerton 1989:72). Third, people recognize, cognize, and attach meaning to places differently for the duration of their life histories, but the composite place remains a "critical arena and set of referents for mapping social and political change" in the past and in present times (Ashmore 2002:1179). Continuing my discussion of colonialism, resistance, and landscape, the following part of this chapter completes my framework for examining shell mounds as places of refuge.

Additional Theoretical Influences

Practice Theory

Theories of practice help to identify how macroscale spatial arrangements near and far from colonial settlements articulate with the microscale of everyday practices. The basic premise of practice theory, brought to the forefront of anthropological thought by Bourdieu (1977) and Giddens (1979), recognizes society as a system, the system as constraining, and the system as made and re-made by human actions (Ortner 1984:159). The practice of day-to-day living includes mundane tasks, habitual routines, and the ways people organize spaces. Through these practices, people become rational actors who strategically and intentionally make sense of their lives, though "constrained and enabled by structure" (Silliman 2001a:192). Considering everyday acts of resistance—"hidden transcripts" and flight—daily negotiations of social circumstances, or "practical politics" (Silliman 2001a), engender profound effects on culture change and the ordering and reordering peoples' lives. Furthermore, as Lightfoot et al. (1998:201) note, "these routine kinds of actions that dominate peoples' domestic lives produce much of the material culture we recover in the archaeological record."

Patterned accumulations of material culture are, in turn, driving forces in the creation of social identities and shaping relationships between agents and structure, as well as indicative of the broader social world in which these relationships unfurl (Appadurai 1986; Hodder and Hutson 2003; Lightfoot et al. 1998:202). "Contact situations," in particular, "are often significant watersheds in reshaping cultural orders since they provide individuals from all walks of life with new opportunities to negotiate and redefine their social identities in the process of daily practice" (Lightfoot et al. 1998:202). However, a literal application of practice theory to colonial encounters may result in the belief that pre-contact groups lack agency without contact and, Silliman (2001a:196-197) warns, scholars should exercise caution in this regard. Other scholars warn practice theory may not be applicable at all when analyzing certain contexts such as burials (Arnold 2001), or when analyzing particular objects within a network of relationships composed of different agents in different social conditions (Smith 2001).

Because practice theorists examine the dialectical relationship between agents and structure, we are also obligated to understand what microscale practices shape structure and how continual shaping changes structure. Studies of resistance are especially apropos for identifying the conditions and consequences of structural change, as is agency theory. To be certain however, practice theory is not agency theory, but includes a suite of theoretical approaches, and is "more than the recognition that individual 'agency' is one of many 'factors' in social evolution (Pauketat 2000:115). Agents are "authorized" social beings, and, much like practice theory, agency is derivative of individual action but not independent of structure (Sassaman 2000:149). Practice theory enables archaeologists, including myself, to access the agency of individuals in daily social interactions.

Materiality and Memory

Materiality is another inseparable phenomenon encompassed in the study of agency because "material culture actually *constitutes* social relations and meaning making," and "social reproduction and cultural change… depend fundamentally on the nexus of agency and materiality" (Dobres and Robb 2005:162, emphasis in original). Equally fundamental, "colonial relations always involved material culture" (Gosden and Knowles 2001:6), though it is well to keep in mind that the movement of materials is well-documented in prehistoric contexts and the allure of materials is not always unidirectional but objects are constantly recontextualized (Harrison 2004:140). Materials course through colonial entanglements (Thomas 1991), from the cargo cults of New Guinea, where Western goods—believed to have divine sources—were exchanged for colonial access to oil, gold, and rubber (Gosden and Knowles 2001), to the shores of California where Russian merchants and Spanish ecclesiastics offered California Indians glass beads, metal objects, food, and other objects in exchange for labor and sundry services. In all examples, "human actors encode things with significance" (Appadurai 1986:5)

Liebmann (2008:361) defines materiality as "the ability of physical objects to create, mediate, and be shaped by ideology" and views the material record, for example artifacts associated with the Pueblo Revolt of 1680, as reflective of social conditions in the time of the revolt and active in shaping the outcomes of the Pueblo revitalization movement. That ideology—generally a collection of concepts and ideas held by individuals, groups, and cultures about how to act in and view the world—encodes and is shaped by material things, I underscore the agency of objects (symbolic of particular ideologies), the close relationship of the mental and physical world (Taylor 2007:299), and, especially, the mutual involvement of people, *places*, and things in creating and maintaining social relationships.

Though stationary—unlike most objects—I argue landscapes are also material things that can be ascribed, built, broken, embodied, reused, and exchanged and have profound social meaning for people. Following Voss (2008a:24), who examines colonial identities at the Presidio of San Francisco, "the meanings of things are never fixed, and hence objects can be taken up for different purposes by different users," but the materiality of objects—buildings, dress, food, and, as I argue, landscapes—are called upon to anchor contingent social identities (Upton 1996:4). "Humans think through things, not just about them" (Liebmann 2008:361). Landscapes are material things and, as Tveskov (2007:432) describes, they are "powerful arenas of social experience," inscribed with meaning and constitutive of identity; a "dual register" operating to both trouble and fix social identities (Voss 2008a:23).

Landscapes—as places *and* things—intersect with memory, as the construction of memory often leaves material traces (Mills and Walker 2008:16; Van Dyke 2008:278). Objects are also "proxies of practice," not obvious on their own but made meaningful through daily practices (Silliman 2009:216). Monuments, burials, and the life histories of objects are examples of the material traces of memory, the products of an intertwined and ongoing process of personal and collective engagement with place that are historically situated and "inextricably bound up with remembrance, and with time" (Van Dyke 2008:278). Collective memory contrasts with personal memory, and presents a "condensed and *schematic*" view of the past that may legitimate authority and reinforce particular identities according to the needs of the present (Halbwachs 1980:52, emphasis added; Van Dyke 2008:278). In the process of memory, pasts are selectively remembered, "reconstructed, obliterated, consumed, conquered, and dismantled," but also wielded by marginalized social groups in the service of resistance (Van Dyke 2008:278). "The 'art of memory'," Hayes (2008:22) astutely notes, "is in its tactical and transformative employment. The application of memory knowledge at the 'right moment' can create sources of power for those who use it with craft, to rupture a stable field of relations." Just as memories are constructed at particular moments in time, these repeated adjustments are also imbued and rendered meaningful in objects and the places people occupy through time, and, in turn, summoned as powerful forces in effecting social action.

Identity

Identity, as a field of inquiry, is the focus of heated debate usually because particular identity claims can foster massive epistemological and political implications (Voss 2008a:13). "Identity" as a term is cumbersome, specifying a suite of tropes, including ethnicity, race, nation, class, age, gender, and sexuality, but without which the spectrum of conditions and outcomes of colonial entanglement could not be detailed. As Haley and Wilcoxon (2005:433) make clear in their study of the neo-Chumash of southern California, identities are not static and enduring, but purposefully created within particular historical contexts and created relative to particular social motivations, structures, and cultural practices (see also Tveskov 2007:431-432; Upton 1996; Voss 2008a:13-15). The absence of a toolbox of global answers to dilemmas about identity "bespeaks the complexities inherent in the different local times, places, contexts, and social agents" archaeologists study (Silliman 2006:150).

Much scholarship exists on the topic of identity, including several examples which examine issues of identity and culture change in colonial contexts (Given 2004; Harrison 2002; Lightfoot 2005a; Lightfoot and Martinez 1995; Lightfoot et al. 1998; Loren 2001; Lucas 2006; Rodríguez-Alegría 2005; Silliman 2004; Voss 2005, 2008b). Many of these examples also intersect with dialogues of materiality to examine the ways in which clothing, foodways, lithic tools, and other objects—including cultural landscapes (Sokolove 2002; Tveskov 2007)—are used by colonial agents to manipulate and restrict identity and social mobility.

As discussed above, I view landscapes as arenas of social experience. They are inscribed with meaning and common experiences, and, likewise, reinforce or challenge "those common experiences that over the long-term create the precedence and stability of meanings that help constitute [and codify] social identity" (Tveskov 2007:433). Transformations of identity, as well as how colonized peoples are identified by others, have long-lasting economic, political, and social ramifications.

> The constellations of identifications and social categories that adhere in present-day social life are indeed a partial legacy of statism, colonialism, capitalism, and individualism… [and] continue to be met with, altered by, and woven into other practices of social identification and social differentiation (Voss 2008a:13; see also Haley and Wilcoxon 2005; Sokolove 2002; Tveskov 2007).

The federal recognition process for Native Americans, for example, and ongoing tribal revitalization efforts demonstrate the poignancy of claiming certain identities in the present, as well as the creative and alternative avenues native groups were able to follow in the past to be able to maintain particular identities throughout periods of colonial settlement.

Summary

Pulling together the different threads used to access and interpret the past, I provide the theoretical fabric of this chapter, composed of four interrelated discussions, and a framework for my dissertation. Part one examines the manner in which studies of culture contact and colonialism treat culture change and persistence. Acculturation models and world-systems theory offer routes to understand, respectively, patterns of cultural transfer and the global nexus of cores, peripheries, and semi-peripheries. These two approaches remain helpful for evaluating the parameters, timing, and outcomes of cultural interactions, though not without criticism for positing unidirectional explanations of culture change and glossing over developments at the microscale. I argue studies of culture contact and, especially, colonial encounters engender new means to evaluate the complexity of social interactions and sophisticated entanglements of agents and objects in colonial settings. Theories of landscape and the study of places of refuge offer one entry point to access and understand the social, material, and spatial variability in colonial entanglements in the San Francisco Bay area.

Part two presents an overview of anthropological studies of power, inequality, and social dominance and resistance. My focus on studies of resistance recognizes traditional dichotomies of dominance/resistance and primary/secondary resistance and argues a temporal dimension is critical to understand the historical circumstances of resistance over the long-term. Equally important, as Ortner (1995:191) makes clear, studies of resistance cannot overlook the interplay between external forces and “the multiplicity of projects in which social beings are always engaged.” I then outlined a model for examining places of refuge, which are found in many regions of the world at many time periods. Within colonial California the study of refugeeism is closely tied to resistance scholarship, namely defiance of colonial spatial arrangements (cf. Byrne 2003), but also studies of frontiers and borderlands. My approach differs from the study of frontiers primarily in the scale at which I examine processes of culture change and maintenance at individual sites of refuge located within a broader colonial frontier.

Additional theoretical influences guiding my research include theories of practice, materiality, and identity. I present each theory in part four, and, although overlapping with other themes in the chapter, I discuss my use of each theory to understand daily practices and social interaction with materials, including culturally significant places. My approach for interpreting landscapes as material things is outlined in part three, and here I consider archaeological approaches to the study of landscapes as a driving force behind my research. After addressing the historical trajectory of landscape studies in European and American academic traditions, I present an argument that builds on three major themes in landscape studies: landscapes as experiential and embodied; vernacular and contested landscapes; and sacred sites. I argue landscapes are active; reciprocally providing social meaning for people who, in turn, attach meaning to significant places. Applicable to research of colonial encounters, my understanding of cultural landscapes is shaped by Given’s (2004) analysis of landscapes of resistance, as well as Bender’s (2001a, 2001b) insightful approach to landscapes for people on-the-move:

> The process by which we make landscapes is never pre-ordained because our perceptions and reactions, though they are spatially and historically specific, are unpredictable, contradictory, full of small resistances and renegotiations. We make time and place, just as we are made by them (Bender 2001a:4).

A final driving influence in my research comes from the work of Ashmore (2002) and Schlanger (1992) whose research I summarized at the conclusion of part three. Schlanger (1992) presents a model for studying persistent places and Ashmore (2002) outlines an approach that accounts for the life history of place. Both scholars identify the long-term engagement with places, though Ashmore pays particular attention to the range of engagements that can occur. People, places, meanings, and memories are interwoven during engagements with socially salient places. Acts of remembrance leave material traces—a burial, the strategic placement of a house floor, harvesting shellfish at particular times of year—and in the physical act of returning to places of refuge and other social acts of decision and disposition, hunter-gatherers transmit cultural traditions, legitimate present social orders, but also "keep the past" (Connerton 1989:72). In the following chapter, I discuss the settlement and subsistence patterns of hunter-gatherers in the San Francisco Bay area to identify prehistoric movements across the landscape and to understand the persistent use of culturally significant places before the period of Spanish colonial settlement.

CHAPTER THREE

COAST MIWOK HUNTER-GATHERERS AND SHELL MOUNDS IN THE SAN FRANCISCO BAY AREA

Archaeologists have long recognized the natural resources available in a given environment and human travel across landscapes are instrumental for understanding how and when hunter-gatherers subsist and settle during particular seasonal, annual, or longer term cycles. Hunter-gatherer research in California is no exception. Complexity (e.g., Arnold 1996; Lightfoot 1993), resource intensification and depression (e.g., Basgall 1987; Broughton 1994a, 1994b, 1997; Raab 2009), and behavioral ecology and optimal foraging theory (e.g., Bettinger 1991; Bettinger and Malhi 1997; Codding and Jones 2007; Kennett 2005) are four key dialogues to which archaeologists in California contribute their expertise on hunter-gatherer mobility and subsistence. The importance of these theoretical contributions should not be overlooked; however in this dissertation I work from theoretical considerations of hunter-gatherer complexity to interpret subsistence and settlement on the Marin Peninsula. I argue refugee Coast Miwok-speakers, as complex hunter-gatherers, retained familiarity with seasonally available resources, the timing of certain ceremonial rites, and the location of socially charged places where practices of the past could be maintained or reformed to suit the needs of the time. As outlined in the previous chapter, I also acknowledge other motivations for movement across the landscape—in addition to the pursuit of food and shelter—to build a long-term, socially informed picture of hunter-gatherer engagement with persistent places before, during, and after colonial contact.

This chapter is divided into three parts. The first part provides an overview of scholarly discussions about "complexity" in hunter-gatherer research. I concentrate specifically on the archaeological manifestations of complex hunters and gatherers to interpret California tribelets and the material evidence of Coast Miwok-speakers on the Marin Peninsula. Settlement and subsistence models for complex coastal hunter-gatherers are described, and then used to discuss the Coast Miwok's seasonal settlement round. With this framework in place, the second part of the chapter discusses shell mounds in the San Francisco Bay area with an eye towards various interpretations of their function and meaning, the seasonal timing of their occupation, and the ecological context of shell mounds. I then introduce my three study sites—CA-MRN-114, CA-MRN-115, and CA-MRN-328—in the last part of the chapter. I view the three shell mounds as part of a much larger mounded landscape with which complex hunter-gatherers engaged before, during, and following contact with Europeans.

Archaeologies of Hunter-Gatherer Complexity

My perspective is that the Marin Peninsula was occupied by complex hunter-gatherers, whose long-term engagement with the landscape through subsistence, settlement, and social practices engendered skills useful to overcome aberrations in diet and the impacts of colonialism. Long-term developments in hunter-gatherer subsistence and settlement strategies were initially conceptualized in terms of a trajectory of increasing social complexity from highly mobile to fully sedentary hunter-gatherers. Early unilinear models of complexity used stone tools to place societies along a continuum progressing towards civilized society (Morgan 1877), and later provided the groundwork for evolutionary sequences arranged by bounded social types, most notably hunter-gatherer bands, agricultural tribes, chiefdoms, and states (Service 1962). However, not all societies fit neatly into this sequence. For example, California's hunter-gatherer “tribelets” fall somewhere between bands and tribes, while Chumash hunter-gatherers in southern California are understood in the context of a vast network of politically connected chiefdoms with hereditary leadership.

Renewed interest in California hunter-gatherers during the 1970s revisited the tribelet concept as originally conceived by Alfred Kroeber (1925, 1966). Accordingly, a tribelet was the basic political unit of hunter-gatherers in California, a “sovereign though miniature political unit, which was land-owning and maintained its frontiers against unauthorized trespass” (Kroeber 1955:307). Lightfoot (2005a:42-43) provides a concise discussion of Kroeber’s tribelet concept, noting four fundamental characteristics of this hunter-gatherer polity. One key characteristic: a tribelet was the largest autonomous or self-governing political unit. It consisted of a single permanent village which served as a sociopolitical center composed of several coalesced lineages (Kroeber 1955:308), and was surrounded by a network of smaller satellite villages.

Hereditary chiefs or headmen were often recognized within tribelets as important leaders well-versed in oration, settling disputes, and scheduling feasts and dances (Lightfoot 2005a:42), and were sometimes singled out by colonial administrators as individuals who could resolve disputes among ever-fractioning communities. In Coast Miwok ethnographic examples (Collier and Thalman 1996), a headman (*hoipu*) shared leadership responsibilities with a headwoman (*maien*). The headman gave advice and mediated disputes, while the headwoman made important decisions about the scheduling of dances and ceremonies. In other parts of California tribelets were presided over by powerful individuals, *aggrandizers*, who inherited their rank and who were popular for their personal qualities, aggressive entrepreneurship, and ability to command loyalty from followers (Hayden 1995; Luby and Gruber 1999).

Revisions of the tribelet model also stress hunter-gatherers as active participants in crafting anthropogenic landscapes through the use of fire, selective harvesting, and mindful conservation practices (Bean and Blackburn 1976), but also reassessed the size and sociopolitical complexity of tribelet polities. Kroeber (1955:307, 1966) had originally estimated tribelets were composed of on average about 250-300 people, with approximately 500-600 tribelets found across California. Bean (1976:101) estimates upwards of 1,000 individuals belonged to some individual tribelets, and these polities were characterized by hierarchical social organization involving craft specialists, commoners, and shamans; higher population densities within tribelets; and inter-tribelet alliances (Bean 1976).

To Bean (1976), social complexity among California’s hunter-gatherers was not only a consequence of the productive ecosystems found all over California and the capacity to develop efficient tools and techniques to harness this productivity. California hunter-gatherers are viewed as complex because of “social institutions” that fostered economic and political alliances, ritual and kinship obligations, tribal rights to the production and distribution of goods, large social gatherings and feasts, and monetary systems that imbued certain resources with intrinsic value (Bean 1976:119-120). In short, archaeologists championing a revision of California hunter-gatherer political economies focused on *complex* hunter-gatherers, including “the rise and elaboration of sophisticated coastal economies, extensive trade networks, craft specialization, and incipient political hierarchies” (Lightfoot 2005a:45).

Beginning in the early 1980s and continuing into the late 1990s and early 2000s, the broader field of hunter-gatherer archaeology experienced a rebirth with the study of “affluent” (Koyama and Thomas 1981) or “complex” (Price and Brown 1985) hunter-gatherers. While the utility of this concept continues to generate debate (e.g., Sassaman 2004), a range of social and archaeological variables are typically employed to define complexity within unique geographical settings while also remaining broadly comparable to hunter-gatherers in other regional contexts. Kelly (1995:293), for example, defines complex hunter-gatherers as "nonegalitarian societies, whose elites possess slaves, fight wars, and overtly seek prestige." This can be compared to the Jomon, complex hunter-gatherers of Japan whose large settlements, high site density, ceremonial features, and cemeteries with associated grave artifacts reflect a complex sedentary lifestyle. The Jomon also practiced logistical subsistence strategies as evidenced by food storage pits, plant cultivation, coastal shell middens, and long distance trade of pottery and other items (Habu 2004).

Additional attributes of complexity studied by archaeologists, include the degree of segregation and centralization (Flannery 1972), segmentation (Kent 1989), social inequality (Feinman 1995; McGuire 1983), logistical subsistence strategies (Binford 1980; Fitzhugh 2002), food storage based on seasonal and spatial subsistence strategies (Testart 1982), territoriality (Andrews 1994), population density (Cohen 1981), and elaborate material culture (Conkey 1985). In coastal southern California, Erlandson (2002:326) argues elaborate material culture, high population density, sedentism, and "complex" social, political, and economic organization signal significant complexity among the Chumash. Also studying the Chumash, Arnold (1992, 1993, 1996, 1996a) defines complexity as a response to environmental stress, which initiated a hierarchical social structure of hereditary elites, powerful shamans, craft specialists, and commoners, as well as the chiefly ability to organize, control, and maintain power over non-kin labor. Alternatively, Gamble (2008) stresses mainland networks between powerful chiefs within and beyond the Chumash culture area as a hallmark of sociopolitical complexity evident before the onset of environmental and resource stress in southern California. Following these examples, I now describe the settlement and subsistence patterns of complex Coast Miwok-speaking hunter-gatherers of the Marin Peninsula.

Subsistence and Settlement on the Marin Peninsula

I believe Coast Miwok-speaking hunter-gatherers exhibit complexity both in their degree of social organization and in their strategies of subsistence, settlement, exchange, storage, and landscape management. Several small-scale hunting and gathering polities, or tribelets, were once located on the Marin Peninsula and spoke a common Coast Miwok language. At least thirteen distinct tribelets comprise the territory of Coast Miwok-speakers (Milliken 1995), which is generally acknowledged as the entire Marin Peninsula from the Marin Headlands north to Bodega Bay and from the Pacific Ocean east to the Sonoma River (Kelly 1978). Today, descendants of Coast Miwok and Southern Pomo-speakers—the Federated Indians of Graton Rancheria—recognize this area as their ancestral territory, including the Santa Rosa plain and the area immediately south of the Russian River. At the time of Spanish settlement, the Aguasto (also, Habasto) tribelet of Coast Miwok-speakers occupied the eastern edge of the Marin Peninsula (Milliken 1995), which includes Point San Pedro—where my archaeological field work took place. *Shotomoko-cha* (also, *Cotomko*'*tca*), *Ewu*, and *Awani-wi* are three key ethnographic village sites recorded in the Aguasto area (Kelly 1978:415; Milliken 1995:242).

Linguistic research provides important information on tribal interactions, such that social constellations viewed across a particular landscape are often shaped by the ability to speak with one's neighbors, which in turn mold enmity and amity relationships, exchange networks, and settlement patterns within particular tribelet territories. The Coast Miwok are a part of the Penutian language family, which also includes Ohlone-speakers of the San Francisco Peninsula and East Bay; hunter-gatherer groups of the Great Central Valley; and dialects found on the

Columbia Plateau (Golla 2007). Earlier linguistic research by Barrett (1908) identified a Moquelumnan, or Miwok, language stock found in three regions of northern California, two of which are located in the north San Francisco Bay region and a third located in the Sierra Nevada range. Within the north San Francisco Bay area, Barrett (1908:303-318) further isolates three Miwok dialects: a western dialect centered around Bodega Bay; a closely related southern dialect found at Tomales Bay and the remaining Marin Peninsula; and a northern dialect located at the southern end of Clear Lake. As I discuss in Chapter Six, the location of these three dialects figure prominently in Coast Miwok social networks and the exchange of obsidian and other resources across the Marin Peninsula before European contact. Also of note, ethnohistoric records have been used to suggest an extension of the Ohlone dialect located on the southern Marin Peninsula and Angel Island (Beeler 1972), but this may be more telling of seasonal movements by Coast Miwok-speakers between coastal and interior villages that may have left places uninhabited during certain times of the year or, equally plausible, a displaced population of Ohlone seeking refuge from intertribal violence at the time of Spanish settlement on the peninsula of San Francisco in 1776 (Brown 1973:186).

A transect from the Pacific coast inland across the Marin Peninsula reveals varied terrain and a diversity of habitats encountered by tribelets occupying this area. Tribelet territories may have coincided with particular landscape features, such that tribelets were "large enough to provide enough habitat diversity to buffer the vagaries of environmental perturbations during most years, but small enough to remain manageable from a few village locations that may have been moved once or twice a year" (Lightfoot and Parrish 2009:80). Habitats within each tribelet territory produced a plethora of plant, animal, and mineral resources well-suited for an economy based on hunting, gathering, and fishing throughout the year (Kelly 1978). Inland forests of redwood, oak-studded hills, and grasslands found in flat, alluvial valleys combine with freshwater creeks to yield a clear annual cycle of resource acquisition (Kelly 1978:415). Ethnographic interviews with Coast Miwok elders identify crab and deer as available year-round; salmon and steelhead could be fished during winter runs; rails and other migratory birds were available in the winter along with shellfish; acorns were collected, processed, and stored in the fall; and an abundance of grasses could be collected for seed meal in the spring and summer months and eaten with berries and sundry small fish and game (Kelly 1978:415-416).

At least three types of coastal environment also ring the Marin Peninsula: open sandy coastlines, rocky intertidal coast, and lagoon/estuaries are found along the Pacific coast (Jones 1992). San Pablo Bay and San Francisco Bay shorelines also provided a rich littoral subsistence base composed of tidal marsh habitat and mudflats—home to countless bird species, shellfish, and other creatures. The habitats of the Marin Peninsula are also dynamic—shaped by post-Pleistocene sea level rise over the last 10,000 years, erosion from wind and water action, sedimentation, tectonic movement, and fire—and contributed to the production of various maritime and terrestrial tool kits used by hunter-gatherers to extract resources. Archaeological, ethnographic, and ethnohistoric evidence document tule balsas, bone and shell tools, lithic tools of obsidian and chert, basketry, and other tools created with plant fibers, such as cordage and netting. The use of watercraft to traverse much of the San Francisco Bay and to transport large quantities of materials efficiently may also downplay the costs involved in resource acquisition, complicating the kinds of sites we would expect to find archaeologically (Ames 2002), and positioning bay shore sites as significant for their "proximity to pathways" (Daehnke 2007:213).

The seasonal settlement pattern of hunter-gatherers on the Marin Peninsula resembles those of hunter-gatherers occupying adjacent areas of the southern North Coast Ranges of

California (Lightfoot 1992), whereby hunter-gatherers cycled between dispersed summer camps along coastlines and larger inland winter villages to be able to maximize their exploitation of seasonally available foods (Lightfoot et al. 2009:211). Although this settlement pattern is assumed in the present study, it is modeled after the residential mobility of hunter-gatherers inhabiting the Pacific Coast, and the extent of its applicability to the eastern shore of the Marin Peninsula—where a "banana belt" climate typically produces milder temperatures compared to the exposed outer coast—is less well known, but is worth discussing.

King (1970a) proposed two settlement models for prehistoric village site located along the San Francisco Bay shore. In the first model, village clusters composed of small sites satellite to larger villages suggest a "socially ranked residence system… in which a ruling family resides in a village constituting the ceremonial and social center of a cluster of 'commoner' communities" (King 1970a:283). The second model, which I employ in my dissertation, mirrors those put forth for other coastal hunter-gatherer groups in central California and proposes site clustering as the result of seasonal returns to a central locus from widely dispersed summer camps (King 1970a:283; see also Parkman 1994). More recently, Banks and Orlins (1981) used historic evidence to construct a "periodically mobile home base model" whereby tribelets were divided between three to five villages, some of which relocated during different times of year between a key village and other scattered communities (see also Milliken et al. 2007:105). Using geospatial modeling techniques, Luby et al. (2006:210) suggest a relationship between clusters of large shell mounds and adjacent shell-bearing sites, such that large shell mounds were not refuse dumps for adjacent satellite sites and may have functioned as either mounded villages, or infrequently as vacant ceremonial centers. I explore this possibility in the following section.

The broader spatial patterning of ethnographic village locations offers perspective on prehistoric site clustering as antecedent patterns of residential mobility. Following Kroeber (1925:830-831), Slaymaker (1974) examines the conspicuous site clustering of Coast Miwok ethnographic villages, including *Shotomoko-cha* (CA-MRN-138) (Slaymaker 1977), located along the San Pablo Bay shore. Slaymaker (1974:5) argues ceremonies and dances were held at principal villages composed of a permanent population and permanent structures, such as sweathouses, multi-family houses, and assembly or ceremonial houses, while transitory populations inhabited satellite sites with few permanent structures like ramadas and brush huts (Lightfoot et al. 2009:211). To Slaymaker (1974:13), the central village was also "a place of identity and importance."

Recent studies of the Coast Miwok address the role of subsistence and settlement patterns (DeGeorgey 2007:16-17), but also that complex coastal hunter-gatherers were not solely optimized to traverse landscapes in search of food and shelter. For example, Goerke (2007:23) acknowledges the ritual cycle of ethnographic Coast Miwok-speakers whose annual calendar consisted of dances characterized by a "unique schedule, ritual, costume, and a number of participants" and sometimes included guests who traveled from distant villages. Playing a central role in seasonal movements, hunter-gatherers also recognized important landmarks and applied place names to them (Goerke 2007:25-27). In this fashion, Coast Miwoks imbued landscapes and persistent places with significance; providing cultural meaning and instilling cultural values for people traversing landscapes (e.g., Basso 1996a; Schneider 2007/2008), as well as guiding the actions of future generations of Coast Miwok-speakers.

Theories of practice remind us that hunter-gatherers were not passive participants during changes in their own lives, but *thoughtful foragers* "endowed with common psychological propensities to think and act in certain ways rather than in others, taking decisions in ecological, social and historical contexts which are unique to themselves" (Mithen 1989:491; see also Mithen 1990). Hunter-gatherers, like any agent, creatively perform activities to achieve specific ends (Roscoe 1993:113), and, as Deeds (2003:90) writes in her study of resistance in a colonial context, "the local environment was an especially conspicuous modifier of the Spanish blueprint." That hunter-gatherers maintained—indeed, were sometimes encouraged and depended on to continue—traditional patterns of subsistence during mission settlement is well-documented and serves as an entry point for my examination of the continuance of other indigenous social practices (Deeds 2003:75; Margolin 1989:90; Wade 2008:172-173).

Long before the first Europeans entered the San Francisco Bay, hunter-gatherers were already well-versed in meeting the challenges of a dynamic landscape: managing natural resources using fire, pruning, and selective harvesting; extracting seasonally available resources from different resource patches; constructing storage receptacles for surplus food items to be used during times of shortage; and maintaining social networks across land and water to exchange items and ideas, and to ensure persistence of people, practices, and places. Into this complex network European colonists entered—at first in the sixteenth century with sporadic visits, then in full force at the end of the eighteenth century—posing another challenge to hunter-gatherers living on the Marin Peninsula. Shell mounds, as the focus of my research, are examined in the next part of this chapter. I study them as records of long-term patterns of residential mobility and subsistence, but also as deposits marking the successes and failures of continuing settlement and subsistence patterns before, during, and after colonial encounter.

Mounded Landscapes of the San Francisco Bay Region

The Setting: Temporal Sequence for Central California

Throughout this dissertation I employ two temporal frameworks. The first uses a geologic perspective to examine broader environmental developments since the last ice age, or since approximately 10,000 radiocarbon years before present (RYBP)—the end of the Pleistocene epoch. The Holocene epoch includes the period of time since 10,000 RYBP to the present and is divided into thirds: the Early Holocene (10,000 to 6650 RYBP), Middle Holocene (6650 to 3350 RYBP), and Late Holocene (3350 RYBP to present) (Erlandson 1997).

To better understand cultural developments during the Late Holocene, especially those in the years leading up to colonial settlement in the San Francisco Bay area, I also employ the temporal framework of Milliken and Bennyhoff (1993:386). This is a revamped version of the original Central California Taxonomic System and subsequent modifications (Beardsley 1954; Bennyhoff and Fredrickson 1994). Accordingly, the archaeological history of Central California is divided into the following periods: Early Period (3000 to 500 B.C.), Lower Middle Period (500 B.C. to A.D. 300), Upper Middle Period (A.D. 300 to 900), Late Period Phase 1 (A.D. 900 to 1500), and Late Period Phase 2 (A.D. 1500 to 1800). A Middle/Late Transition (A.D. 700 to 1100) is also defined. Although I employ this model in my research, I also acknowledge its limitations including the possibility that some cultural expressions coexisted before and after arbitrary temporal boundaries (e.g. Moratto 1984:199).

The Setting: San Francisco Bay

The San Francisco Bay is a massive tidal estuary, the largest on the west coast of North America, where freshwater outflow from the Sacramento-San Joaquin River Delta intermingles with salt water tides to produce resource-rich salt and brackish marshes (Byrne et al. 2001:66). Now threatened by growing cities and agricultural demands (Bowe 2009), a carefully balanced cycle of seasonal snow melts flush the delta and bay, in turn depositing nutrients into the ecosystem and enticing anadromous fish, like sturgeon and salmon, to return from the Pacific Ocean. The estuary is composed of several bays, including San Francisco Bay, San Pablo Bay, San Rafael Bay, Richardson Bay, Grizzly Bay, and Suisun Bay. Discussed above, hunter-gatherers in the San Francisco Bay area inhabited a varied and dynamic landscape shaped by periodic fires, erosion from rain and strong on-shore winds, drought, tectonic shifts, sedimentation, and sea level rise.

Geologically, Sloan (2006:48) writes, the San Francisco Bay area "reads like a Russian novel with a very large cast of characters." Tectonic movements over the past 140 million years contribute to the geologic mosaic seen in the San Francisco Bay, as well as the varied topography, soils, and unique blend of ecosystems and microclimates experienced by complex hunter-gatherers. Formed by the meeting of the North American and Pacific Plates, three basement complexes—Franciscan, Great Valley, and Salinian—give rise to the diversity of rocks and minerals found in the San Francisco Bay area (Sloan 2006:49). Two basement complexes—Franciscan and Salinian—cleave the Marin Peninsula. Rocks found east of the San Andreas Fault include those in the Franciscan basement, such as basalt, radiolarian chert, graywacke, and serpentinite, a metamorphic rock and the state rock of California (Sloan 2006:49-62). Plutonic (igneous) granites brought north along the San Andreas Fault over the past 110 million years are part of the Salinian basement found west of the San Andreas Fault at Point Reyes (Sloan 2006:68-70). Sedimentary fill from the past 65 million years of transition from a marine to terrestrial environment and tertiary volcanic rocks also contribute to the unique terrain of the San Francisco Bay area, as well as the lithic artifacts recovered from archaeological sites.

Over the past 10,000 years, eustatic changes and the formation and expansion of the bay estuary from sediment accumulations figure prominently in the growth and development of shell mound communities ringing the bay shore (Lightfoot 1997:137-138). Sea levels have been steadily rising since the end of the Pleistocene about 10,000 BP, when the greater San Francisco Bay was a river valley through which the combined waters of the Sacramento and San Joaquin Rivers—called the California River—flowed through the Golden Gate (Sloan 2006:142-143). Rapid sea level rise took place afterwards from approximately 9500 to 8000 BP, possibly covering early riparian archaeological sites located along the California River. Sea levels then steadily decreased between 8000 to 6000 RYBP. After about 6000 BP the rate of inundation slowed even further, sediment accumulations from the Delta continued, and, combined with periodic tectonic movements, salt and brackish intertidal marshes and oyster beds began to form along the shore, though at different rates at different locations around the bay (Lightfoot 1997:137-138). By about 2000 BP the San Francisco Bay reached its full extent with open bay waters, mud flats, and lush marsh habitats, although sea levels continue to rise and the bay shore landscape that developed over the last 6000 years has been severely altered within the past 200 years of California history (Kay 2009).

The Middle Holocene (6650 to 3350 RYBP) was a formative time ecologically and culturally. At this time many of the basal levels of the earliest shell mounds were constructed as hunter-gatherers began exploring the bounties of mudflats and marshes. Through consistent returns to the same locations over time, Lightfoot (1997:138) states, hunter-gatherers "would have raised these coastal places above the nearly flat, extensive, featureless plains of the bay shore marshlands." Continued inundation of the bay during the Late Holocene (3350 RYBP to present) and repetitive, intentional deposits of shell, rock, earth, and ash further demonstrate why archaeologists often locate the deepest deposits of some shell mounds 1 to 6 meters below sea level (Lightfoot 1997:138).

Lightfoot (1997:139) posits four hypotheses to explain why shell mounds, not dispersed middens, were created by hunter-gatherers in the Middle Holocene: shell mounds were constructed to keep villages above high tide; shell mounds were strategically located to maximize harvests of shellfish, fowl, and fish and well-suited for water transportation; shell mounds were "long-term repositories for the dead" and links between ancestors and subsequent descendants; and shell mounds were built as markers to delimit territorial boundaries. A combination of functional and social interpretations, I explore these hypotheses in greater detail in the following section.

The Setting: History of Shell Mound Research

Large shell mounds and shell-bearing sites are ubiquitous features to river, ocean, lake, and bay shores the world over, and have a long tradition of archaeological study beginning in the 1860s (Trigger 1986). Often used to refer to shell-bearing sites, the terms "midden" and "kitchen midden" (*kjökkenmödding*) have roots in the Scandinavian language and refer to an accumulation of refuse adjacent to dwelling areas (Meehan 1982:4; Stein 1992:6). Applied early-on and liberally to many shell-bearing sites, including those studied in the San Francisco Bay area by Danish-born Nels C. Nelson, the term midden is particularly cumbersome because not all shell-bearing sites were used as dumps for the refuse of daily shellfish processing (Claassen 1991b). Luby et al. (2006) now address a range of multi-function shell-bearing site types—shell mounds, shell middens, shell heaps, shell scatters, and others—as an extension of a broader regional pattern of Native American mound construction found in most regions of North America. Locally, mounded sites are not particular to the San Francisco Bay, but extend inland to the Sacramento-San Joaquin River Delta where they are found along the major water courses of the Central Valley and other tributaries. Here, earthen mounds predominate. Several key earthen mound sites, such as the Windmiller mound (CA-SAC-107), yielded burial and artifact data used to establish cultural-historical sequences for the Central Valley and Bay Area (Moratto 1984:178-181), though many are now destroyed as a consequence of archaeological study, river erosion, urban sprawl, and intensive agricultural development (Rosenthal 2007:149)

Casual collection at many of California's coastal sites, including shell mounds, began near the end of the nineteenth century and possibly even earlier (Moratto 1984:226). Scientific studies commenced in the first decade of the twentieth century and mark the first of three broad phases of shell mound research in the Bay Area (Lightfoot and Luby 2002; Luby et al. 2006). Between 1906 and 1908, Nelson conducted the first systematic survey of shell mound sites in San Francisco Bay region, including the coastal strip between the northern and southern latitudes of the San Francisco Bay, Carquinez Strait, and eventually Tomales Bay and those sites found along the Pacific Coast up to the Russian River (Nelson 1907, 1909). Recording and mapping 425 shell mounds, Nelson's survey is also the first spatial analysis of mound sites in the region and the first to treat the San Francisco Bay region as a distinct archaeological unit (Bickel 1976:1). Nelson (1909) documented the appearance, composition, and preservation of the shell mounds, which are salient attributes still employed by archaeologists to assess the dimensions, archaeological constituents, and attrition of bay mounds. During this initial phase of research, constituent analysis was explored as one means to evaluate mound age (Gifford 1916), but also laid the groundwork for subsequent analysis of shell mound components and ecology.

Quantitative methods and analysis characterize the second period of shell mound research in the San Francisco Bay area between 1940 and 1960 (Luby et al. 2006). At this time, the "California School of Midden Analysis" spearheaded numerous field projects around the bay partly because of the proximity of the University of California to coastal sites and partly because of the formation of the University of California Archaeological Survey in 1948 (Heizer 1949; Mason et al. 1998:304; Waselkov 1987:141). Column sampling and other techniques were pioneered at some sites as means to access ecological data (Meighan et al. 1958), as well as to answer persistent questions about the age, deposition, and constituents of shell mounds (Cook and Treganza 1947; Gifford 1946; Greengo 1951, 1952; Treganza and Cook 1948).

During this second period of shell mound research excavations of archaeological sites on the Marin Peninsula were especially prevalent. Following the complete excavation of one shell mound in Solano County (Treganza and Cook 1948), CA-MRN-20 was excavated as a salvage operation and exercise in compositional analysis (Follett 1957; McGeein and Mueller 1955). Other sites, especially those at Point Reyes, where excavated intensively for European artifacts left behind by the *San Agustin*, which sank in Drakes Bay in 1595. These artifacts were treated as temporal markers for central California, as well as evidence to prove or disprove Francis Drake's visit and thirty-six day layover in 1579 (Heizer 1941, 1947; Meighan 1950b; Treganza 1959). Lightfoot (1997:130) notes that research questions were also raised about the degree to which shellfish and estuarine resources could support large year-round hunter-gatherer populations, and whether littoral economies (and those who subsist on them) were inferior to inland peoples who subsisted on acorn crops—a sentiment perhaps evident in the rampant use of shovel broadcasting techniques to quickly excavate many coastal mounds (Meighan 1950a).

A florescence of field methods, specialized analyses, and theoretical insights characterize the third period of shell mound research beginning in the 1960s (Luby et al. 2006). The birth and rapid development of cultural resource management placed many archaeologists in close contact with shell mounds and other shell-bearing sites as urban development in the San Francisco Bay area boomed. During this time, archaeologists started to connect bay mounds to a broader regional context, drawing on research from other areas of the world to build robust interpretations of hunter-gatherer mobility and subsistence.

Ethnographic research among living coastal populations provides valuable analogous information on the timing and social dimensions of shellfish harvesting and the creation of mounded spaces (Meehan 1982; Waselkov 1987). Theories of hunter-gatherer subsistence and settlement now also situate local findings in a broadly comparative network of research examining maritime hunter-gatherers (Erlandson 1988, 1994; Yesner 1980); seasonality and diet (Broughton 1994b, 1997; Claassen 1986; Erlandson et al. 1999; Gobalet and Jones 1995; Jones et al. 2008; Lightfoot and Cerrato 1989; Parkman 1994; Wake and Simmons 2000); as well as identity and symbolism (Claassen 1991a; Luby 1991; Luby and Gruber 1999). This period continues to make great strides in laboratory and field methods in shell mound research (Cannon 2000a, 2000b; Casteel 1970, 1976; Claassen 1998; Lightfoot 1985; Schaaf 1981; Stein 1986, 1992), including studies of post-depositional processes and taphonomy (Bickel 1978; Byram 2009; Ceci 1984; Rogers and Broughton 2001).

<u>The Setting: Composition and Integrity of Shell Mounds</u>

In light of the diversity of research interests, some commonalities are recognized for shell mounds in the Bay Area (Lightfoot 1997:131-137). They are typically oval or oblong in form, and are often found along shorelines near freshwater drainages (Lightfoot 1997:131). Shell mounds range between nine and 183 meters in diameter (Luby et al. 2006:194), and their height varies between broadly dispersed, lateral middens of no more than one-half meter in height to clearly circumscribed mounds rising between one to 10 meters above the ground surface. One well-known mound site, the Emeryville shell mound, was estimated to be 100 by 300 meters and contained no fewer than ten distinct strata spanning over 10 meters in depth and minimally 2,000 years of history (Broughton 1997:848; Uhle 1907).

The internal composition of shell mounds consist primarily of complex deposits of dark, organic soil, fire-cracked rock, sand, lenses of ash, and concentrations of shellfish and other marine invertebrates. Diachronic changes in shellfish assemblages are documented early on (Nelson 1910:376-378). In the San Francisco Bay, oysters are replaced by mussels and then later by clams (Jones 1992:4). Found within the matrix of shell, rock, and ash are artifacts of bone, lithic tools, shell beads, and basketry; ethnobotanical and vertebrate faunal remains; architectural remains, cooking hearths, and other features; and sometimes human burials. Of burials, Lightfoot (1997:131) notes three distinct patterns of human interments: as cemetery complexes composed of multiple individuals, such as those recorded at the Tiburon site (CA-MRN-27) and the Patterson mound (Bickel 1981; King 1970b); in small burial groups and often associated with house floors, such as at Ellis Landing (Nelson 1910:383); and as individuals or in pairs "spoon-fashion" (Nelson 1910:383).

Some intact shell mounds may also contain historic artifacts within their upper deposits, demonstrating continuity between the Late Period and the historic era. However, early accounts from European explorers are descriptively vague about native villages, but might have witnessed hunter-gatherers residing on coastal mounds during visits to the San Francisco Bay before 1776. In one alluring comment, Nelson (1909:347, emphasis added) states "many informants have pointed out both *some of the smaller sites between San Rafael and Petaluma* and also some of the larger ones south of San Mateo as having been occupied by the Indians as late as 1870." Scattered material evidence for these late occupations include a Spanish-made brick from a shell mound in Sausalito; "red silk" from mounds near San Pablo; a brass medal dating to 1768 recovered from a mound on the peninsula of Alameda; a fragment from a three-legged metate from the West Berkeley shell mound (CA-ALA-307); and from a mound on Mare Island, a stone slab "inscribed with Egyptian hieroglyphics" (Nelson 1909:347).

These discoveries provide tantalizing evidence for continued use of shell mounds during colonial forays into the Bay Area, but our understanding of late components is more often severely limited because the uppermost deposits are entirely missing. As journal accounts from early European visits are quiet on the matter of hunter-gatherer occupations of mounded villages, this ephemeral period of time is often hinted at through radiocarbon assays (Lightfoot and Luby 2002:277). That said, we cannot rule out the possibility that some shell mounds might have "escaped the notice of early explorers" (Lightfoot and Luby 2002:277). European artifacts of metal and glass might still be present, especially considering assemblages from other colonial archaeological sites in the region.

Like many of the earthen mounds of the Central Valley where agricultural development, natural damage, and even archaeological excavation have erased many sites, shell mounds in the Bay Area have also experienced natural and cultural disturbances. Rodent burrowing; natural erosion from coastal winds and rain; and human impacts from construction, quarrying, and archaeological excavation complicate interpretations of coastal shell mound sites (Byram 2009; Ceci 1984). Nutrient-rich midden soils were once sought after by later bay residents for use in their gardens, while some aficionados preferred shell mound soils for their tennis courts (Ceci

1984:65). These taphonomic processes—especially commercial mining of some mounds—demand detailed mapping (Schneider and Panich 2008), and are especially relevant as they muddy our understanding of the uppermost layers of shell mounds and possible late hunter-gatherer occupations. Equally relevant, "house" depressions are recorded on the surfaces of some mounds, including those examined in the present research. Sorting cultural features from post-depositional disturbances poses one challenge to interpreting late mound components.

<u>The Setting: Timing and Interpretation of Shell Mound Occupations</u>

No archaeological sites along the bay shore in the San Francisco Bay area predate approximately 6000 BP, when rising sea levels gave way to accumulations of river sediment. Most well-dated deposits span from 500 B.C. to A.D. 900, the "golden age" of shell mound communities (Lightfoot and Luby 2002:276). Excellent syntheses of archaeological research at Bay Area shell mounds are provided by Moratto (1984); Lightfoot (1997) for the Middle Holocene (6650 to 3350 BP); Lightfoot and Luby (2002) for the Late Holocene (3350 BP to present); and King (1970a:277) for sites on Marin Peninsula excavated before 1970. Many large and deeply stratified shell mounds, such as Emeryville (CA-ALA-309; Schenck 1926; Uhle 1907), the Ryan Mound (CA-ALA-329; Leventhal 1993), the Patterson or Newark Mound (CA-ALA-328; Davis and Treganza 1959), West Berkeley (CA-ALA-307; Wallace and Lathrap 1975), Ellis Landing (CA-CCO-295; Nelson 1910), and the Stege Mound complex (CA-CCO-298, CA-CCO-300; Loud 1924), demonstrate repeated use for thousands of years and have been excavated extensively (Figure 3.1). A suite of radiocarbon and obsidian hydration determinations indicate a diversity of site use patterns, but generally frequent reuse of shell mounds "over extended periods ranging from five to nineteen hundred years" (Lightfoot 1997:135). For example, the Richmond study area in the East Bay shows cycles of use and abandonment stretching from the Early Period (3000 to 500 B.C.) to the Late Period Phase 2 (A.D. 1500 to 1800), as well as a clear shift from a broadly dispersed constellation of nineteen mound sites occupied contemporaneously during the Upper Middle Period (A.D. 300 to 900) to a tightly formed cluster of six mounds and three distant sites inhabited during the Late Period Phase 2 (Lightfoot and Luby 2002:272).

Radiocarbon determinations for the Stege Mound complex offer compelling evidence for occupation of coastal shell mounds during the Late Period Phase 2, including three determinations (UCR-1147, UCR-1150A, and UCR-1153) suggestive of habitation during the eighteenth century A.D. (Breschini et al. 1984:2-3). Similar Late Period Phase 2 components are documented at Ellis Landing (CCO-295) and nearby Brooks Island (CCO-290) (Kent Lightfoot, personal communication, 29 March 2010). To the south of Point San Pablo, several radiocarbon determinations (WSU 3367-3371, WSU-3846) from the Ryan Mound (CA-ALA-329) suggest Late Period occupations and human interments between A.D. 1250 and A.D. 1700 (Leventhal 1993:442). Two determinations (Beta-76863, Beta-76866) from Emeryville shell mound also fall within the Middle/Late Transition and Late Period Phase 1, a time of shifting population densities and village clustering (Broughton 1997:850).

On the Marin Peninsula, a survey of available radiocarbon data indicates Coast Miwok occupation from the Early Period through the Late Period Phase 2 (Table 3.1). Radiocarbon determinations from De Silva Island (CA-MRN-17) at Richardson Bay are two of the oldest in San Francisco Bay area and indicate early habitation along the then formative estuary (Moratto 1984:274). Three thousand five hundred years later, hunter-gatherers living in the same area greeted Juan Manuel de Ayala's ship, the *San Carlos*, as it entered the San Francisco Bay in

Figure 3.1. Location of Bay Area archaeological sites discussed in text.

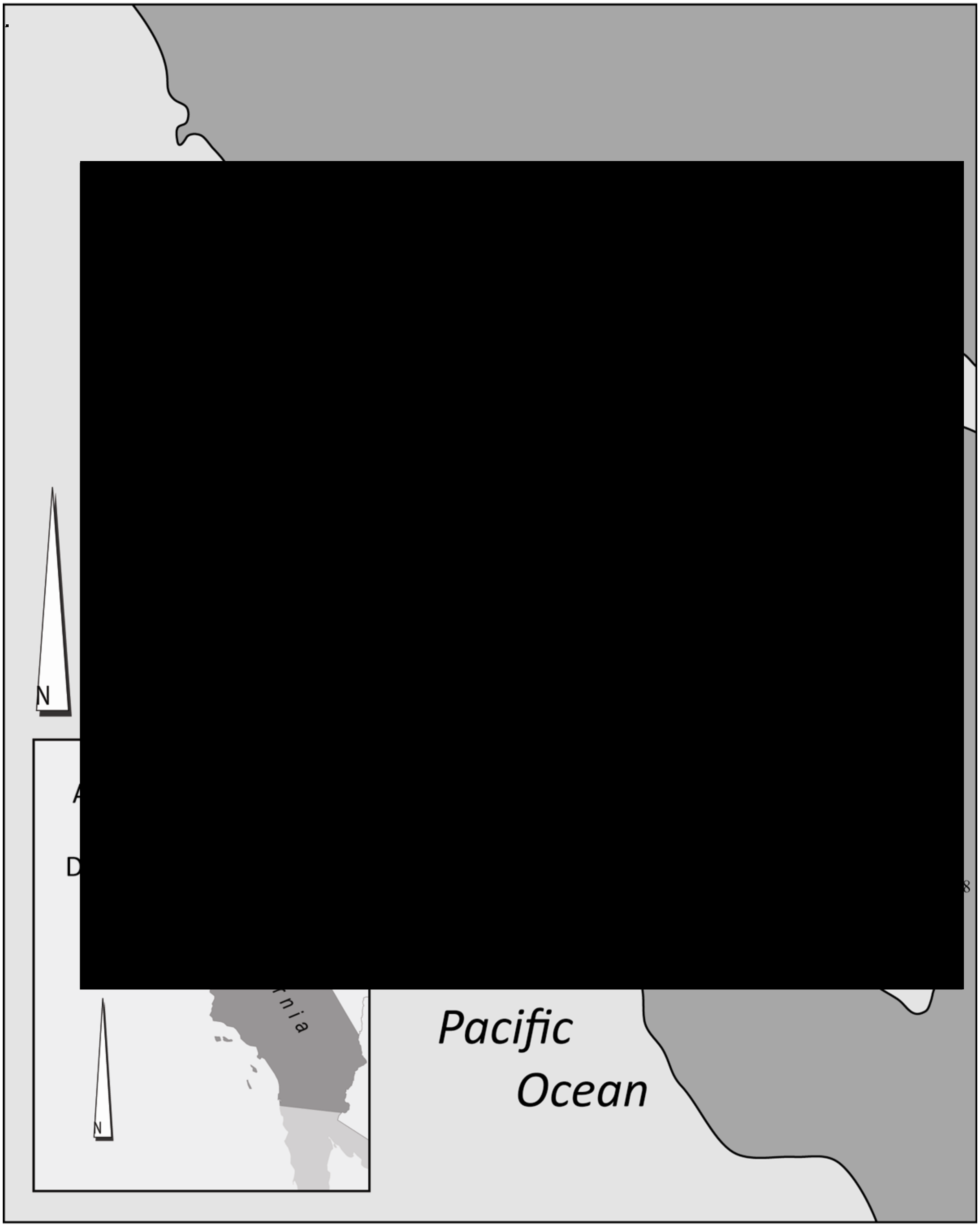


Table 3.1. Radiocarbon Data for East Marin County and Select Late Period Shell Mounds in the San Francisco Bay Area.

Site Trinomial	Site Name	Lab/Sample No.	Material	^{14}C Years BP	Calib. Age Range	Reference
CA-ALA-309	Emeryville	Beta-76863	Bone collagen	950 ± 50	AD 1000-1215	Broughton 1997:850
CA-ALA-309	Emeryville	Beta-76866	Bone collagen	720 ± 60	AD 1220-1395	Broughton 1997:850
CA-ALA-309	Emeryville	I-7963	Charcoal	1030 ± 60	AD 890-1160	Broughton 1997:850
CA-ALA-309	Emeryville	I-9896	Charcoal	1110 ± 70	AD 780-1030	Broughton 1997:850
CA-ALA-329	Ryan Mound	I-7895	Bone collagen	430 ± 80		Breschini et al. 1984:1
CA-ALA-329	Ryan Mound	I-7887	Shell Bead	980 ± 80		Breschini et al. 1984:1
CA-ALA-329	Ryan Mound	I-7896	Charcoal	520 ± 80		Breschini et al. 1984:1
CA-ALA-329	Ryan Mound	WSU-3367	Bone collagen	250 ± 50	AD 1250-1700	Leventhal 1993:442
CA-ALA-329	Ryan Mound	WSU-3368	Bone collagen	460 ± 50	AD 1250-1700	Leventhal 1993:442
CA-ALA-329	Ryan Mound	WSU-3369	Bone collagen	300 ± 60	AD 1250-1700	Leventhal 1993:442
CA-ALA-329	Ryan Mound	WSU-3370	Bone collagen	650 ± 50	AD 1250-1700	Leventhal 1993:442
CA-ALA-329	Ryan Mound	WSU-3371	Bone collagen	700 ± 55	AD 1250-1700	Leventhal 1993:442
CA-ALA-329	Ryan Mound	WSU-3846	Bone collagen	835 ± 90	AD 1420	Leventhal 1993:443
CA-ALA-329	Ryan Mound	CAMS-79711	Shell Bead	1180 ± 30		CRD[a]
CA-ALA-329	Ryan Mound	CAMS-80287	Shell Bead	815 ± 30		CRD
CA-ALA-329	Ryan Mound	CAMS-80288	Shell Bead	850 ± 30		CRD
CA-ALA-329	Ryan Mound	CAMS-80299	Shell Bead	920 ± 30		CRD
CA-ALA-329	Ryan Mound	CAMS-80907	Shell Bead	955 ± 30		CRD
CA-CCO-297	Stege Complex	UCR-1147		250 ± 100	AD 1700	Breschini et al. 1984:2-3
CA-CCO-297	Stege Complex	UCR-1148		315 ± 80	AD 1635	Breschini et al. 1984:2-3
CA-CCO-297	Stege Complex	UCR-1149		300 ± 80	AD 1650	Breschini et al. 1984:2-3
CA-CCO-297	Stege Complex	UCR-1150A		215 ± 100	AD 1735	Breschini et al. 1984:2-3
CA-CCO-297	Stege Complex	UCR-1150B		560 ± 80	AD 1390	Breschini et al. 1984:2-3

[a]CRD = California Radiocarbon Database (http://www.californiaprehistory.com/radiodb1.html)

Table 3.1. Radiocarbon Data for East Marin County and Select Late Period Shell Mounds in the San Francisco Bay Area (continued).

Site Trinomial	Site Name	Lab/Sample No.	Material	^{14}C Years BP	Calib. Age Range	Reference
CA-CCO-297	Stege Complex	UCR-1151		675 ± 80	AD 1275	Breschini et al. 1984:2-3
CA-CCO-297	Stege Complex	UCR-1152	Charcoal	425 ± 80	AD 1525	Breschini et al. 1984:2-3
CA-CCO-297	Stege Complex	UCR-1153	Charcoal	150 ± 0	AD 1800	Breschini et al. 1984:2-3
CA-CCO-297	Stege Complex	UCR-1154B	Shell	545 ± 80	AD 1405	Breschini et al. 1984:2-3
CA-CCO-297	Stege Complex	UCR-1166A	Charcoal	580 ± 100	AD 1370	Breschini et al. 1984:2-3
CA-MRN-14	Shelter Hill	I-7935	Charcoal	1230 ± 80	AD 720	Moratto et al. 1974:141
CA-MRN-14	Shelter Hill	I-7936	Charcoal	1345 ± 80	AD 605	Moratto et al. 1974:141
CA-MRN-17	De Silva Island	UGA-4545	Charcoal	5480 ± 125		CRD
CA-MRN-17	De Silva Island	UGA-4592	Charcoal	5575 ± 220		CRD
CA-MRN-27	Tiburon	I-3148	Charcoal	1980 ± 95		King 1970b:6
CA-MRN-27	Tiburon	I-3149	Charcoal	2320 ± 190		King 1970b:6
CA-MRN-42		UCR-1632	Shell	540 ± 100		CRD
CA-MRN-42		UCR-1633	Shell	580 ± 100		CRD
CA-MRN-44/H	Angel Island-Immigration Station	Beta-216413	Shell	1320 ± 40	AD 770-1030	DeGeorgey 2007
CA-MRN-44/H	Angel Island-Immigration Station	Beta-216692	Bone collagen	1780 ± 40	AD 70-250	DeGeorgey 2007

Table 3.1. Radiocarbon Data for East Marin County and Select Late Period Shell Mounds in the San Francisco Bay Area (continued).

Site Trinomial	Site Name	Lab/Sample No.	Material	^{14}C Years BP	Calib. Age Range	Reference
CA-MRN-44/H	Angel Island-Immigration Station	Beta-216344	Shell	1450 ± 40	AD 670-880	DeGeorgey 2007
CA-MRN-44/H	Angel Island-Immigration Station	Beta-216345	Shell	1550 ± 40	AD 590-760	DeGeorgey 2007
CA-MRN-44/H	Angel Island-Immigration Station	Beta-216346	Soil	1220 ± 40	AD 710-910, AD 920-960	DeGeorgey 2007
CA-MRN-44/H	Angel Island-Immigration Station	Beta-216347	Shell	1520 ± 50	AD 580-780	DeGeorgey 2007
CA-MRN-44/H	Angel Island-Immigration Station	Beta-216348	Shell	1600 ± 40	AD 530-700	DeGeorgey 2007
CA-MRN-44/H	Angel Island-Immigration Station	Beta-217284	Charcoal	320 ± 40	AD 1500-1670	DeGeorgey 2007
CA-MRN-44/H	Angel Island-Immigration Station	Beta-218548	Shell	950 ± 40	AD 1190-1330	DeGeorgey 2007
CA-MRN-44/H	Angel Island-Immigration Station	Beta-220056	Tooth collagen	2760 ± 40	AD 820-740	DeGeorgey 2007
CA-MRN-44/H	Angel Island-Immigration Station	Beta-220057	Shell	1460 ± 40	AD 660-830	DeGeorgey 2007

Table 3.1. Radiocarbon Data for East Marin County and Select Late Period Shell Mounds in the San Francisco Bay Area (continued).

Site Trinomial	Site Name	Lab/Sample No.	Material	^{14}C Years BP	Calib. Age Range	Reference
CA-MRN-44/H	Angel Island-Immigration Station	Beta-220058	Bone collagen	1760 ± 40	AD 330-510	DeGeorgey 2007
CA-MRN-44/H	Angel Island-Immigration Station	Beta-220059	Shell	980 ± 40	AD 1130-1300	DeGeorgey 2007
CA-MRN-44/H	Angel Island-Immigration Station	Beta-220060	Bone collagen	2050 ± 40	AD 140-350	DeGeorgey 2007
CA-MRN-115	Thomas Site	C-186	Charcoal	633 ± 200		Libby 1955:112; Meighan 1953:5
CA-MRN-115	Thomas Site	C-186	Charcoal	911 ± 180		Libby 1955:112; Meighan 1953:5
CA-MRN-127		Beta-28750	Charcoal	370 ± 50		Bieling and Psota 1989
CA-MRN-138	*Shotomoko-cha*	I-5797		700 ± 95		Slaymaker 1974
CA-MRN-138	*Shotomoko-cha*	I-5798		40 ± 90		Slaymaker 1974
CA-MRN-152	Pacheco	UCLA-1891A	Bone collagen	3270 ± 150		Clewlow and Wells 1981:143; Goerke and Cowan 1983:52
CA-MRN-152	Pacheco	UCLA-1891B	Bone collagen	3050 ± 130		Clewlow and Wells 1981:143; Goerke and Cowan 1983:52
CA-MRN-170		I-5938	Bone	1350 ± 95		Chavez 1976
CA-MRN-170		I-5988	Charcoal	420 ± 90		Chavez 1976
CA-MRN-193	*Olompali*	I-6726		530 ± 85		Slaymaker 1972

Table 3.1. Radiocarbon Data for East Marin County and Select Late Period Shell Mounds in the San Francisco Bay Area (continued).

Site Trinomial	Site Name	Lab/Sample No.	Material	^{14}C Years BP	Calib. Age Range	Reference
CA-MRN-254	Dominican College	Beta-128754	Charcoal	240 ± 120	AD 1430-1950	CRD
CA-MRN-254	Dominican College	Beta-128755	Charcoal	1260 ± 130	AD 550-1020	CRD
CA-MRN-254	Dominican College	Beta-128756	Charcoal	1060 ± 110	AD 705-1210	CRD
CA-MRN-254	Dominican College	WSU-4839	Charcoal	520 ± 150		Bieling 1998
CA-MRN-254	Dominican College	WSU-4840	Charcoal	1380 ± 70		Bieling 1998
CA-MRN-254	Dominican College	WSU-4841	Charcoal	1230 ± 50		Bieling 1998
CA-MRN-254	Dominican College	WSU-4842	Charcoal	1750 ± 90		Bieling 1998
CA-MRN-254	Dominican College	WSU-4881	Charcoal	1200 ± 90		Bieling 1998
CA-MRN-254	Dominican College	WSU-4882	Charcoal	1270 ± 90		Bieling 1998
CA-MRN-254	Dominican College	WSU-4883	Charcoal	1830 ± 90		Bieling 1998
CA-MRN-254	Dominican College	WSU-4965	Charcoal	525 ± 80		Bieling 1998
CA-MRN-254	Dominican College	WSU-4966	Charcoal	1700 ± 90		Bieling 1998

Table 3.1. Radiocarbon Data for East Marin County and Select Late Period Shell Mounds in the San Francisco Bay Area (continued).

Site Trinomial	Site Name	Lab/Sample No.	Material	^{14}C Years BP	Calib. Age Range	Reference
CA-MRN-254	Dominican College	WSU-4967	Charcoal	1270 ± 70		Bieling 1998
CA-MRN-402	*Echa-tamal*				AD 1400-1817	Dietz 1976:175-182
CA-MRN-471	San Jose Village	I-7625	Charcoal	600 ± 80	AD 1350	Jackson 1974:86
CA-MRN-471	San Jose Village	I-7626	Charcoal	400 ± 80	AD 1550	Jackson 1974:86

1775. Nearby, DeGeorgey (2007) documented Early, Middle, and Late components at CA-MRN-44/H on Angel Island in addition to a rich faunal assemblage composed of at least 25 fish taxa suggestive of a prehistoric "platform" from which specialized task groups fished throughout the year (Simmons and Carpenter 2009:77).

Late Period Phase 2 components are also evident at the ethnographic village sites, including *Echa-tamal* (CA-MRN-402; Dietz 1976:175-182), *Shotomoko-cha* (MRN-138; Slaymaker 1974), and *Olompali* (CA-MRN-193; Slaymaker 1972). San Jose Village (CA-MRN-471) also contains Late Period and ethnographic components, while *Olompali* is one of the oldest continuously occupied sites in the Bay Area (Schneider 2009:68). Although archaeological sites at Point Reyes (e.g., the Estero site, CA-MRN-232; the Cauley site, CA-MRN-242; the McClure site, CA-MRN-266; and the Mendoza site, CA-MRN-275) are not examined in detail in the present study, they too yield rich prehistoric and protohistoric artifact assemblages—at least into the late 1500s—and are the continuing focus for innovative culture contact research (Russell 2008). In all, archaeological sites located on the Marin Peninsula, including those in the present study, provide strong support that many prehistoric sites were inhabited periodically through to the historic period.

The timing and clustering of shell mounds during the Late Period may support a model of resource intensification in the San Francisco Bay area. Documented at Emeryville shell mound, but also explored in subsequent chapters of this dissertation, this model is supported by faunal data, specifically a collapse in populations of high-yield mammalian fauna and sturgeon and an increased prevalence of lower rank resources (Broughton 1994b:372, 1997:857). Alternatively, the formation of shell mound clusters and their periodic and persistent occupation may also support a model of territorial circumscription during the Late Period. Resource stress, population increase, and seasonal subsistence pursuits left shell mounds unoccupied during certain times of year and at other times venues for reunion, decision-making, and ceremonial practice (Lightfoot and Luby 2002:267). A radiocarbon assay demonstrating site use during the Middle Period, Late Period, and period of European entry into the San Francisco Bay and other data collected from a cluster of three shell mounds at Point San Pedro provide an opportunity to more carefully detail changes and continuities of shell mound function and meaning.

Whether shell mounds were created for a single purpose—or for multiple reasons—is a matter of debate, and ultimately becomes a question of *how* they were used. Early functional interpretations of shell mound use focused on the sheer quantity of shellfish remains, faunal remains, and other artifacts as accumulated deposits of domestic refuse, or as midden deposits (Gifford 1916; Nelson 1909:335). An array of human interments present in some shell mounds led some to argue they functioned more as specialized cemeteries (Leventhal 1993), or sites of ceremonial feasting (Luby and Gruber 1999). Another scenario, traced to Nelson (1910) and still espoused by many archaeologists, focuses on material evidence for domestic activities—food-processing, cooking, and other daily chores—and mortuary practices at shell mound sites as representative of "full-service" mounded villages or communities (Luby et al. 2006:196-197). A collection of artifactual, ecological, burial, and geospatial data now guide interpretations of shell mounds as multipurpose *and* specialized sites with variable composition and size. Current research suggests a diverse array of shell-bearing site types and clustering patterns where Bay Area hunter-gatherers lived, dined, danced, and buried their dead (Luby et al. 2006).

As discussed above, a wealth of prehistoric archaeological data exist for shell mounds dating to the Middle Period and Late Period Phase 1, yet the timing of mound occupations just before the Spanish *entrada* into northern California remains open for interpretation. The top-most deposits of shell mound sites and more recent occupations of these mound sites by hunter-gatherers nearing the era of Spanish settlement in the San Francisco Bay area (A.D. 1776-1830s) are less well-known. Uhle (1907:36) suggested the great depth of time visible in some shell mounds should not overshadow the upper most layers, which may demonstrate occupation up to the "threshold of modern times." He adds "the fact that their roots reached far back into the prehistoric period of California does not prevent our seeing the tops developing almost to the present day" (Uhle 1907:36). The following section introduces three shell mounds on the Marin Peninsula that focus our view of the threshold between prehistoric and historic California.

Shell Mounds at China Camp State Park

Archaeological field investigations were conducted at three shell mounds—CA-MRN-114, CA-MRN-115, and CA-MRN-328—located in China Camp State Park, a 612 hectare (1,512 acre) state park located on Point San Pedro. The park is named for Chinese shrimp fishing camps, which were once located on the shore of Point San Pedro from the mid-1860s to 1905 (Brienes 1983; Humphrey 1979). Following secularization of Mission San Rafael, Point San Pedro was part of the *Rancho San Pedro, Santa Margarita y las Gallinas* land grant held by Timoteo Murphy from 1844 until his death in the early 1850s (Humphrey 1979:8). Parcels of the approximately 8,903 hectare (22,000 acre) land grant were then sold, including one parcel purchased by George McNear who in turn leased portions of the property to ranchers such as W.H. Thomas, MRN-115's namesake. Historic ranch features such as cement cisterns (e.g., CA-MRN- 531/H located between MRN-115 and MRN-328) are still visible in some areas of China Camp State Park. The cistern and a vertical metal pipe located up stream at the base of MRN-328 might be the remains of a damned reservoir used to water livestock and could have serious implications for understanding stratigraphy at MRN-328.

Chinese descendants of the shrimp fishing operation continue to reside at China Camp village (Brienes 1983), and since the creation of the park in 1977 archaeological research has focused primarily on these historic Chinese shrimp fishing communities (Schulz 1988, 1996; Schulz and Lortie 1985). Famously described by a young Jack London (2001 [1905]:1), at Point San Pedro "where the tide ebbs and flows, the Chinese sink great bag-nets to bottom, with gaping mouths, into which the shrimp crawls and from which it is transferred to the boiling pot." In one historical analysis of Chinese shrimp fisheries in the San Francisco Bay, Brienes (1983:81-82) comments on the physical and social isolation of shrimp camps located on Point San Pedro. Probably compounded by Chinese exclusion laws, shrimp camps at Point San Pedro were relatively inaccessible except by boat which contributed to cultural gulf "probably wider in Marin County than most other places… [the camps] were enclaves as well as factories" (Brienes 1983:81-82). The extent to which the physical isolation of Point San Pedro was sought after by refugee Coast Miwok is worth considering. Archaeological surveys along the shoreline and inland ridges of the China Camp park unit recorded historic buildings and features associated with the shrimp fishing industry and American period, as well as several Native American shell mound sites (Humphrey 1979).

CA-MRN-115 (the Thomas site) is a large multi-component shell mound approximately five meters in height and measures 30 meters east to west, 45 meters north to south, and covers an area of approximately 1060 square meters. Two smaller shell mounds—CA-MRN-114 and CA-MRN-328—are situated a few meters north and south of MRN-115 on the slopes of two hills, and all together these three sites form a conspicuous cluster. MRN-114 covers an area of approximately 490 square meters and midden soils from MRN-328 extend over approximately

824 square meters. Within China Camp State Park, several smaller shell mounds are recorded along the shore east and west of the study area. These include CA-MRN-110, CA-MRN-111, CA-MRN-112, CA-MRN-113, CA-MRN-116, CA-MRN-117, CA-MRN-118, CA-MRN-119, CA-MRN-491, CA-MRN-492, CA-MRN-493, and CA-MRN-494.

Two petroglyphs—a human figure and two concentric circles—are associated with MRN-110 at Rat Point. Although Nelson recorded MRN-110 in 1907, the petroglyphs were documented in 1977 and have not been relocated owing to the possibility of wave action and coastal erosion. Nelson also recorded MRN-113 and MRN-116, but they too were probably destroyed by the construction of San Pedro Road: the park's only thoroughfare. Beginning at MRN-114, MRN-115, and MRN-328—my study area—the shoreline topography from east to west changes from rocky coast to intertidal marsh. Shell mounds here tend to be located within sheltered canyons along seasonal creek beds—rather than exposed rocky coastline—providing for ideal living conditions, as evidenced by "house" depressions recorded on several sites (e.g.. MRN-115, MRN-118, MRN-328, MRN-491/H).

Possibly the only permanent water source in the entire park (Humphrey 1979:20), a freshwater spring is located a few meters south of MRN-115. Two seasonal creek beds are also found within the study area. One creek flows from the freshwater spring east around MRN-115 before meandering west around the base of MRN-114 where it is then diverted through a culvert under San Pedro Road. The other creek runs from the base of MRN-328 due north towards San Pedro Road. This creek bed is located approximately 20 meters west of MRN-115, such that both creeks run along either side of MRN-115 before emptying into the saltwater marsh.

Nelson (1907) recorded "Shellmound No. 115" (MRN-115) and "Shellmound No. 114" (MRN-114) as part of a monumental survey of shell mounds in the greater San Francisco Bay. Nelson (1907:186) mapped both sites noting their dimensions, states of preservation, and associated features, including "indications of pits on the top" of MRN-115. MRN-328 was identified only after the creation of China Camp State Park where the three shell mounds are presently located deep in a forest of California Bay Laurel, oak, and thickets of poison oak.

Nelson's map also depicts the eastern most of the two creeks as passing to the east of MRN-114 instead of its present-day course, which runs west of the site (University of California Archaeological Survey, n.d.). Instead of dismissing this as cartographic error, Nelson may have instead illustrated the original creek course and the original extent of the archaeological site. Development of nearby San Pedro Road and construction of a culvert used to divert the creek may have negatively impacted MRN-114. Specifically, the base of MRN-114 may have been truncated to divert the creek towards the modern culvert. Although the area in question is now dominated by a clump of poison oak, some shell was identified in the sidewall of the creek bed and will need to be investigated further.

Archaeological excavations at MRN-115 were originally conducted in April and May of 1949 under the auspices of the newly formed University of California Archaeological Survey (UCAS), directed by Robert Heizer. As a student of Heizer's, Clement Meighan oversaw excavations of multiple subsurface test units at MRN-115, including twelve five-by-five foot units located at the south end of the mound; five auger units placed systematically at five feet intervals running south from the shell mound; and one pit feature located on top of the mound.

The pit feature represents the remains of a semi-subterranean conical bark house used by hunter-gatherers up to the nineteenth century A.D. (Meighan 1953:2), and is analogous in form and construction to bark houses in other areas of California (e.g., Bean and Theodoratus 1978:292; Lightfoot et al. 2009). Similar features are found on the surface of MRN-328 and on top of other shell mounds in the vicinity, although these have yet to be tested archaeologically. Meighan's excavations at MRN-115 in 1949 yielded artifacts typical of other shell mound sites, including flaked stone artifacts, ground stone artifacts, worked bone implements, a pentagonal abalone (*Haliotis rufescens*) ornament, faunal remains, and baked clay fragments (Meighan 1953).

Atypical of most other shell mound sites—and most archaeological sites, for that matter—excavation in the pit feature yielded burned wood house planks, grass thatching, and the nested remains of four plain and diagonal twined baskets. The rare preservation of basketry and other organic remains at MRN-115 compliments those discovered in arid and underwater archaeological contexts in other parts of North America (e.g., Bernick 1998; Geib and Jolie 2008), and presents an opportunity to fully explore previously unknown dimensions of Bay Area shell mound-dwellers. All of the artifacts collected from MRN-115 are housed at the Phoebe A. Hearst Museum of Anthropology (PAHMA) at the University of California, Berkeley and were studied as part of my project.

Sixty years later, I integrate finds from Meighan's excavations at MRN-115 with new data collected from MRN-114, MRN-115, and MRN-328 to identify long-term patterns of hunter-gatherer subsistence, settlement, and shell mound function before, during, and after the period of Spanish missionization in the San Francisco Bay area. Fundamental research questions seek to understand *why*, *how*, and *when* the three sites were inhabited. The mixture of flaked stone tools, bone implements, basketry remains, faunal remains, and human interments present at MRN-114, MRN-115, and MRN-328 suggest a suite of daily and ceremonial practices. However, I do not understand site use as a constant through time and apparent shifts in the function of the three shell mounds during the Late Period (A.D. 900-1800) require careful study. Determining *when* these sites were inhabited is another key research question driving my archaeological field investigations.

Summary

Shell mounds are at once fickle, complex palimpsests of shell, rock, ash, and artifacts; valuable resources capable of revealing material information on hunter-gatherer subsistence and settlement patterns; but also sentinels for long-term patterns of social change and continuity. I have attempted in this chapter to sort through relevant literature on complexity, hunter-gatherer subsistence and settlement, and shell mounds to find a framework for examining the lives of hunter-gatherer refugees leaving Spanish missions in favor of familiar homes and practices.

Though traditionally used to describe hunting and gathering populations in the Pacific Northwest and Southern California where social rank, craft specialization, and large sedentary villages are evident, I proffer Coast Miwok-speakers, inhabitants of the Marin Peninsula, are also complex hunter-gatherers. Following a short discussion of archaeological approaches to complexity, I present examples of social and organizational complexity among the Coast Miwok: their degree of social organization, strategies of subsistence, patterns of residential mobility, exchange networks, storage practices, and landscape management techniques. Although the San Francisco Bay area—and California for that matter—was among the most densely populated regions in native North America north of Mexico, a tribelet organization ensured access to a range of natural resources throughout the year from different habitats; kin networks and patterns of marriage supported exchange networks for the flow of goods and ideas; and powerful headmen and headwomen made decisions, diffused arguments, and scheduled ceremonies assiduously preserved by previous generations.

Coast Miwok-speaking hunter-gatherers were not only well-tuned to the tempo of seasonally available foods and the locations of comfortable places to reside, they thoughtfully moved across the landscape. Ethnographic sources are rife with place names of social and ceremonial value (Collier and Thalman 1996; Kelly 1978). Building on theoretical points presented in Chapter Two, persistent, daily movement across the landscape for sustenance, shelter, or social events reinforced attachments to place in a recursive act of "reviving and revising" old times (Basso 1996a:6). That many cultural practices are found in twentieth century ethnographies—and in the minds of some twenty-first century Coast Miwok descendants—and that hunter-gatherers maintained traditional subsistence pursuits in other colonial contexts in North America suggests a point of entry for examining the continuance of other indigenous social practices at shell mounds in colonial San Francisco Bay.

In the last part of this chapter, I outline the fundamental characteristics of shell mounds, including their appearance, composition, and preservation. The mounded landscape of the San Francisco Bay is composed of more than 425 shell mounds and shell-bearing middens, but now only a handful remain intact. Some are several meters tall, others stretch laterally over hundreds of meters rising no more than a meter or two, but most are generally oval or oblong in form and found along the bay shore near a freshwater source. Aside from these key distinguishing traits, there remain many unanswered questions about their function, meaning, and timing of occupation. Natural and cultural impacts to the tops of many shell mounds also skew our interpretations of their function more recently. Not only prehistoric sites, late deposits at three shell mounds in China Camp State Park offer an important opportunity to understand shell mounds as places of refuge for hunter-gatherers in the Late Period and Historic period.

To understand how and when mound sites were inhabited at this time, I examine the archaeological record from MRN-114, MRN-115, and MRN-328 at micro and macro-scales of analysis. This entails, first, examining the occupation of shell mounds on a broader temporal scale to be able to track diachronic changes and continuities in complex hunter-gatherer practices before, during, and after contact (Lightfoot 1995). Spatially, I expand my purview of colonial encounters to examine the nexus of goods and ideas adopted and altered at locations *away from* the Franciscan missions of Alta California. I also examine places of refuge as part of a broader mounded landscape whereby hunter-gatherer mobility entails more than finding food and searching for shelter, but also meaningful departures and returns to culturally resonant features. Second, I detail fine-grained changes and continuities within the archaeological context of MRN-114, MRN-115, and MRN-328. The tools of this scale—mapping, surface collection, geophysical survey, and subsurface testing—are described in the next chapter and offer inroads to address the practices of mound dwellers through time, including use of space, subsistence, raw material choice, and technological changes or permanence in lithic tool production. Through my use of both scales of analysis I attempt to make clear the processes and places of refuge, while also remaining comparative to other shell mound research in the region.

CHAPTER FOUR

ARCHAEOLOGICAL FIELD INVESTIGATIONS & MUSEUM RESEARCH

Archaeological field investigations were conducted as part of the China Camp Archaeological Project (CCAP) at MRN-114, MRN-115, and MRN-328 over the course of two years to provide material evidence of Native American refugeeism during the colonial period. These three shell mounds provide strong evidence for prehistoric occupation during the Middle and Late Periods, but their intact upper deposits also afford an opportunity to examine the long-term record of hunter-gatherer habitation, including potential historic occupations by mission refugees. In this chapter, I summarize the methods and overall results of my field investigations designed to be able to answer diachronic questions of site use through time and synchronic questions of terminal shell mound use by refugees. Detailed analyses of lithic, faunal, ethnobotanical, and historic artifact assemblages, and their temporal significance, are described in the following two chapters.

Research Questions, Expectations & Research Design

Minimally, a thousand years of human occupation is inscribed on the landscape of China Camp State Park. Working backwards from the present, each occupation in this region is preceded by a cultural presence that played a role in the preservation and persistence of Bay Area shell mounds: the State Park by ranching and a Chinese shrimp fishing industry; a Mexican *rancho* by mission property; and mission lands by the Auguasto tribelet of Coast Miwok-speaking hunter-gatherers. Whether actively constructed, leveled to make room for new inhabitants, left alone in the growing forest, or infrequently used by park visitors as a private rendezvous, shell mounds are a quiet but persistent cornerstone in the social memory and land use of Bay Area residents. MRN-114, MRN-115, and MRN-328 are especially significant for understanding the long-term use of shell mound sites by Coast Miwoks during the Late Period (A.D. 900 to 1800) and during and after colonial settlement in the San Francisco Bay.

Counter to a story of Native American cultural disintegration at the hands of the Spanish padres is one of Coast Miwok cultural persistence and the maintenance of prehistoric hunter-gatherer settlement and subsistence rounds. As I describe in Chapter Three, past research on hunter-gatherer settlement patterns and habitation of shell mound clusters in the Bay Area identifies a change in site use before and during European settlement in A.D. 1776, specifically a switch from year-round habitation of large shell mounds to seasonal occupation of smaller satellite mounds located around a large mound site (King 1970a; Luby et al. 2006; Milliken et al. 2007:105-107; Nelson 1909:328-329; Slaymaker 1974). One explanation put forth to explain this transition stresses territorial circumscription, resource stress, and resource depression brought on by increasing human populations and overexploitation in the Late Period, and inferred from low quantities of high-yield mammalian fauna and sturgeon in the archaeological record and higher amounts of broadly dispersed and seasonally available resources (Broughton 1994a, 1994b, 1997). Building on available ethnographic data (Milliken 1995:19-20; Milliken et al. 2007:105), another interpretation posits shoreline villages were important territorial symbols and ceremonial sites to where hunter-gatherers would return seasonally on moves between inland and coastal environments but also places to aggregate, venerate ancestors, and carry on rituals and other cultural practices (Leventhal 1993; Lightfoot 1997; Lightfoot and Luby 2002:267). Can these two interpretations help explain shell mound clusters in other areas of the San Francisco Bay such as those on the Marin Peninsula?

My research addresses diachronic changes in shell mound use through time, synchronic use of space at distinct moments in time, and brings to bear theoretical dialogues in landscape and identity on colonial encounters. Research questions addressed throughout my fieldwork and analysis are as follows:

- When were MRN-114, MRN-115, and MRN-328 occupied?
- Who inhabited these shell mounds, and what activities took place at these spaces before, during, and after culture contact?
- What changes or continuities are evident in Coast Miwok settlement and subsistence patterns (& other artifacts) following Spanish settlement in the San Francisco Bay?
- What are the dynamics of colonial encounters at places located away from colonial centers?
- When hunter-gatherers fled Spanish missions with permission or illicitly, where did they go?
- What role do places of refuge play in Native American cultural persistence during and after colonial settlement?

Building on these research questions as well as scholarship examining colonialism, I began archaeological field investigations at China Camp State Park with some expectations. First, building on the field work and conclusions of Meighan (1953), I believe all three sites were inhabited in the Late Period and historic times, possibly as late as the early to mid-1800s. Second, I assume during the Late Period and historic times the shell mounds were occupied by Coast Miwok-speakers who had once lived at or at least knew of these sites. Third, I argue Spanish padres did not entirely prevent their neophyte charges from leaving the missions and obtaining resources central to their subsistence and cultural existence. This pattern is documented at other Spanish colonial contexts in North America and explored later in this discussion. Fourth, I suspect returns to familiar village sites—places of refuge—afforded opportunities for Coast Miwok-speakers and other Indians to survive culturally and physically by continuing subsistence pursuits, but to also congregate occasionally and perhaps even secretly to resist introduced colonial structures and refashion other cultural practices. Lastly and following my discussion in Chapter Two, I anticipate continuity in material culture between pre-contact and contact period archaeological deposits with evidence of mixed native and European artifact types, especially glass trade beads and metal objects. This pattern is indicated at other regions of refuge and colonial contexts in California where archaeological evidence supports a pattern of "resistive adaptation," whereby refugees maintained some cultural practices but also selectively embodied elements of European culture (Bernard 2008:348).

Although the primary thrust of this chapter and the following two chapters will be to examine the material assemblage from the three archaeological sites, I employ the multidisciplinary perspective of historical anthropology to aid in answering my research questions and test my expectations. In this approach, archaeological materials are employed as but one data set used to elucidate the practices of hunter-gatherer refugees before, during, and after Spanish settlement. Using a collaborative research design modeled successfully in other areas of Alta and Baja California (e.g., Gonzalez et al. 2006; Lightfoot et al. 1991, 2001; Panich

2009), I solicited input from members of the Federated Indians of Graton Rancheria; employees of the California Department of Parks and Recreation; and colleagues from the University of California, Berkeley during all phases of my project (Schneider 2007/2008). Senior State Archaeologist E. Breck Parkman greatly facilitated my archaeological research at China Camp State Park and initially identified MRN-115 as a possible candidate to explore culture change and continuity at the far margins of colonial epicenters in northern California (Schneider 2007b).

Following successful collaborative, multiphase research models such as those referenced above, I created a hierarchical research design which minimized impacts to the three shell mounds. Throughout my archaeological field investigations, I adhered to a methodological hierarchy whereby the selection of specific field methods depended upon the results of the preceding ones. Likened to a surgical procedure, each phase of field research decreased in scale and increased in its precision of analysis; from survey to mapping, from mapping to surface collection, and finally from surface collection to subsurface archaeological testing. In this manner, each preceding field strategy ultimately defined the spatial layout of each site and aided the selection and precise placement of excavation units by forecasting key locations where testing could or could not take place. Additionally, the research design was carried out incrementally and reflexively. Following each phase of research, results were critically assessed, input from stakeholder groups was gathered and integrated into the research design, and subsequent field methods were selected to maximize data collection and lessen damage to the sites.

Equally germane to my research design, MRN-114, MRN-115, and MRN-328 are located within the ancestral territory of the Coast Miwok and it was incumbent upon me to establish and maintain a meaningful relationship with the Federated Indians of Graton Rancheria, the federally recognized descendants of the Coast Miwok and Southern Pomo. In addition to soliciting input on my research design and field methods from tribal members, collaboration with the Federated Indians of Graton Rancheria involved periodic meetings with the Sacred Sites Protection Committee—Graton Rancheria's committee for the protection of cultural resources in Marin and southern Sonoma County—and creation of a treatment plan for the inadvertent discovery of human remains. Explicit avoidance of human remains required a carefully orchestrated research strategy involving geophysical survey and thoughtful placement of excavation and auger units; minimally invasive methods espoused by practitioners of indigenous archaeologies working with disenfranchised Native American communities (Atalay 2006; Ferguson 1996; Schneider 2007a; Shackel 2004; Swindler et al. 1997; Watkins 2000) and successfully applied in other collaborative research contexts (Daehnke 2007; Gonzalez et al. 2006; Lightfoot et al. 2001; Panich 2009).

China Camp Archaeological Project

Background Research and Pedestrian Survey

Before archaeological field work at China Camp State Park could begin, background research was conducted to familiarize myself with previous fieldwork at MRN-114, MRN-115, and MRN-328. This included: preliminary analysis of the existing MRN-115 collection at the Phoebe A. Hearst Museum of Anthropology (PAHMA), University of California, Berkeley and associated field notes; map research and a literature review to become acquainted with archaeology research conducted in the region; and an informal pedestrian survey of the three sites to identify site boundaries and significant surface features and artifacts of interest to my research.

Missing field notes compound problems associated with retracing Meighan's archaeological fieldwork and identifying surface features and site datums. Of the over 500 artifacts, ecofacts, and soil samples in the MRN-115 collection at PAHMA, only those listed in the MRN-115 report—54 artifacts—have provenience information (Meighan 1953). To be able to better understand how, when, and where artifacts from MRN-115 were excavated, I attempted to relocate any possible field notes, maps, and other provenience information on and off campus. Of special concern, a "site record book, Marin County, site 115" is mentioned in the footnotes of the MRN-115 site report (Meighan 1953:7), but it could not be located.

In my expanded search for any information about the 1949 fieldwork at MRN-115, I examined Meighan's dossier of correspondence in the Records of the Department of Anthropology at the Bancroft Library; correspondence, writings, and archaeological records in the Robert F. Heizer Papers at the Bancroft Library; and the CA-MRN-115 site file in the UCAS records at the Phoebe A. Hearst Museum of Anthropology (UCAS, no date). The MRN-115 UCAS site file contains only four photographs of the excavation and a copy of Nelson's plan map of MRN-114 and MRN-115 (discussed in Chapter Three). However, other UCAS manuscripts produced from sites recorded by Meighan—for example CA-MRN-232 (the Estero site) excavated in April of 1950, a year after fieldwork at MRN-115 (Meighan 1950b)—contain site descriptions; daily journals of field methods and finds; sketch maps and artifact illustrations; multiple photographs; and artifact catalogs.

In an effort to track down similar information for MRN-115, I also contacted archaeologists who volunteered on the MRN-115 project in 1949, including David A. Fredrickson, Robert E. Greengo (Professor Emeritus, University of Washington), Robert J. Squier, Dorothy Rainier Libby (Professor Emeritus, California State University, Long Beach), and Joan Meighan (Clement Meighan's widow). Libby did not reply, and Fredrickson had no memory of the project at MRN-115 (David Fredrickson, personal communication, 13 February 2007). Joan Meighan recalled the following:

> I have had a chance to look through Clem's site material that he left and there is nothing for Mrn-115. He was always ready to, and usually did, write the site report when he finished the field work on a site and then he would turn all of the site records over to the [UCAS], museum or wherever the artifacts were stored. Clem didn't keep a field diary of the sites he excavated, unlike some archaeologists. All of the information on the sites he dug would be on printed forms (artifact slips, record forms of one sort or another, maps and notes about the site) that he would later compile into tables, charts and general information that would be published in the site report. As he had published a report on The Thomas Site, he wouldn't have kept any of the material for further study as he evidently had no intention of doing any more work on that particular site. Everything of his pertaining to the site would definitely have gone into the [UCAS] files (Joan Meighan, personal communication 16 May 2007).

Greengo was certain that the "site record book" refers to a "hand-written field notebook (perhaps later typed) that should have been kept with the other records of [MRN-115]" (Robert Greengo, personal communication, 19 March 2008). Squier's response is also worth noting:

> My participation in the Thomas site (MRN-115) [project] was limited to one day with Clem Meighan and a crew of undergraduate students from Cal, (my first day on an

> archaeological excavation). As a novice and having been on many sites since, my memory of that day is very sketchy. I took no notes myself, but I'm sure that Clem took complete notes as he always did… Clem told me on one occasion that when he retired from UCLA he had stored all of his papers at his retirement home in Bend, Oregon. It may be to your advantage to talk to Joan Meighan again since she might not have recognized the field notes you seek (Robert Squier, personal communication, 20 April 2008).

While there appears to be some disagreement on whether Clement Meighan used a notebook, the recollections of past fieldworkers generally indicate there may not be any additional field notes for MRN-115 and if they exist, they may have been lost.

As a second component of my background research historic and archaeological maps were researched to be able to ascertain the quantity, spatial distribution, and variety of shell bearing sites recorded along the shore of Point San Pedro through time. Historic maps are helpful resources for relocating archaeological sites and features, as well as powerful tools for tracing patterns of land use and the dynamics of cultural landscapes. Historic maps can also reveal the persistence of cultural features on the social fabric of subsequent human occupations, as demonstrated by the presence of "Indian mounds" on some nineteenth century maps of Marin County (see for example, Goerke 2007, Figure 21). Some of the earliest maps of Marin County include *disuenos* created for the distribution of land grants under Mexican colonial authority. These maps are useful for identifying the extent of land allotments following the secularization of Spanish missions and the locations of historic buildings and features. *Rancho San Pedro, Santa Margarita y las Gallinas*, granted to Timothy Murphy (Don Timoteo Murphy) in 1844, includes the northeast portion of San Rafael, including land acquired by Mission San Rafael Archangel north to Ygnacio Pacheco's Rancho San Jose and east to San Pablo Bay (Donnelly 1966). No shell mounds are indicated on this map, but several tenant names are associated with structures found within the rancho and are worth future exploration.

American survey maps produced after the Mexican rancho era (i.e., post-1849) also plot various historic features and landmarks across the Marin landscape. Many of these features are located along the bay shore and used to produce sounding maps for boats navigating bay waters (e.g., Ringgold 1851). Buildings, granite survey monuments, and trees were also used by surveyors to produce early contour maps of the Marin peninsula for selling parcels of land. For example, three maps produced by G.F. Allardt (1871a, 1871b, and 1876) indicate way points as prominent oak and buckeye trees found along the coast, but also brick kilns, slaughterhouses, oyster beds, structures associated with the Chinese shrimp fishing camps on Point San Pedro, and other vestiges of industry. While the production of such maps would have placed surveyors in the vicinity of shell mounds—especially conspicuous mounds like MRN-115—none are recorded until Nels Nelson's (1909) systematic shell mound survey in the early twentieth century.

After identifying the range of archaeological sites present within China Camp State Park, a third component of my background research involved an informal pedestrian survey of MRN-114, MRN-115, and MRN-328, as well as the immediate vicinity and the spaces between each site. This pedestrian survey was judgmental and was primarily designed to relocate the sites and to locate site boundaries, surface features, and other natural features that could potentially enhance my understanding of site topography. Site boundaries were determined by distinct changes in surface soil color and texture, such that clear borders were identified between dark, organic midden soils associated with the three shell mounds (typically 10YR 3/1, or darker) and lighter soils (typically 10YR 3/3, or lighter) composed primarily of forest duff. Key archaeological features identified on the surfaces of each site and surrounding landscape include shallow depressions on all three sites; remnant depressions associated with Meighan's 1949 excavations at MRN-115; smaller depressions potentially associated with pothunting activity; and the historic features associated with MRN-531/H located between MRN-115 and MRN-328. Important natural features were discussed in Chapter Three and include two seasonal creek beds and a freshwater spring located south of MRN-115. These features and the general topography of the study area were then systematically mapped.

Mapping

MRN-328 and MRN-114 were first mapped using compasses (14 degrees, 43 minutes east magnetic declination) and tape measures in January 2007 to be able to define site boundaries, significant surface features, and to reconnoiter possible lines of sight and locations for future site datums. Wooden datums were placed on both sites, and UTM (Zone 10) data were collected using a hand-held Garmin "eTrex Legend" GPS unit, although with some difficulty due to the heavily forested environment (Table 4.1). Bearings and distances to significant site features were recorded and mapped radially from zero to 360 degrees and relative to the site datums.

Table 4.1. Locations of tape and compass map datums.

[redacted]	[redacted]	[redacted]
[redacted]	[redacted]	[redacted]
[redacted]	[redacted]	[redacted]

Between January and March of 2007, the project area was systematically mapped using a Sokkia SET 510 Electronic Distance Measuring instrument, or total station. The goals of the mapping project were threefold, but primarily geared towards systematically recording significant archaeological surface features at MRN-114, MRN-115, and MRN-328 (Schneider and Panich 2008). The first goal was to create accurate site plan maps that could be used to identify spatial boundaries and, through detailed mapping of surface topographic relief, relocate surface features at all three sites. Second, the maps were produced to provide State Park staff with an accurate depiction of the project area and for monitoring post-depositional natural and human disturbances to the shell mounds. Third, after defining a manageable study area for the project, precise plan maps could then be used to assess general site topography, creek drainages, shell mound subsidence, and other features potentially hidden by the forested landscape.

Included in the site report on archaeological excavations at MRN-115 in 1949 are: a site plan map; a plan drawing of the house pit excavation; profile drawings; and a cross-section of the site's basal deposits based on five test auger units (Meighan 1953). These maps were used to identify the approximate location of Meighan's excavation units, but they have very little provenience information useful to relocate coordinates for site datums and excavation units.

Similarly, topographic contour lines are depicted on Meighan's plan map but they have little bearing on the modern site surface—shaped by cultural and natural disturbances over the past 60 years—and for identifying the twelve circular pit features, or house depressions, recorded by Meighan (1953).

After gathering information on previous field work at MRN-115, archaeological mapping of the project area commenced. This involved first assessing three primary natural and cultural disturbances that might impact interpretation of the shell mound surface models. First, many shell mounds are comprised of stratigraphically complex mixtures of shell, ash lenses, fire-cracked rock, earthen fill, burials, and artifacts layered over thousands of years by different inhabitants and often mixed by cultural transformation processes—excavation for house pits, hearths, and burials, as well as excavation by archaeologists, construction workers, and looters—and natural transformation processes—tree falls, bioturbation, erosion, and subsidence. In addition to prehistoric deposits however, MRN-114, MRN-115, and MRN-328 also have common currency as illicit hangouts for some present-day park goers who leave behind bottles, cans, bullet cartridge casings, and other items. Late nineteenth century Chinese porcelain fragments associated with the Chinese shrimp fishing camps were also recovered from the surface of MRN-115 and hint at historic site "use." Understandably, it is important to be able to distinguish the occupations of Native American refugees from more recent activities.

Second, in a novel attempt to help curb the rate of human and natural disturbances to MRN-115, employees of the California Department of Parks and Recreation covered the entire mound in chain-link fencing, which was laid horizontally across the surface of the site. Anthony "Tony" Gonzalez, head of maintenance for China Camp State Park, recalled placing the fence across MRN-115 in 2002 (Anthony Gonzalez, personal communication, 7 March 2008). The fence appears to be working. However, general weathering combined with the gradual accumulation of tree limbs and leaf litter on top of the fencing have smoothed some surface features, making the boundaries of some house pits less visible to the naked eye. Without the aid of a geophysical survey, which would have been complicated by the metal fencing, closely spaced readings from an electronic total station could help to clarify the outlines of surface features on MRN-115. The final plan map is also intended as a tool to aid park staff and archaeologists in their efforts to monitor the park's cultural resources.

Third, a suite of natural disturbances can complicate our understanding of site topography at China Camp. In addition to the widespread destruction of shell mounds from urban development (Ceci 1984; Luby et al. 2006:197– 98), shell mounds and loose shell-bearing soils bear the brunt of rodent disturbance, heavy rains, and coastal erosion, which can lead to slumping and possible subsidence. Additionally, at least two tree falls impact the study area. Nelson (1907:186) and Meighan (1953:1) noted a large buckeye tree that once grew out of MRN-115, but this tree has long since collapsed, taking with it a portion of the shell mound. At MRN-328, a similar tree fall gutted a portion of the site and fell on top of one of the more provocative areas of the site: a cluster of shallow depressions believed to be the remains of semi-subterranean house pits.

Tree clusters, thick vines, dead branches, and spotty forest lighting hinder clear lines of sight and the possibility of mapping all three shell mounds from a single site datum. Instead, a primary project datum and multiple subdatums were established. Three subdatums were initially staked out from the primary datum (1000 meters N, 1000 meters E, and 1000 meters Z) at points around MRN-115 in order to map parts of the site and to break up the entire project area into manageable mapping strata. Foot-long pieces of aluminum angle bar were used as permanent site datums. To reduce operator error and for ease in setting up the instrument, ideally all of our subdatums would have been placed at coordinates with even integers (e.g., 1002.000 N, 1055.000 E, rather than 1002.154 N, 1055.673 E). However, subdatum location was wholly dependent upon clear lines of sight. Because of this, subdatums were placed where a back sight was possible. At times, some smaller tree branches were pushed aside or removed entirely while total station “trick shots” were often needed to successfully navigate small gaps between trees and branches.

After establishing the primary project datum and three subdatums located at points thought to be ideal for mapping all three sites, MRN-114 and MRN-115 were then mapped. Being on a relatively open area with a flat, gentle slope, MRN-114 was mapped with the total station by first laying out a north-south baseline with a measuring tape emanating from one subdatum. Another tape measure was then placed perpendicular to the north-south baseline and moved at five-meter increments. The stadia rod was then moved systematically along the east-west line at five-meter intervals. The entire site was mapped using this method, while the looter holes and two large buckeye trees were mapped with additional points placed judgmentally for higher resolution.

Collecting data between archaeological sites did not follow the same method used for mapping MRN-114 because stretching measuring tapes in the forest swiftly became a challenging and time-consuming task. Instead, east-west transects were marked every five meters off of a single north-south baseline using a compass and bright orange flagging tape. The flagging tape was used as a guide for the person holding the stadia rod. This person would walk towards the flagging tape, stopping approximately every five meters—and every 10 meters in especially flat areas—for the EDM operator to record data. Points along the left side, right side, and bottom of both creeks were recorded at one-half-meter intervals in order to reduce angularity resulting from interpolation in our mapping software.

Using the three subdatums placed around MRN-115, the site could be divided into separate strata and mapped in the same manner as MRN-114. Baselines were extended from each datum and transects were created as before. However, as MRN-115 is a large shell mound approximately five meters tall, flagging tape was not used to mark transects as it became difficult for the person holding the stadia rod to see over the rise of the mound. A third crew member often helped guide the person holding the stadia rod and also removed branches for clear lines of sight.

Data points were collected around the base of MRN-115 approximately every five meters, while most points on the sides and top of the mound were spaced every half meter or meter to more clearly define pit features. Additional data points were collected from each pit for greater resolution in the final plan map. Some data at the base of MRN-115 could not be recorded from any of the three total station subdatums as some trees were simply too large to negotiate. These missing data from areas behind some trees created tree “shadows” on the original surface map for MRN-115 and prompted the placement of a fourth subdatum closer to the site.

Similar concerns resulted in the placement of three more subdatums closer to MRN-328 in order to collect data around the fallen tree and locate coordinates for subsurface test units. Data from MRN-328 were collected in a similar fashion as at MRN-114, except for a cluster of shallow depressions on top of the site that were recorded using tighter intervals between points. In total, 1,936 individual points were collected using nine datums presented in Table 4.2.

Table 4.2. Locations and descriptions of nine datums used to map project area.

Datum	Northing, Easting, & Elevation[a]	Location Description
Primary	1000.000N, 1000.000E, 1000.000Z	Approximately 4 meters northeast of MRN-531/H; stamped "CCAP 2007 UC Berkeley"
Subdatum 1	996.917N, 1055.006E, 998.449Z	South of MRN-115
Subdatum 2	1053.985N, 1021.067E, 996.135Z	Northeast of MRN-115
Subdatum 3	1060.025N, 1049.983E, 995.749Z	North of MRN-115 and south of MRN-114
Subdatum 4	1008.448N, 1027.108E, 998.673Z	Southwest of MRN-115
Subdatum 5	975.210N, 976.311E, 1002.103Z	West of MRN-328 (across creek bed) and south of MRN-531/H
Subdatum 6	956.812N, 994.028E, 1006.544Z	East (up slope) of MRN-328
Subdatum 7	1079.827N, 1060.576E, 996.678Z	On MRN-114
Subdatum 8	967.185N, 999.891E, 1005.040Z	On MRN-328 and north of Subdatum 6

[a]Distances measured in meters from the primary datum.

Following the mapping phase, data were processed and digital maps were produced using *Surfer*, Version 8 (Golden Software, Inc. 2003). As discussed above, mapping of the three shell mounds was implemented to accomplish three main goals: to collect digital elevation data that could be used to relocate the sites, to monitor disturbances, and to assess topographic features associated with the three sites. Using maps created with total station data, it is possible to highlight specific natural and cultural components of the shell mound sites. For example, house pits—and even the remains of Clement Meighan's 1949 excavation—are easily identified with the shaded relief map, and when combined with two-dimensional contour and post maps, the shaded relief map is a powerful tool for archaeologists and park staff to relocate archaeological features and to monitor surface disturbances (Figure 4.1).

A three-dimensional surface map was used to interpret site topography, creek drainages, shell mound subsidence, and other hidden features of the landscape (Figure 4.2). A kriging algorithm was used to produce this particular map, and shading, color, and lighting can be adjusted to exaggerate vertical surface features (Golden Software, Inc. 2003). Unlike the shaded relief map, a three-dimensional surface map can also be rotated along X, Y, and Z axes to examine site topography close-up and from multiple angles. Using the three-dimensional surface map, the two creek beds and the overall change in elevation across the study area lends insight to site formation processes and geomorphology. For example, the creek that runs along the base of MRN-114 is clearly eroding the site. What is less clear is whether the same creek may have once flowed around the other side of MRN-115, creating the depression visible at the base of the site. This depression around MRN-115 might also be interpreted as subsidence associated with natural weathering and the sheer weight of the shell mound documented at larger Bay Area mounds (Nelson 1909:329–330, 1910:364–365; Uhle 1907:11). At MRN-328, it is also possible to clearly see the three shallow, circular depressions that decrease in size from south to north.

Figure 4.1. Shaded relief and contour map of MRN-115 showing surface depressions and areas of Meighan's excavations in 1949 (contours relative to primary datum).

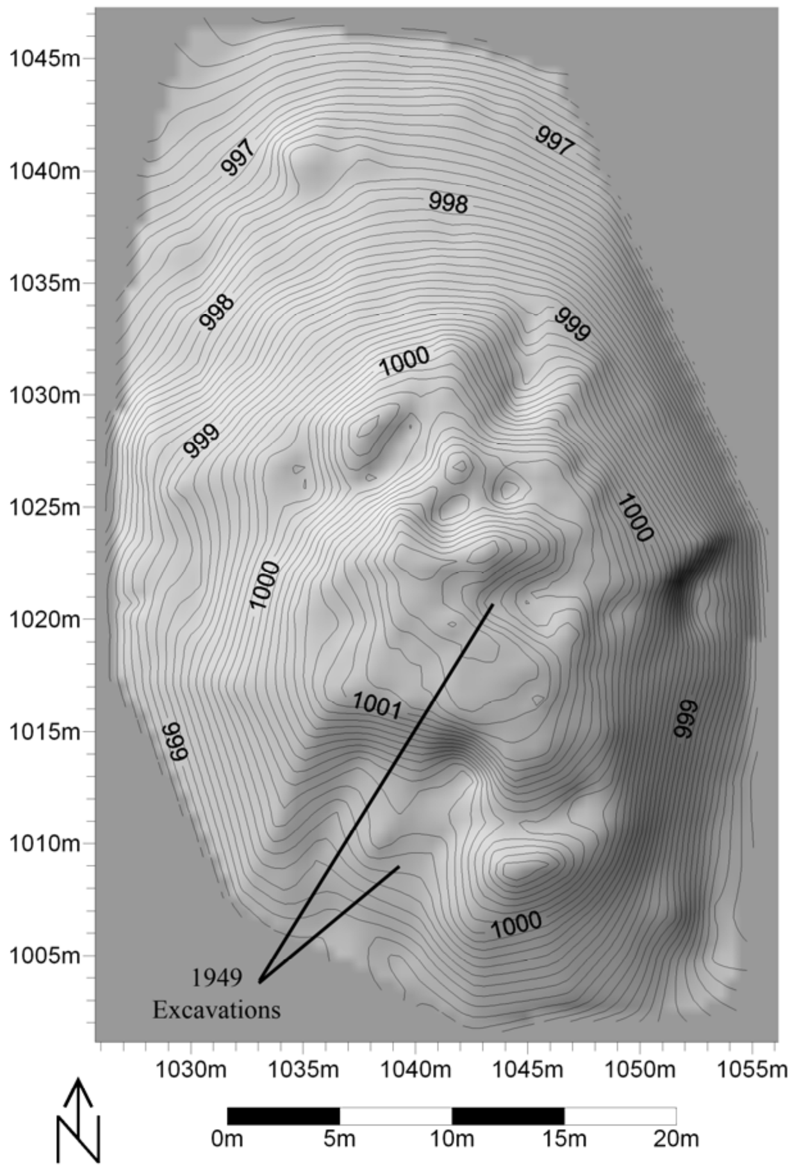
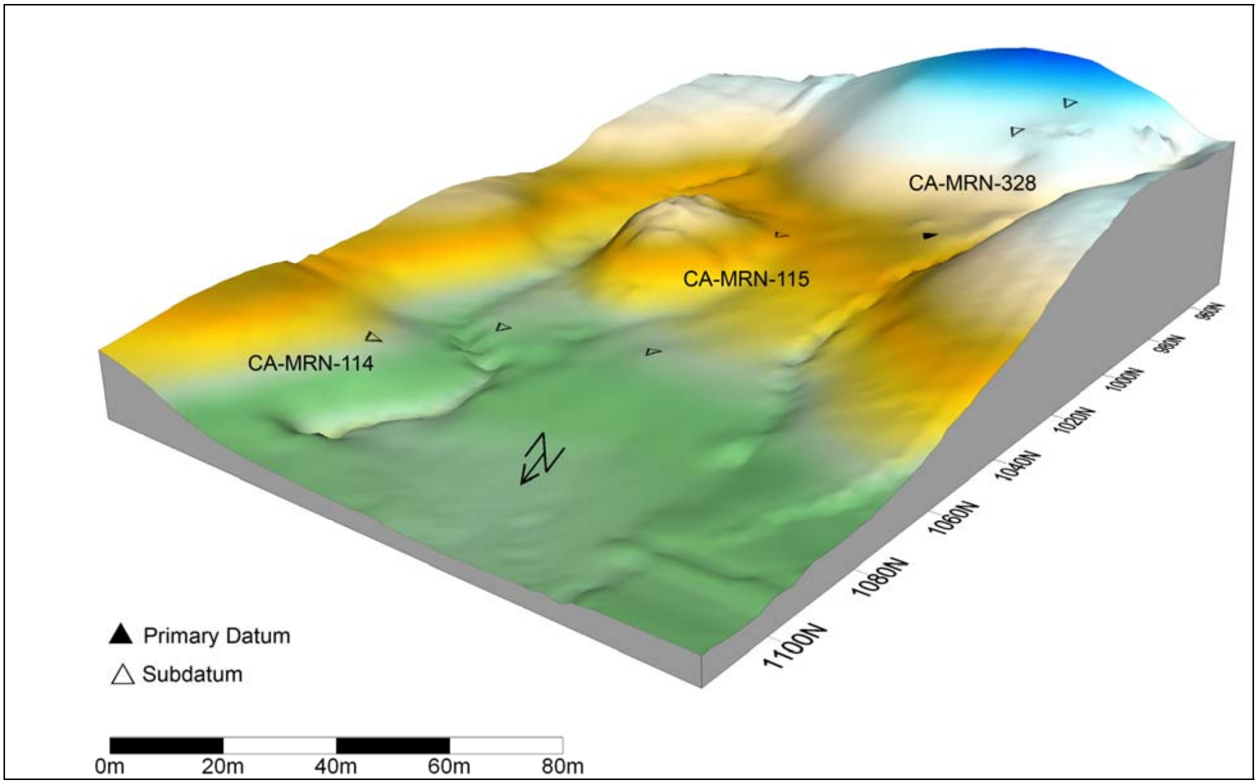


Figure 4.2. Three-dimensional surface map of project area in China Camp State park, including MRN-114, MRN-115, and MRN-328.



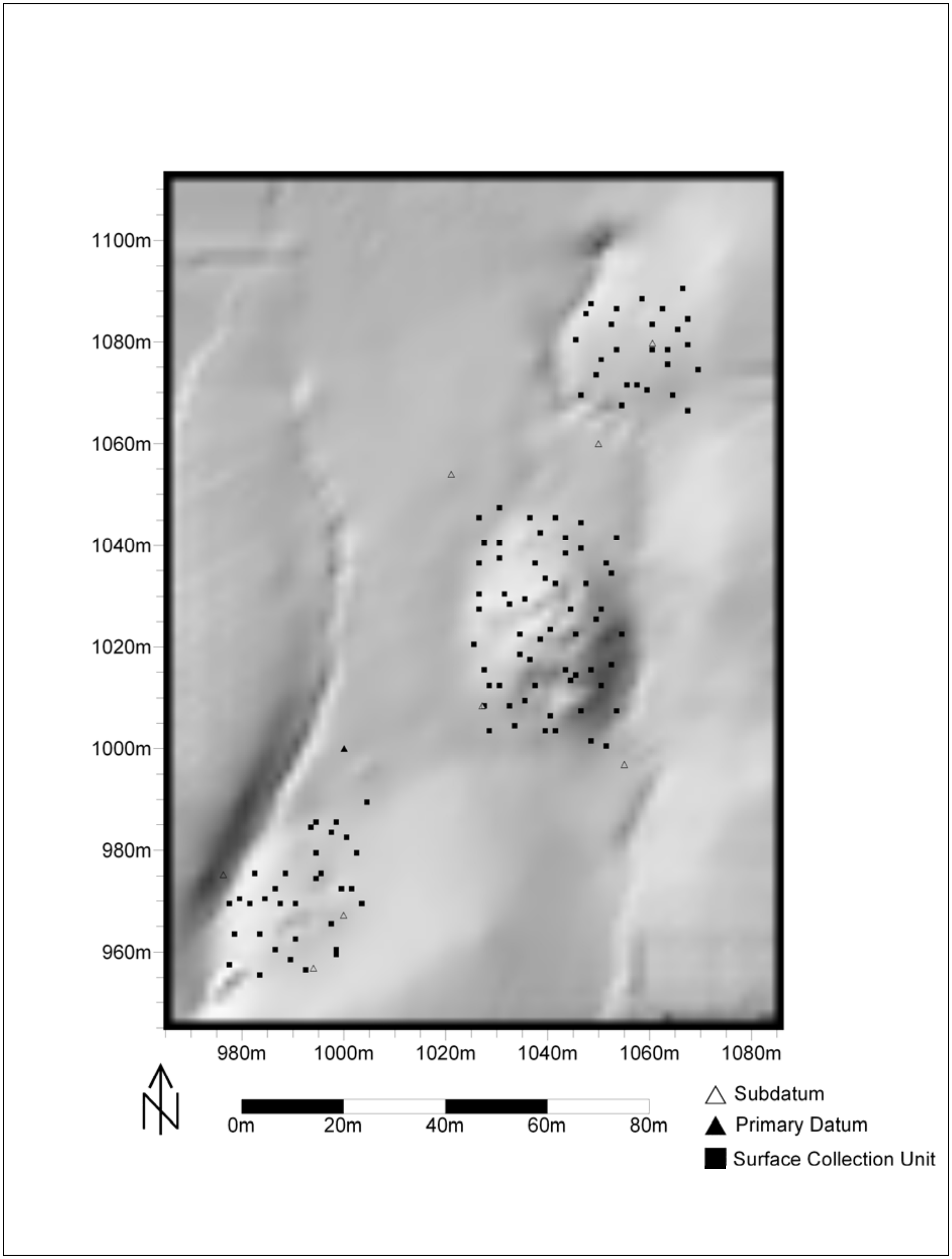
<u>Surface Collection</u>

Between July 16, 2007 and August 2, 2007, undergraduate students enrolled in Anthropology N133: "Field Methods in California Archaeology" (UC Berkeley) participated in multi-phased field research at China Camp State Park. As part of the field school, students assisted with surface collection, geophysical survey, augering, and excavation of a single one-by-one meter test unit to determine the spatial distribution and depth of each shell mound and to locate possible activity areas based on surface and near-surface artifact densities.

A four percent stratified random unaligned surface collection was conducted to evaluate the spatial distribution of artifact densities across each site as a means to locate potential areas of protracted human activity. This was done by first staking out a five-by-five meter grid across the surfaces of MRN-114, MRN-115, and MRN-328 using an optical transit and tape measures, and then randomly selecting a single one-by-one meter surface collection unit within each five-by-five meter block. In this fashion, 26 surface collection units were sampled at MRN-114, 58 surface collection units were sampled at MRN-115, and 33 surface collection units were sampled at MRN-328. In total, 117 one-by-one meter surface collections units were sampled (Figure 4.3).

Implementing field research in the summer, much of the grass covering all three sites was brown and first removed from each unit—along with any duff—before surface collection began. Collecting from MRN-115 posed a special challenge due to the chain-link fence cover the site. Instead of clipping through the fencing to access the site surface, it was instead used as a barrier to prevent collection of artifacts from depths beyond a few centimeters. This seemed to work for the most part although problems were encountered in some areas where patches of fencing

Figure 4.3. Surface collection units at MRN-114, MRN-115, and MRN-328.



overlapped and prevented thorough collection. During the surface collection, fire-cracked rock (FCR) was weighed, counted, and returned to the collection unit, and to control for the amount of shell collected, only diagnostic shell parts were collected and fragments no smaller than a pinky finger nail.

In addition to FCR, surface artifacts include ground stone, chert and obsidian flakes, clamshell disc beads, and historic artifacts such as glass, metal, and a collection of bullet cartridge casings. Faunal remains collected from the surface collection units include mussel (*Mytilus* spp.), oyster (*Ostrea lurida*), clam (mostly *Macoma nasuta*), cockle (Family Cardiidae), barnacle (*Semibalanus balanoides*), crab (*Cancer* spp. or *Hemegrapsus oregonensis*), *Callianax biplicata* (formerly *Olivella biplicata*), abalone (*Haliotis rufescens*), bat ray (*Mylobatus californicus*), as well as fish, mammal, and bird remains. Due to the possibility of contamination from modern animal remains, fauna collected during the surface collection were not analyzed beyond these approximate identifications.

Table 4.3. Artifact counts and densities for MRN-114, MRN-115, and MRN-328 surface collection units.

		MRN-114			MRN-115			MRN-328	
Artifact Category	Count (n)	Mean (per m2)	# Empty Units (n=26)	Count (n)	Mean (per m2)	# Empty Units (n=58)	Count (n)	Mean (per m2)	# Empty Units (n=33)
Faunal	11	0.42	21	10	0.17	49	15	0.45	22
Shellfish	376	14.46	3	1398	24.10	3	827	25.06	3
FCR	156	6.00	7	918	15.83	2	373	11.30	4
Flake Stone (Obsidian)	2	0.08	24	1	0.02	57	1	0.03	32
Flake Stone (Chert)	14	0.54	18	30	0.52	40	22	0.67	21
Historic Artifact (Metal, Glass. Ceramic)	26	1.00	16	12	0.21	52	52	1.58	17

In the laboratory, materials were sorted into six broad categories—faunal remains (mammal, bird, or fish), shellfish (mussel, clam, or oyster), FCR, obsidian flake stone, chert flake stone, and historic artifacts (glass, metal, or ceramic)—totaled, and used in a spatial mapping program (*Surfer*, Version 8) to create isopleth maps of extrapolated artifact densities. Table 4.3 presents the counts, mean artifact density per square meter, and number of empty collection units for faunal remains, shellfish, FCR, flake stone (obsidian), flake stone (chert), and historic artifacts for the 117 one-by-one meter surface collection units. Mean artifact densities per square meter, the relatively large number of empty collection units, and the isopleth maps indicate variable distributions of artifact types across all three sites.

Surface densities of faunal remains are similar at MRN-114 and MRN-328, but much lower at MRN-115. At all three *shell* mounds, surface densities of shellfish (mussel, clam, or oyster umbos and fragments larger than a pinky finger nail) are surprisingly low—with the upper

10 centimeters of each site composed primarily of a loose mixture of organic soil, ash, and highly pulverized shell. Surface density data also indicate a low occurrence of historic artifacts at MRN-115, especially compared to MRN-328 where bullet cartridge casings, ferrous metal artifacts (e.g., tin cans), and bottle glass litter the lower half of the site. The chain-link fencing lying across MRN-115 and the peripheral locations of MRN-114 and MRN-328 may explain the higher surface densities of historic artifacts at MRN-114 and MRN-328. MRN-114 is found closer to the park's major thoroughfare, San Pedro Road, whereas MRN-328 is located next to a historic site and cattle cistern (MRN-531/H); an area of ranching activity in the past, and to this day a hangout and shooting gallery for some illicit park-goers.

Concerning lithic artifacts collected from the surfaces of MRN-114, MRN-115, and MRN-328 the quantity of FCR is high compared to other shell bearing sites in the north San Francisco Bay area (Luby et al. 2006:207), although expected densities of flake stone and FCR are relatively consistent at all three sites and likely consonant with lithic assemblages from other North Bay shell mounds (Luby et al. 2006:207-208). Another interesting pattern, densities of flake chert artifacts are found consistently at the margins of each site and may be indicative of a spatial patterning associated with activity areas at the base of each mound site. This pattern is especially noticeable at MRN-115 where high densities of flake chert artifacts and FCR appear to ring the base of the mound, whereas the only obsidian artifact—a finished obsidian biface—was collected in a unit (1038N, 1043E) upslope, closer to the house depressions. On the other hand, mound subsidence and the settling of heavier (lithic) artifacts cannot be ruled out, as seems to be the case for FCR densities located down slope at MRN-114 and MRN-328.

In sum, surface artifact densities provided a useful entry point to locate potential areas of additional archaeological study. These data are not taken as a proxy for vertical distribution of artifact densities because each shell mound represents a palimpsest of prolonged cultural activity characterized by overlapping, compressed, or undercut artifact distributions potentially created by different groups of people doing different activities for different lengths of time. Geophysical survey and controlled subsurface testing were implemented to ground truth predicted activity areas and collect data related to the long-term occupation of the study area by hunter-gatherers.

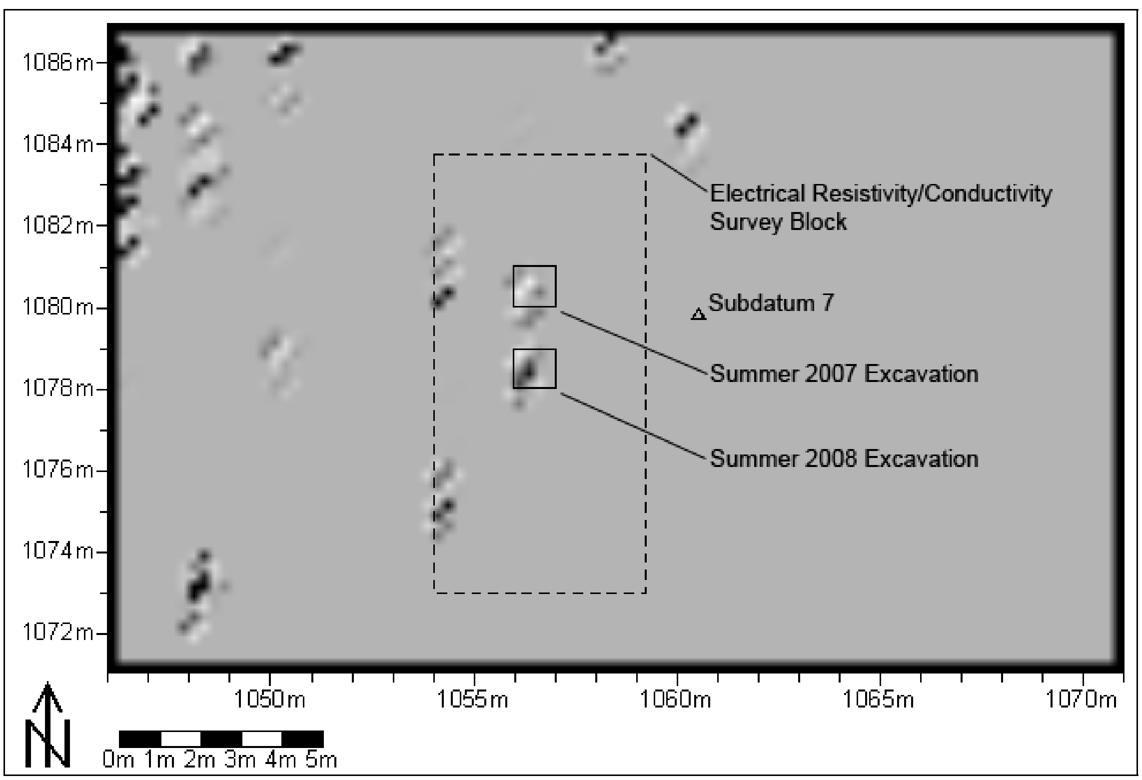
Geophysical Survey

Magnetometry The next component of my multi-phased, minimally intrusive archaeological field investigations at China Camp State Park involved geophysical prospection. Remote sensing techniques involving subsurface magnetic detection have been used successfully in many archaeological contexts (Bruseth et al. 2007; Garrison et al. 1985; Kvamme 2003; Linford and Canti 2001; Martin et al. 1991; Nishimura 2001; Rapp and Hill 1998), including many California archaeological contexts (Arnold et al. 1997; Lightfoot et al. 2001; Panich 2009; Silliman et al. 2000; Tschan 1997). Following these studies, a combination of passive and active (or, induced) geophysical survey methods were selected to identify surface and near-surface archaeological features for future testing, and to potentially avoid human burials during future excavation.

Active geophysical techniques—such as electrical resistivity and conductivity surveys—transmit electrical pulses into the ground and record electrical signals as they reflect off of subsurface anomalies. The most common passive method employs a magnetometer to identify areas of magnetic susceptibility and other anomalous features such as burials, buried architectural features, and hearths located between the site surface and down to about one meter depth. Anthropogenic activity, such as the displacement of the soil matrix during the excavation of a burial; the presence of iron-oxides in soils and FCR; and some archaeological materials, including ferrous metal and fired clay (e.g., ceramics) determine magnetic susceptibility. Archaeological geophysical survey was conducted only at MRN-114. The metal chain-link fence on top of MRN-115 (stapled to the site with iron rebar) would have distorted the magnetometer readings, and at MRN-328 a fallen Bay tree covers most of the site and would be difficult to negotiate while surveying transects and operating the geophysical gear.

A Geometrics 858 "MagMapper" cesium gradiometer/magnetometer was used to survey a 400 square meter area of MRN-114 during the summer of 2007. Building on surface artifact density data collected during the previous phase of field work, the magnetometer survey block included a range of variation in artifact counts at the center of the site. From 1071N, 1046E, the southwest corner of the survey block, wooden stakes were placed in a five-by-five meter grid across the site. Following survey methods described by Silliman et al. (2000:93), nylon ropes marked in one meter intervals with flagging tape were stretched across the create the two east and west baselines of the survey block. Additional ropes—also marked with flagging tape at one meter intervals—were then stretched across the survey area by two crew members every one meter to create north and south transects for the magnetometer operator to follow. In this fashion, the operator was able to easily position the magnetometer sensors over the flagged one meter intervals and take a reading while maintaining a comfortable gait along the transect.

Figure 4.4. Shaded-relief of MRN-114 showing areas of high magnetic susceptibility.



Rob Cuthrell (Ph.D. candidate, University of California, Berkeley) helped process and display the magnetometry data using *Surfer*, Version 8. Using a local polynomial spatial algorithm, a shaded-relief map reveals several subsurface magnetic anomalies, including a large cluster of anomalous features located at the northwest corner of the survey block (Figure 4.4). This tight clustering of magnetic anomalies also appears to correlate with surface densities of FCR. Upon further inspection however, I believe the magnetometer data—and the FCR surface density isopleth map—reflect clusters of naturally occurring rocks with a high iron content found in the creek bed at the base of MRN-114.

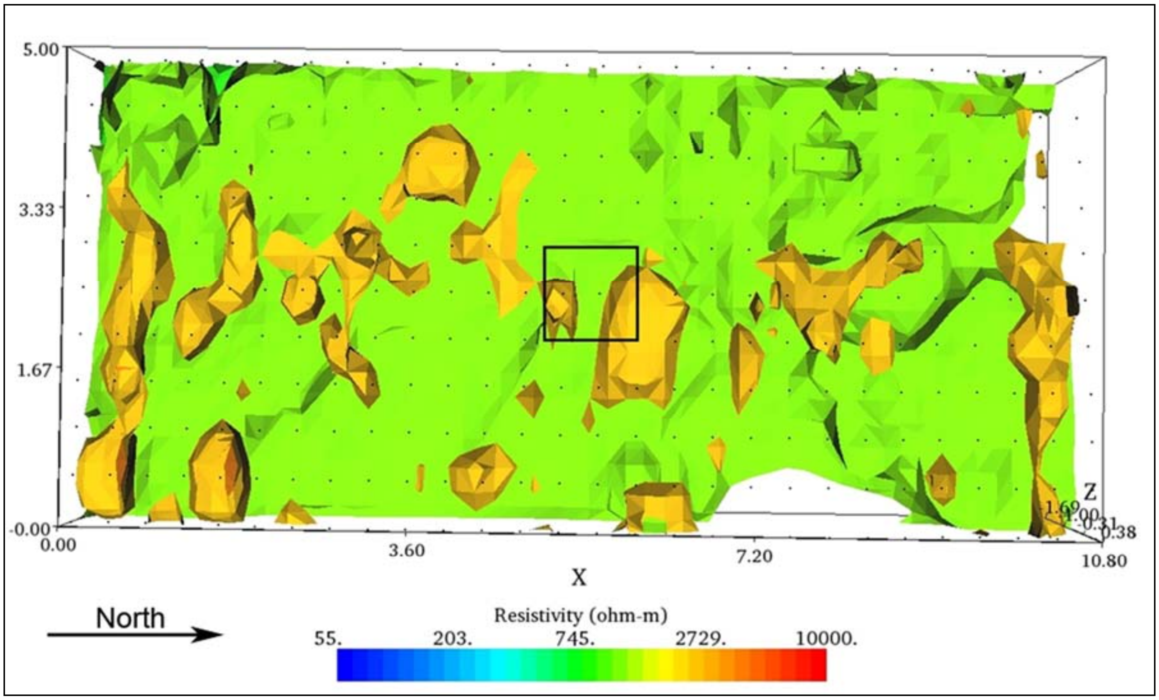
Another array of at least seven anomalies is clustered at the center of the survey block and oriented diagonally from west to east (see Figure 4.4). This area of MRN-114 also produced relatively low surface densities of FCR compared to the northwest corner of the magnetometer survey block. Taken together, low surface densities of FCR and the orientation of magnetic anomalies—almost linear in form—were believed to be non-random and more cultural in layout. Subsequently, as part of the summer 2007 field school, one anomaly was tested to ground truth the geophysical data. Described in more detail below, the single one-by-one meter test unit (1080N, 1056E) was excavated to a depth of 30 centimeter. Between approximately 10 to 20 centimeters, excavation produced multiple fragments of iron-rich FCR and what appears to be a burned earth feature represented by compacted breccia with pulverized shell, charcoal, and highly magnetic ash (Linford and Canti 2001:223). A single 427 gram chunk of fired earth at 30 centimeters was collected in its entirety and is similar in texture and color to slag.

Electrical Resistivity/Conductivity Electrical resistivity/conductivity is often used in tandem with archaeological magnetometry, which is well-suited for broad surveys such as that described above. An Advanced Geophysics Inc. "Mini Sting" (Earth Resistivity/Induced Polarization Meter) was used during the summer of 2008 to survey a smaller 54 square meter area in the center of MRN-114 that included the linear cluster of anomalies identified during the previous magnetometer survey. With assistance from Rob Cuthrell (Ph.D. candidate, University of California, Berkeley), who helped with collecting and post-processing soil resistivity data, I was able to pinpoint a single subsurface anomalous feature for controlled excavation and subsequently collect samples for radiocarbon analysis.

Electrical resistivity/conductivity is an active geophysical method that allows for controlled study of a select portion of an archaeological site. The method involves transmitting electrical signals through the ground and determining the rate of their return (a measure of the electrical current as it flows through resistive or conductive soils) as a proxy for identifying depths to subsurface archaeological deposits. Accordingly, electrical currents travel slower through porous—resistive—earth and some geological deposits, and quicker through moisture-laden—conductive—soils such as those with dense clay inclusions. Similar in principle to cultural disruptions of a site's magnetic field, soil resistivity/conductivity is sensitive to human alterations to natural stratigraphy such as excavation for burials or hearths because these processes "cause a distinguishable disruption of the geomorphological distribution in a site by exchanging materials from normally discrete soil layers and importing or exporting them into upper or lower levels" (Tschan 1997:108).

During the survey, researchers are able to control the depth of the electrical signal depending on the placement of electrodes. At MRN-114, a dipole-dipole survey—in which only four electrodes transmit and receive electrical signals at any given time—was selected because of the site's relatively shallow depth (approximately one to two meters), and electrodes were spaced every 40 centimeter to produce a fine-grained evaluation of subsurface deposits. The survey block measured 10.8 meters (north to south) by five meters (east to west) and was composed of 11 transects spaced every half-meter. To collect geophysical data, 28 electrodes were hammered into the ground at 40 centimeter intervals along the survey transect; moistened to assure contact resistance; and connected via electrical cables to the Earth Resistivity/Induced Polarization Meter. The meter is in turn connected to a power source: a 12 volt deep-cycle marine battery. Once connected, the operator begins taking measurements, with a total of 204 readings per transect. Compared to the magnetometer, this form of electrical resistivity/conductivity survey is time-intensive—taking approximately 45 minutes to one hour to place electrodes, produce contact resistance, and complete a single transect—but the data are invaluable for locating subsurface features within archaeologically complex midden deposits, as I describe below.

Figure 4.5. Three-dimensional map of subsurface resistive and conductive features at MRN-114 showing the location of the summer 2008 excavation unit.



Soil resistivity data from only one transect are stored onboard the Earth Resistivity/Induced Polarization Meter at a time, and need to be downloaded following the completion of each survey transect. In doing so, we gained real-time feedback on the geophysical survey and immediately several resistive and conductive anomalies were detected with the survey block (Figure 4.5). For example, in the southwest corner of the survey area, a large conductive anomaly was detected. Located slightly down slope on MRN-114 near a creek bed, I believe these data reflect an area of clayey and water saturated soils from surface runoff. In support of this interpretation, deposits of greasy, humic soils (10YR 3/2) mixed with brittle, decomposed shell fragments were recorded in auger units located just five meters west of this area. Also plausible, a large buckeye tree—with large, water-laden roots—is located approximately two meters southeast of the survey block. These roots prevented excavation in one auger unit (1074N, 1064E) beyond 20 centimeters, and were also present in excavation unit 1078N, 1056E.

The soil resistivity survey also identified clear interfaces between different soils within the site—such as the interface between cultural deposits of the shell mound and underlying natural deposits at approximately one and one-half meters depth—and multiple subsurface resistive anomalies. Using the three-dimensional model as a guide, an excavation unit (1078N, 1056E) was placed over a cluster of resistive and conductive anomalies—two meters due south of the magnetic anomaly excavated at MRN-114 during the previous summer—to ground truth the geophysical data and to collect organic samples for radiocarbon dating. Before excavation began, the geophysical data were carefully examined to estimate depths to specific subsurface features: the resistive anomaly estimated to be located in the north section of the unit at 40 to 50 centimeters and at one meter for the conductive anomaly located in the south end of the unit.

Subsequent excavation of 1078N, 1056E uncovered a dense layer of compacted shell, ash, FCR, and lithic tools similar to deposits encountered in unit 1080N, 1056E. However, further excavation yielded a stone-lined hearth feature at a depth of approximately 20 to 45 centimeters along the north wall of the unit. This *resistive* feature ('Feature 1") was bagged for flotation and two samples from the basin of the hearth were submitted to Beta Analytic, Inc. for AMS radiocarbon dating. A second *conductive* feature ("Feature 2") located at a depth of 20 to 35 centimeters in the southwest corner of the same excavation unit was composed almost entirely of ash. Described in greater detail below, excavations at MRN-114 confirmed the electrical resistivity/conductivity data and its value for producing accurate three-dimensional models of subsurface archaeological deposits within shell mound sites.

Subsurface Testing & Excavation

Auger Test Units Consecutive auger test units were excavated at MRN-114 and MRN-328 during the summer of 2007, fall of 2007, and summer 2008 (Figure 4.6). Auguring was not conducted at MRN-115: the chain-link fence prevented geophysical survey and I decided not to conduct excavations without first identifying possible subsurface features to avoid and/or target for further study. In keeping with a multi-scalar, minimally invasive field strategy, my methodological approach for subsurface archaeological testing fundamentally attempted to minimize destruction to archaeological deposits. Augering is a less "excavation-centric" method that brings the practice of archaeology "in-line with an ethic of conservation stewardship" (Daehnke 2007:57-58), and it is a cost-effective and time-sensitive technique widely acknowledged for maximizing data related to spatial patterning across sites and through time (Cannon 2000a, 2000b; Stein 1986, 1992). While my research methods aim to be minimally destructive, diachronic and synchronic analysis of archaeological deposits are also central components to my research. To this end, auger test units were sampled at MRN-114 and MRN-328 to determine the vertical and horizontal extent of each site and to track changes in material assemblages through time as a means to understand patterns of prehistoric and historic site use.

Although defending the viability of shovel-test surveys in particular, Lightfoot's (1989:413) contention that a well-designed systematic testing regiment can produce meaningful spatial and diachronic data is germane to my research. Accordingly, systematic shovel-testing can "generate estimates on the probability of discovering diverse-sized manifestations characterized by variable artifact densities and internal artifact distributions" (Lightfoot 1989:413). In a similar fashion, I believe a systematic auger sample can produce comparable results for deeply stratified shell mounds, as Cannon (2000b) demonstrates through his analysis of faunal densities collected from augers to assess regional and temporal variability in the intensity of salmon fishing through time and between sites. Furthermore, excavation can be expensive, time-consuming for projects with fewer personnel, and can "restrict the areal extent

Figure 4.6. Augering at MRN-114 (top) and at MRN-328 (bottom), China Camp State Park.

of testing on midden sites, which would likely produce an unrepresentative picture of subsurface deposits" (Cannon 2000a:69).

The presence of larger artifactual inclusions (e.g., FCR) that would otherwise hinder core sampling at the study sites; the relative ease, efficiency, and cost-effectiveness of augering by a small team of two to three archaeologists; and the likelihood that any one area of the three shell mounds would have been used differently, at different times, by different people guided my decision to select a sampling strategy that integrates systematic auger testing. Furthermore, auger data collected systematically and carefully across MRN-114 and MRN-328 form a solid foundation for intrasite and intersite stratigraphic comparisons and a contextualizing arena for data gathered from subsequent targeted excavations.

All auger units were excavated with four-inch (2471 square centimeters) regular and sand bucket augers attached to extension rods marked with fluorescent tape at 20 centimeter increments. Using an eight percent stratified random unaligned sampling strategy (i.e., two auger units within each five-by-five meter block; this sampling strategy was replaced with a four percent sample in the fall of 2007 due to time constraints), four auger units were excavated in the northeast corner of MRN-114 during the 2007 field school to determine site depth and the extent of the site and to finalize a collection strategy for future auger testing. I recognize that each auger unit is smaller than a typical one-by-one meter test unit, however I assume the auger units are representative of the one-by-one meter unit in which they are placed. Pre-cultural soils were encountered at approximately 130 centimeters near the north and center of the site and at 40 centimeters at the northeast edge of MRN-114.

Each of these four units was drilled in 20 centimeter arbitrary levels and screened through nested 1.3 centimeters (1/2 inch), six millimeter (1/4 inch), three millimeter (1/8 inch), and 1.5 millimeter (1/16 inch) screen mesh. FCR was weighed and returned to the unit, while the collection of shell from screens followed a similar strategy as the surface collection. A modified Auger Record Form was created for the survey project following Daehnke (2007:77). This form includes categories intended for quickly quantifying the presence and absence of artifacts, flake stone, obsidian, chert, bone, and charcoal, as well as fields for FCR counts and weights, shell types observed, Munsell soil color, and general comments.

Archaeological testing at MRN-114 continued in the fall of 2007. A four percent stratified random unaligned sampling strategy, or 29 auger units, were sampled. Using the five-by-five meter grid created for the surface collection, the southwest corner of one one-by-one meter unit was selected at random for the auger unit within each five-by-five meter block. Of the 29 auger units, soil samples from 20 percent, or six auger units, were collected in their entirety for flotation. For these units, soil from each 20 centimeter level (approximately two to five liters per 20 centimeter level) is stored separately in heavy-duty sandbags. The remaining auger units were excavated in 20 centimeter arbitrary levels, soils were screened through nested six millimeter (1/4 inch) and three millimeter (1/8 inch) screen mesh, and artifacts were sorted and bagged by each level fraction. In some auger units, thick tree roots prevented excavation below a certain depth. In these instances, the auger unit was terminated. Artifacts collected from these auger units include identifiable shellfish fragments, charcoal, faunal remains, FCR, flake stone, and historic artifacts such as glass, iron cut nails, salt-glazed stoneware (probably associated with the Chinese shrimp fishing communities), and bullet cartridge casings.

Twenty-six auger units were sampled from MRN-328 using a four percent stratified random unaligned sampling strategy, and 20 percent, or five auger units, were collected in their entirety for flotation. Similar to MRN-114 flotation samples, soil from each 20 centimeter level

Figure 4.7. Distribution of auger test units at MRN-114 and MRN-328.

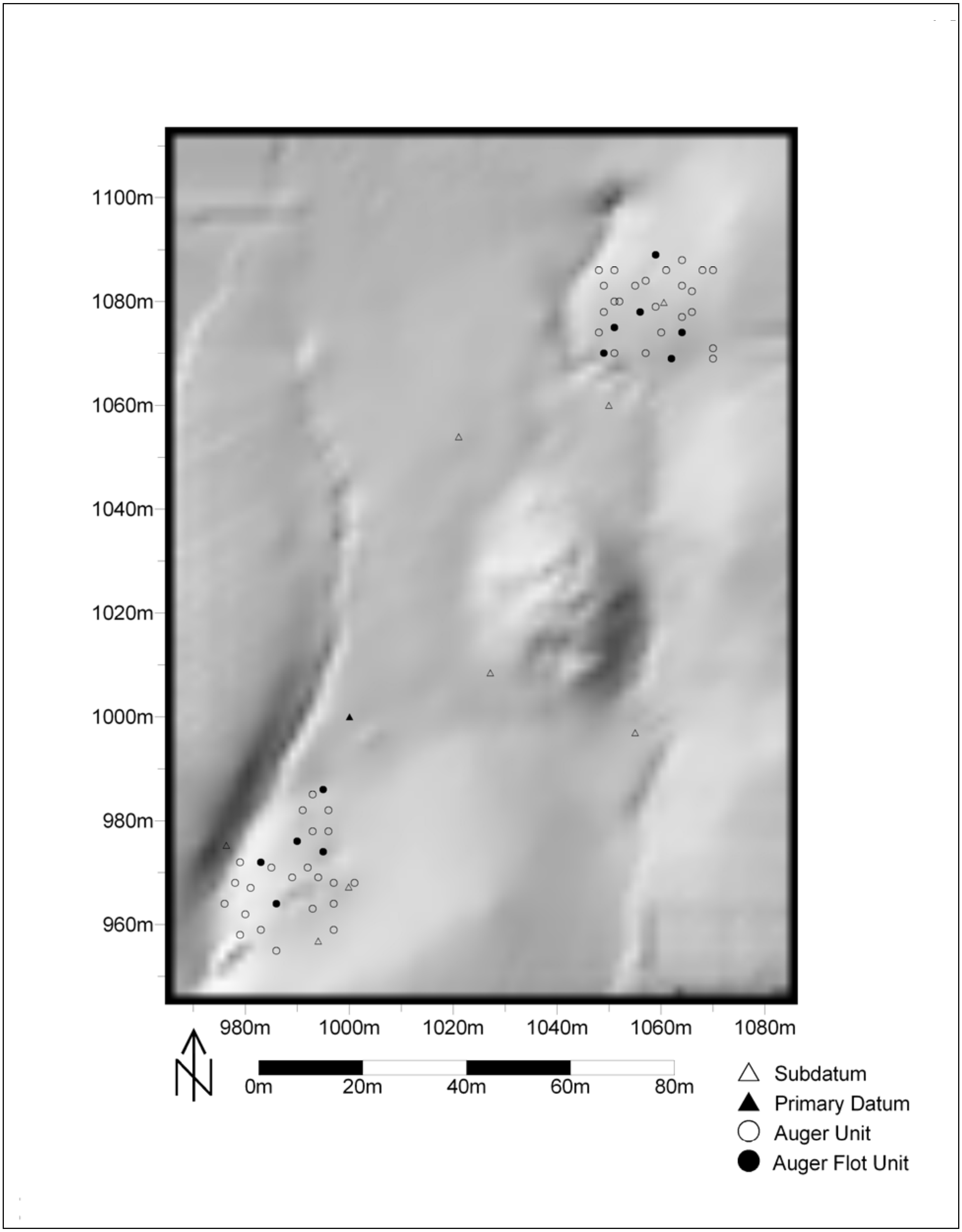


Figure 4.8. Isopach model for MRN-114 showing approximate thickness of midden deposits.

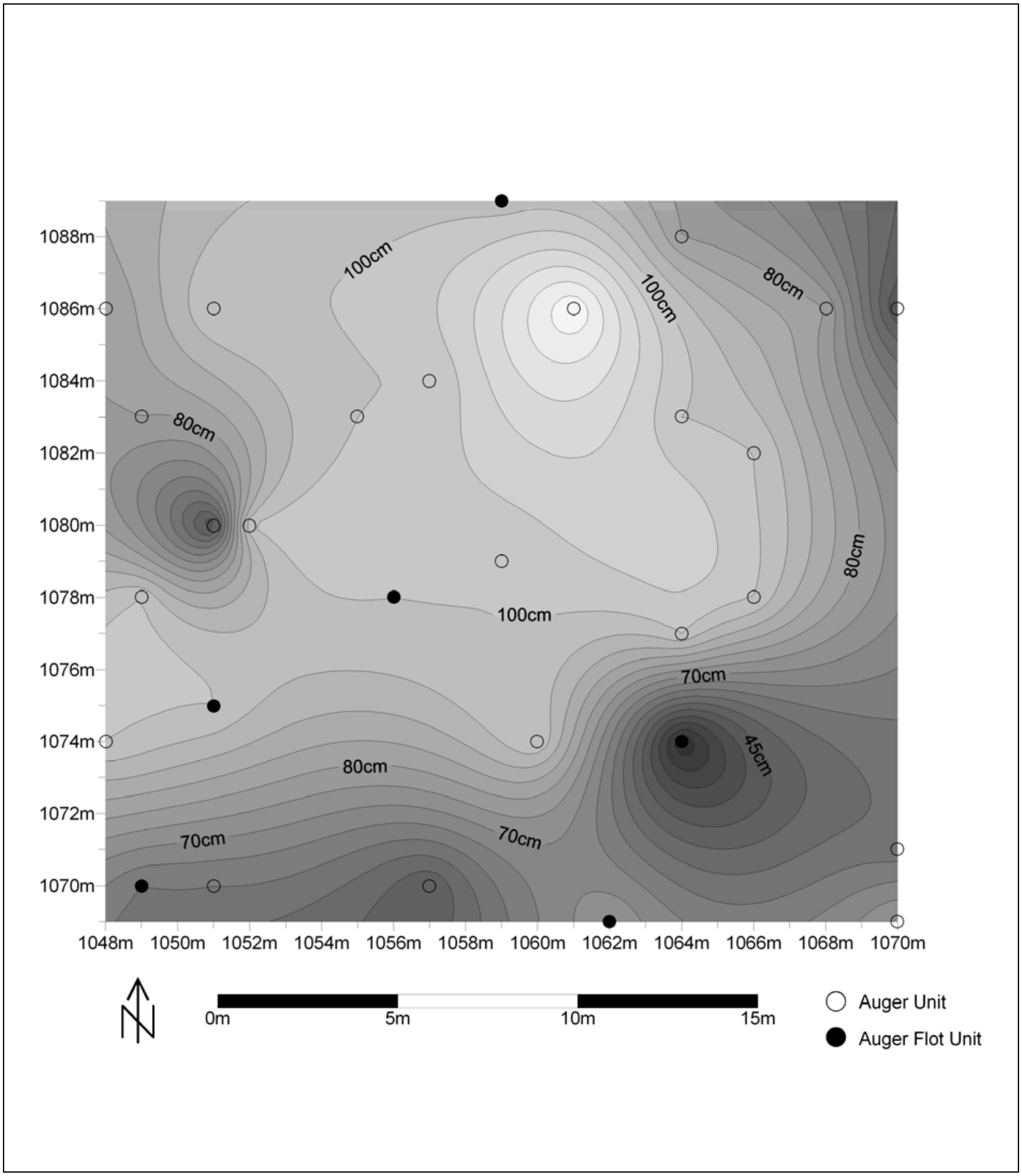
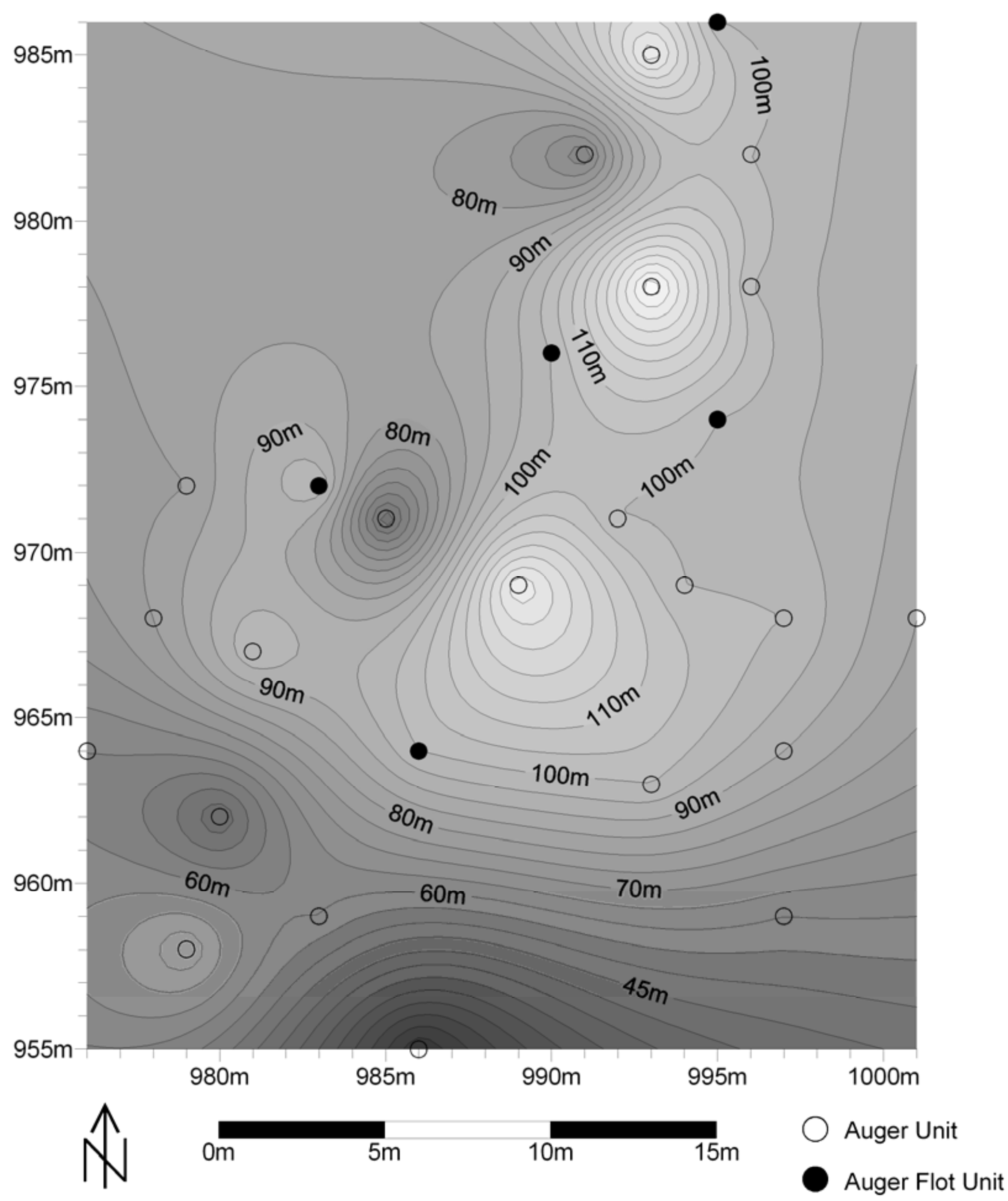


Figure 4.9. Isopach model for MRN-328 showing approximate thickness of midden deposits.



was bagged separately to prevent contamination. Of the remaining auger units, soils were excavated and screened through nested six millimeter (1/4 inch) and three millimeter (1/8 inch) screen mesh following the same strategy used at MRN-114. Artifacts include identifiable shell fragments, faunal remains, ground stone, flake stone, and FCR. Of note, a single serrated obsidian projectile point and a steatite pipe fragment were also collected and are discussed in the following two chapters. In total, 55 auger units were sampled at MRN-114 and MRN-328 (Figure 4.7). Auger unit coordinates and maximum depths obtained in each unit are summarized in Table 4.4.

Isopach maps were produced to calculate the areal extent and thickness variation of archaeological midden deposits at MRN-114 and MRN-328 (Figures 4.8 & 4.9). Although tree roots and dense geologic deposits sometimes forced auger units to be terminated prematurely, mean depths at MRN-114 and MRN-328 offer important information on the thickness of archaeological deposits at both sites, areas of extensive activity, and paleotopography—"the landscape as it existed prior to its substantial alteration by human occupation" (Whittaker and Stein 1992:32). Mean auger unit depths for MRN-114 and MRN-328 are 83.45 centimeters and 87.78 centimeters respectively, and give a general sense for site depth without variation across the site. Using the isopach map for MRN-114, an area of thick midden deposits is observed in the north and center of the site. A swath of thick midden also appears to follow the same linear formation of anomalies detected using the magnetometer and may give clues to determine areas of intense and persistent habitation. For MRN-328, the isopach map reveals a similar linear band of thick midden deposit running through the center of the site from north to south. This phenomenon most likely mirrors the thick berm of shell midden located up slope where three shallow, circular depressions were identified while mapping MRN-328. Without testing the depressions archaeologically, their possible function as house pits offers comparative potential for examining patterns of habitation and trash disposal at MRN-114 and MRN-328.

Targeted Excavations Excavations were conducted at MRN-114 in 2007 and 2008. In total, two units were excavated; one in the summer of 2007 and the second in the summer of 2008. Both excavation units were located based on geophysical survey data for the purpose of groundtruthing subsurface magnetic and electrically resistive anomalies and to collect organic samples for radiometric analysis. Each excavation unit measured one-by-one meter, and was excavated in 10 centimeter arbitrary levels except when stratigraphic layers were observable. All sediments were screened through nested six millimeter (1/4 inch) and three millimeter (1 /8 inch) screen mesh and were generally excavated using pointing and margin trowels.

Following the magnetometer survey of MRN-114 in 2007, unit 1080N, 1056E was selected to test one magnetic anomaly and it was excavated to a depth of 30 centimeters, not to pre-cultural deposits. A friable mixture of pulverized shellfish remains, humic soil, artifacts comprised Stratum 1 (zero to 10 centimeters). Stratum 2 (10 to 20 centimeters) produced a compacted layer of pulverized shellfish, charcoal, and ash, and in Stratum 3 (20 to 30 centimeters) a dense pocket of compacted earth, shell breccias, ash, faunal remains, and other artifacts. Material remains recovered from all three strata include lithic artifacts such as obsidian and chert flake stone tools, lithic ground stone, and FCR. A single live 0.22 caliber Winchester bullet was excavated from Stratum 1, but not collected and the presence of a 0.22 caliber Omark/Cascade cartridge casing (ca. 1967-present) in Stratum 3 may reflect bioturbated soils. Ubiquitous mollusk remains include mussel shell, oyster shell, and clam shell, and smaller quantities of crab and barnacle were recorded throughout. A single 427 gram piece of fired earth

Table 4.4. Summary of excavated auger units at China Camp State Park.

Site	Unit	Catalog #	Depth (cm)	Site	Unit	Catalog #	Depth (cm)
MRN-114	1086N/1070E	7/31/07-2	40	MRN-328	985N/993E	7/9/08-1	140
MRN-114	1086N/1068E	7/31/07-3	80	MRN-328	986N/995E	7/9/08-2	100*
MRN-114	1088N/1064E	7/31/07-4	80	MRN-328	982N/996E	7/9/08-3	100
MRN-114	1086N/1061E	8/1/07-2	130	MRN-328	982N/991E	7/9/08-4	60
MRN-114	1089N/1059E	9/21/07-1	97*	MRN-328	978N/996E	7/9/08-5	100
MRN-114	1086N/1051E	9/21/07-2	100	MRN-328	971N/992E	7/11/08-1	100
MRN-114	1086N/1048E	9/21/07-3	80	MRN-328	974N/995E	7/11/08-2	100*
MRN-114	1083N/1049E	9/21/07-4	80	MRN-328	968N/997E	7/11/08-3	100
MRN-114	1083N/1055E	9/23/07-1	100	MRN-328	976N/990E	7/11/08-4	100*
MRN-114	1084N/1057E	9/23/07-2	100	MRN-328	968N/1001E	7/14/08-1	85
MRN-114	1083N/1064E	9/27/07-1	100	MRN-328	964N/997E	7/14/08-2	90
MRN-114	1082N/1066E	9/27/07-2	100	MRN-328	969N/994E	7/14/08-3	100
MRN-114	1078N/1066E	9/28/07-1	100	MRN-328	959N/997E	7/14/08-4	60
MRN-114	1077N/1064E	9/28/07-2	100	MRN-328	955N/986E	7/14/08-5	0
MRN-114	1079N/1059E	9/28/07-3	100	MRN-328	963N/993E	7/15/08-1	100
MRN-114	1080N/1051E	9/28/07-4	40	MRN-328	969N/989E	7/15/08-2	140
MRN-114	1078N/1049E	9/28/07-5	100	MRN-328	978N/983E	7/16/08-1	150
MRN-114	1074N/1048E	9/29/07-1	100	MRN-328	972N/979E	7/16/08-2	80
MRN-114	1075N/1051E	9/29/07-2	100*	MRN-328	971N/985E	7/16/08-3	45
MRN-114	1074N/1060E	9/29/07-3	100	MRN-328	967N/981E	7/16/08-4	100
MRN-114	1074N/1064E	9/29/07-4	20*	MRN-328	972N/983E	7/16/08-5	100*
MRN-114	1071N/1070E	9/29/07-5	57	MRN-328	968N/978E	7/17/08-1	80
MRN-114	1078N/1056E	11/2/07-1	100*	MRN-328	964N/976E	7/17/08-2	60
MRN-114	1070N/1049E	11/2/07-2	60*	MRN-328	962N/980E	7/17/08-3	40
MRN-114	1069N/1062E	11/2/07-3	75*	MRN-328	958N/979E	7/17/08-4	80
MRN-114	1070N/1051E	11/2/07-4	60	MRN-328	959N/983E	7/17/08-5	60
MRN-114	1070N/1057E	11/2/07-5	45	MRN-328	964N/986E	7/17/08-6	100*
MRN-114	1069N/1070E	11/2/07-6	76				
MRN-114	1080N/1052E	11/2/07-7	100				

*Indicates auger unit collected for flotation analysis was also collected from Stratum 3 and is similar in texture and color to slag. Archaeological magnetometry data coupled with the total assemblage of fired earth; compacted deposits; lenses of shell, charcoal, and ash; faunal remains; and lithic artifacts excavated from this unit suggest an activity area where processing tasks took place. It is possible that shellfish, fish, and other animals collected from nearby aquatic and terrestrial habitats would have been processed and cooked at MRN-114 through time, and therefore makes the site a prime candidate for further study concerning Late Period and colonial occupations. It is not clear from the excavation if the site was also used a place residence for the Coast Miwok. The compact shell layer within Stratum 2 and fired earth found below this level lend some support to this idea, but stratigraphic comparisons between sites may also lend support to differential site use within the cluster of shell mounds.

The second phase of excavation MRN-114 took place in 2008 following a soil resistivity/conductivity survey. The survey located several resistive and conductive subsurface anomalies, one of which—a highly resistive anomaly—was selected for targeted excavation. Located approximately two meters due south of the previous excavation unit, unit 1078N, 1056E was excavated in 10 centimeter arbitrary levels to a depth of 60 centimeters, with the exception of Stratum 1 which was excavated to 20 centimeters. All soils were screened through nested six millimeter (1/4 inch) and three millimeter (1 /8 inch) screen mesh. Unlike the excavated auger units, screened three millimeter subsamples from each stratum were bagged separately for future laboratory subsampling, and the six millimeter screened sample was sorted in a similar fashion as the auger test units. Two features identified within the unit—Feature 1 (Stratum 4a) and Feature 2 (Stratum 5a)—were excavated as distinct stratigraphic deposits and collected separately for flotation at the Archaeological Research Facility, University of California, Berkeley.

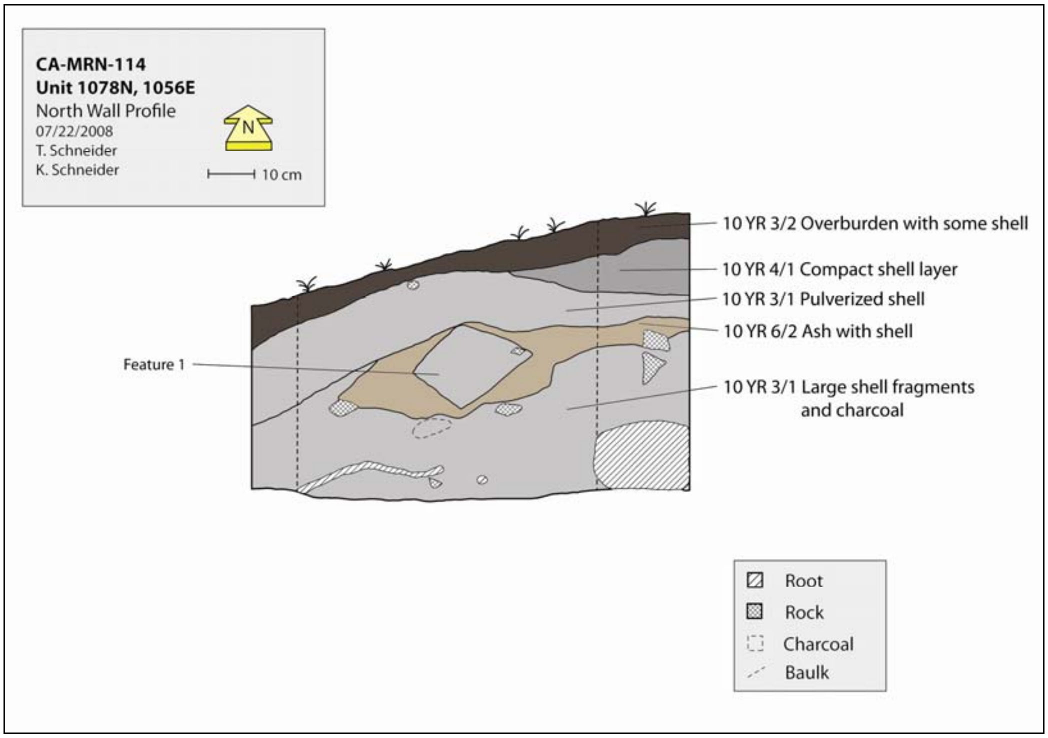
Based on the stratigraphic composition of unit 1080N, 1056E excavated the previous summer, Statum 1 was excavated to 20 centimeters to efficiently remove loose overburden of crushed shell, earth, and natural vegetation. Artifacts from Stratum 1 include chert artifacts, animal bone, an iron cut nail, and a small fragment of salt-glazed earthenware stylistically similar to those collected from the surface of MRN-114. Artifacts from Stratum 2 (20 to 30 centimeters) include chert flake tools, a flake stone chopping tool, groundstone, animal bone, and an iron cut nail. Stratum 2 also contained the compacted layer of shell found in the other excavation unit, in addition to a deposit of ash, larger fragments of mussel shell, and charcoal found in the northeast corner of the unit. This ash deposit extended into the northwest corner of Stratum 3 (30 to 40 centimeters), and based on the soil resistivity data this deposit was subsequently excavated as a distinct stratigraphic deposit. Artifacts associated with Stratum 3 are similar to those recovered in Strata 1 and 2, with the exception of an obsidian bifacial tool.

Stratum 4 (40 to 50 centimeters) contained numerous plant roots, with one root running the entire length of the east profile. Flake stone, animal bone, clay daub, and especially large fragments of mussel shell were recovered throughout the stratum. In addition to lithic and bone artifacts, Stratum 5 (50 to 60 centimeters) contained almost exclusively mussel shell remains, but also smaller quantities of clam, oyster, barnacle, whelk, crab, and bat ray. Large (two to five centimeter) fragments of mussel shell and sometimes whole mussel shells were observed in the stratum's northeast corner and this pocket of shell was possibly protected from the crushing weight of the upper deposits by the tree root found directly above in Stratum 4.

Feature 1 (Stratum 4a) appears to be a stone-lined cooking feature, or hearth, and is believed to be the resistive feature identified during the soil resistivity/conductivity survey

Figure 4.10. Photograph of Feature 1, Unit 1078N/1056E, MRN-114.

Figure 4.11. Profile illustration of Feature 1, Unit 1078/1056E, MRN-114.



(Figure 4.10). In profile, Feature 1 is semicircular and extends from 20 to 45 centimeters below surface along the north wall of the unit. Clusters of large cobbles and FCR formed the basin of the feature, which appears to have been filled over time with large fragments of charcoal, ash, and shellfish remains (Figure 4.11). Feature 2 (Feature 5a) is located at a depth of 20 to 35 centimeters in the southwest corner of the unit. To the naked eye, Feature 2 appears to be composed almost exclusively of ash and is believed to represent the conductive anomaly identified during the soil resistivity/conductivity survey. It is unclear whether Feature 2 is a transposed primary context (e.g., ash dump from Feature 1), or use-related primary context (e.g., a separate processing area), but I believe these features represent the remains of Coast Miwok cooking areas. Associated artifacts—chert flake tools, groundstone artifacts, an obsidian bifacial tool, a flake stone chopper, and clay daub—suggest activities related to cleaning and cooking plant and animal remains. Similarly, the compacted shell layer observed in both excavation units is believed to be a living surface, or possible house floor where processing tasks unfolded on a daily basis.

Summary & Intrasite Stratigraphic Comparisons

While archaeological assemblages from MRN-114, MRN-115, and MRN-328 suggest areas of activity at each site, my research questions related to shell mound clustering and their use through time compel me to make intrasite stratigraphic comparisons and to identify patterns of change in artifact assemblages and densities through time. For these reasons, here I examine archaeological data collected from auger test units at MRN-114 and MRN-328 and the two excavation units to interpret diachronic and synchronic patterns of site use, though I am mindful of various past and present behavioral processes and subsequent archaeological analyses that may potentially refine and enrich the present study.

For example, surface collections of historic artifacts were on average higher at MRN-114 and MRN-328 than at MRN-115. I believe this to be a consequence of MRN-114's accessibility near the park's only paved road and the location of MRN-328 adjacent to an area of intense late twentieth century ranching activity and miscellaneous activities by present-day park visitors. To this end, landscape modifications such as possible looting at MRN-114; quarrying and the creation of the culvert at MRN-114; and possible disturbances to MRN-328 from the construction of a cistern and a small reservoir demand careful attention when distinguishing the activities of historic Indian groups from those of more recent "occupants" and the impact of more recent occupations on subsurface archaeological deposits.

Examining first the matrix at MRN-114 and MRN-328, soil color is typically described as dark loamy-sand composed of larger percentages of sand and silt than clay. Soil color varies slightly between the lowest and most recent deposits, and is typically dark gray (10YR 4/1), dark grayish brown (10YR 4/2), very dark gray (10YR 3/1), or very dark grayish brown (10YR 3/2). Nearing underlying pre-cultural deposits, some areas of both shell mounds, such as the southwest corner of MRN-114, are heavily saturated and composed of a mixture of shell dust, clay inclusions, and a black (10YR 2/1) humic soil. The absence of artifacts and shell indicate sterile soils, which are also announced by a clear change from midden soils to brown (10YR 5/3 or 10YR 4/3) duff-rich soil found off site and rocky dark yellowish brown (10 YR 4/4, 4/6, 3/4, and 3/6) deposits located below both shell mounds and presumably underneath MRN-115. Despite apparent similarities in the composition and archaeological assemblages at MRN-114 and MRN-328, a closer examination of auger data reveal nuances in the vertical and horizontal patterning of archaeological deposits at both sites.

Working in 20 centimeter increments within each auger unit from MRN-114 and MRN-328, raw counts of particular artifact classes and faunal data provide insight to patterns of site use and abandonment through time and across space. Spatially, counts of FCR, chert artifacts, and archaeological obsidian were compiled to produce artifact density maps for each 20 centimeter layer at MRN-114 and MRN-328. Much like the surface density maps described above, all three artifact types cluster at the margins of both shell mounds although at different locations around each site through time. For example, at MRN-328 higher quantities of FCR are found at the south end of the site between zero and 60 centimeters and at the north end of the site below 60 centimeters. At MRN-114, FCR is clustered at the north end of the site from approximately 40 to 100 centimeters and at the southwest end of the site above 40 centimeters. Changes in the relative density of particular artifacts through time provide a strong indication of differential site use and spatial arrangements related to the creation of activity areas by hunter-gatherers who periodically and persistently inhabited the same area over the long term.

Fluctuations in the quantity of particular lithic artifacts—FCR and flaked stone—from zero to 100 centimeters in depth may also give clues to the activities that transpired at the shell mounds over time. For both MRN-114 and MRN-328, average quantities of FCR follow a similar trajectory. Although the quantity of FCR from each stratum at MRN-328 is less than FCR counts at MRN-114, through time the sites mirror each other in terms of an apparent decrease in FCR above and below 40 to 60 centimeters in depth. Similarly, the quantity of obsidian artifacts is highest in the upper 20 centimeters of both shell mounds. Flake stone artifacts manufactured from chert also increase on average at MRN-114 in the upper 20 centimeters, but not at MRN-328.

Averages of mussel shell collected from auger units at MRN-114 and MRN-328 show a visible increase at 20 to 60 centimeters, a sharp decline above 20 centimeters, and are strikingly similar to averages of FCR through time. The apparent "peak" in mussel shell between 20 and 40 centimeters matches depositional sequences of shellfish remains in other Bay Area sites (Jones 1992:4), namely the transition from oyster (early) to mussel (middle) and then to clam (late). However, a steady increase of oyster shell in the upper deposits of MRN-114 and MRN-328 and a decline in clam shell contradict the well-documented pattern of prehistoric shellfish exploitation in the Bay Area. Several possible explanations—differential patterns of habitat change around the bay, the gradual settling of heavier clam shell, oyster shell fragility at lower depths—spring to mind.

Taken together, averages of shellfish remains, FCR, chert artifacts, and obsidian artifacts fluctuate through time and provide a baseline for asking questions about long-term changes in shell mound function and meaning. Decreasing amounts of FCR; an increase in obsidian artifacts in more recent deposits at MRN-114 and MRN-328; and an increase in chert artifacts above 20 centimeters at MRN-114 may indicate shorter stays and the formation of a mounded community where daily tasks—lithic tool production, processing shellfish, etc.—were site-specific. For example, the location of MRN-114 closest to an intertidal marsh habitat make it a suitable area to process shellfish, crustaceans, fish, and other plant and animal species through the use of earth ovens and cutting tools made from local chert. MRN-328—located further inland—may have functioned as a lithic workshop where obsidian points and other lithic tools were produced and utilized to hunt and process terrestrial game.

Addressing my fifth expectation presented at the start of this chapter, fluctuations in mean artifact densities through time are suggestive of periodic and continuous occupation at MRN-114 and MRN-328. These occupations are viewed spatially in the distribution of surface artifact densities; subsurface features at MRN-114 detected using a magnetometer and soil resistivity/conductivity instrument; through time using mean artifact densities from 55 auger units excavated at MRN-114 and MRN-328 in 20 centimeter increments; and at a landscape scale of analysis when considering cartographic representations of historical and archaeological landscapes on the Marin Peninsula. Unexpectedly however, colonial-era deposits and attendant material culture are not obvious at any of the three shell mounds despite historical and prehistoric artifact assemblages. Intrasite stratigraphic comparisons are quiet on the matter of whether the three shell mounds were inhabited contemporaneously and reoccupied by refugee Coast Miwok seeking physical and cultural alleviation during the colonial period. In the following two chapters, material analysis and archaeometry provide additional data to evaluate this question in more detail.

CHAPTER FIVE

ANALYSIS & INTERPRETATION OF ARCHAEOLOGICAL REMAINS FROM CA-MRN-114, CA-MRN-115, AND CA-MRN-328

This chapter describes analysis of archaeological materials collected from MRN-114, MRN-115, and MRN-328. Lithic artifacts, botanical remains, fauna, and artifacts of ceramic, metal, and glass are four primary material categories associated with MRN-114, MRN-115, and MRN-328. In this chapter, each category is described along with the laboratory methods utilized during analysis of the material assemblages from China Camp. The bulk of the analysis was conducted in the California Archaeology Laboratory at UC Berkeley. Chronometric analyses, including AMS radiocarbon dating and obsidian hydration, and X-ray fluorescence spectrometry enlisted external and interdepartmental collaboration and are presented in detail in the following chapter. Materials from the MRN-115 collection at the Phoebe A. Hearst Museum of Anthropology (UC Berkeley) are also examined, including the limitations and benefits of using archived museum collections.

Throughout this chapter, materials collected during surface collection, systematic augering, targeted excavations, and those collected by Clement Meighan at MRN-115 in 1949 are treated as a whole to be able to make general interpretations about differences and similarities in site use. With that, it is important to acknowledge differences in material assemblages at each shell mound which may be attributed to difference in the specific recovery methods used, such as the lack of screening during Meighan's excavations at MRN-115 or my excavation of auger units at MRN-114 and MRN-328. In general, materials collected will be treated as a whole, however in situations where recovery methods appear to impact artifact patterning or where these methods appear to indicate plausible differences in site use, these issues will be discussed.

Botanical Remains

<u>Analysis of Features 1 and 2 from MRN-114</u>

Botanical and faunal remains are important components to the study of colonialism, especially the adoption of introduced animals and plants into native and European diets *and* the persistence of indigenous foodways—the ways people produce, acquire process, consume, and think about food—during colonial settlement. As described in the previous chapter, a total of eleven "flotation" auger units were excavated at MRN-114 (n=6) and MRN-328 (n=5) in 20 centimeter levels. Each stratum was bagged individually for flotation to aid in the identification of stratigraphic patterning of representative species through time. However, due to time restrictions, only three auger units underwent flotation and none of the flotation units were screened and analyzed. Feature 1 and Feature 2—excavated in Unit 1078N/1056E at MRN-114—were collected as bulk samples and prioritized for flotation and analysis at UC Berkeley.

Following a modified SMAP flotation system (Pearsall 2000), soils from Feature 1 (two liters) and Feature 2 (7.2 liters) were poured through 350 µm and 250 µm meshes to create heavy and light fractions. The heavy fraction was then sieved through nested 6 millimeter (1/4 inch), 3 millimeter (1/8 inch), and 1.5 millimeter (1/16 inch) mesh screens. Contents from the six millimeter and three millimeter fractions were then combined into a single > 1/8 inch fraction and the 1.5 millimeter fraction was further screened using a riffle box to achieve a 12.5 percent subsample.

Table 5.1. Counts (NISP) of macrobotanical remains from Feature 1 and Feature 2, excavated in Unit1078N/1056E, MRN-114.

	Feature 1	**Feature 2**	***Total***
Arctostaphylos sp.	0	1	1
Calcined fragment	0	2	2
cf. Amaranthaceae	1	0	1
cf. Amaranthaceae/ Chenopodiacea	0	7	7
cf. Asteraceae	0	1	1
cf. Atriplex sp.	1	0	1
cf. Cardamine	1	0	1
cf. Chenopodium sp.	1	1	2
cf. Chenopodium spp.	0	28	28
cf. Cyperaceae-various	0	4	4
cf. Fabaceae	1	0	1
cf. Poaceae	4	7	11
cf. Poaceae spikelet	0	3	3
cf. Salicornia	1	0	1
cf. Sambucus	0	4	4
cf. Solanacea	0	3	3
cf. Trifolium sp.	0	1	1
cf. Vitis sp.	0	1	1
Cyperaceae	10	19	29
Modern seed	3	4	7
Parenchyma	16	22	38
Poaceae	10	29	39
Quercus sp.	1	23	24
Sambucus sp.	3	5	8
Umbellularia californica	62	30	92
unIDable fragment	71	131	202
unIDed seed	10	24	34
unIDed shell/testa	0	35	35
Wood (g)	4.23	2.322	6.552
Residue (g)	0.706	9.315	10.021

Table 5.2. Summary of macrobotanical remains from Feature 1 (2.0 L) and Feature 2 (7.2 L) (Unit 1078N/1056E) showing counts per volume.

Feature 1	Count	Count per Liter[a]	Feature 2	Count	Count per Liter[b]
cf. Amaranthaceae	1	0.50	Arctostaphylos sp.	1	0.14
cf. Atriplex sp.	1	0.50	Calcined fragment	2	0.28
cf. Cardamine	1	0.50	cf. Amaranthaceae/ Chenopodiacea	7	0.97
cf. Chenopodium sp.	1	0.50	cf. Asteraceae	1	0.14
cf. Fabaceae	1	0.50	cf. Chenopodium sp.	1	0.14
cf. Poaceae	4	2.00	cf. Chenopodium spp.	28	3.89
cf. Salicornia	1	0.50	cf. Cyperaceae-various	4	0.56
Cyperaceae	10	5.00	cf. Poaceae	7	0.97
Modern seed	3	1.50	cf. Poaceae spikelet	3	0.42
Parenchyma	16	8.00	cf. Sambucus	4	0.56
Poaceae	10	5.00	cf. Solanacea	3	0.42
Quercus sp.	1	0.50	cf. Trifolium sp.	1	0.14
Sambucus sp.	3	1.50	cf. Vitis sp.	1	0.14
Umbellularia californica	62	31.00	Cyperaceae	19	2.64
unIDable fragment	71	35.50	Modern seed	4	0.56
unIDed seed	10	5.00	Parenchyma	22	3.06
			Poaceae	29	4.03
			Quercus sp.	23	3.19
			Sambucus sp.	5	0.69
			Umbellularia californica	30	4.17
			unIDable fragment	131	18.19
			unIDed seed/fragment	24	3.33
			unIDed shell/testa	35	4.86

[a]2.0 liters for Feature 1
[b]7.2 liters for Feature 2

Artifacts within the heavy fraction were weighed and counted following the same methodology used in the analysis of the regular auger units. After drying, the light fraction was further divided into > 2 millimeters, one to two millimeters, and < 1 millimeter fractions using a nested sieve. Due to time restrictions and differences in feature volumes, a portion of the < 1 millimeter fraction for Feature 1 (50%) and Feature 2 (12.5%) was then subsampled and scanned for diagnostic artifacts, faunal remains, and botanicals. Insect eggs and insect feces often complicate accurate identification of botanical remains at this scale. Rob Cuthrell of UC Berkeley conducted the analysis and identifications of the sample fractions from both features. The prefix “cf.” indicates tentative plant identifications and is more telling of the scarcity of comprehensive paleoethnobotanical research and comprehensive comparative collections in California, not the abilities of the analyst. The present discussion relates to only a small portion of MRN-114—and the project as a whole—but it is hoped that future study of the auger flotation samples will provide added insight.

In total, 196 macrobotanical elements (nutshells, seeds, fruits, and other remains) were identified in Feature 1 and 385 macrobotanical elements were identified in Feature 2 (Table 5.1). While the connection between assemblage diversity and sample size is well-known (Kintigh 1984), Feature 2 has nearly twice as many macrobotanical elements compared to Feature 1, greater diversity of plant remains, but smaller counts per volume (Table 5.2). The macrobotanical assemblage from both features is composed of species typically recovered from archaeological sites in central California, such as oak (*Quercus* sp.), manzanita (*Arctostaphylos* sp.), and bay (*Umbellularia californica*). However, identification of several small seed-producing plant species—Amaranthaceae, Chenopodiaceae (including possibly *C. berlandieri*), *Atriplex* sp., and Poaceae—are added evidence of the importance of seed crops and maintaining flexible relationships with an array of resources within California hunting and gathering subsistence economies (Lightfoot and Parrish 2009:129-130). Among other gifts, Lieutenant Ayala received pinole made from an unknown seed during his encounter with Coast Miwok ambassadors in 1775 (Santa María 1971:25 [1775] in Milliken 1995:42). The array of botanical remains further speaks to the range of environments utilized in Coast Miwok daily practices, such as the presence of *Atriplex* sp. and Salicornia which are found in salt marsh habitats, as well as the range of uses for any given plant. For example, the roots of *Atriplex californica* (California saltbush) could be gathered for soap while its seeds were consumed as pinole (Lightfoot et al. 2009a:229).

The collection of raw materials for the manufacture of basketry and other woven items is hinted at by the presence of plant remains from the Family Cyperaceae (sedges) and Family Poaceae (grasses). Described below, basketry remains from MRN-115 are believed to contain split sedge "roots," a common medium for many California Indian basket weavers to this day (Collier and Thalman 1996:158; Shanks 2006:87-88). In addition to the production of nutritious seeds that could be ground into meal or stored for later use, grasses were also incorporated into baskets, mats, thatching for structures, headdresses, pillows, and quivers (Collier and Thalman 1996:190; Lightfoot et al. 2009a:219).

Berries and greens are also present. Cardamine (possibly bittercress) and Trifolium (clover) were identified. Nourishing and delicious, "most Central Coast Province peoples relished fresh clover leaves" (Lightfoot et al. 2009a:218), which were typically eaten raw. *Trifolium amoenum* (Showy Indian clover), an endangered species, was only recently rediscovered in Marin County and is currently the focus of replanting efforts by the Federated Indians of Graton Rancheria. Elderberries (*Sambucus* sp.) and plants in the Family Solanacea (e.g., nightshade) were consumed fresh, though a Coast Miwok informant commented that nightshade was "not good for pinole" (Collier and Thalman 1996:58). In addition to being "good to eat" (Collier and Thalman 1996:122), elderberries were also made into cider; elder flowers were brewed in tea and consumed to reduce fever, which Maria Copa—a Coast Miwok informant interviewed by Isabel Kelly in the 1930s—added is a practice favored by both Coast Miwok and Spaniards (Collier and Thalman 1996:394); and elder wood was used to make pipes and used exclusively in the production of ceremonial clapper sticks used during curing rites and other ceremonies (Collier and Thalman 1996:151, 219).

Manzanita berries are identified in many archaeological sites across California and within shell mounds of the San Francisco Bay area (Hammett and Lawlor 2004:296-297). Their specific use is recorded in ethnographic literature of the Coast Miwok (Collier and Thalman

1996), as well as Pomo groups to the north and many other central California people (Lightfoot et al. 2009a). Manzanita berries could be eaten, ground into pinole, fermented to create cider, stored, and were also recognized for their medicinal qualities (Lightfoot et al. 2009a:226). In addition to the edible and medicinal properties of manzanita berries, among the Coast Miwok manzanita wood was also fire-hardened and shaped into arrow points (Collier and Thalman 1996:188).

Comprising 15 percent of the total macrobotanical assemblage from the two features, California bay (*U. californica*) is another ubiquitous component of many Bay Area archaeological sites and the trees are a common sight in the China Camp study area. For the Coast Miwok, fresh bay leaves were utilized for medical purposes such as headaches and stomachaches (Collier and Thalman 1996:392). Explaining their presence in the MRN-114 cooking features and the presence of two additional calcined macrobotanical fragments, bay seeds were parched, pounded, and made into cakes or simply roasted in earth ovens and then eaten (Collier and Thalman 1996:146). Maria Copa likened the smell of toasted bay seeds to chocolate and commented that bay cakes were eaten with salt and sometimes as a garnish on acorn mush (Collier and Thalman 1996:146). Similar to manzanita berries, bay seeds could also be collected and stored for the winter (Collier and Thalman 1996:146). So important were bay trees for everyday life, Tom Smith—another Coast Miwok elder interviewed by Isabel Kelly in the 1930s—recalled some bay trees were privately owned (Collier and Thalman 1996:194). His own large bay tree produced “fine nuts,” although Maria Copa apparently “never heard [bay trees] were privately owned” (Collier and Thalman 1996:194).

<u>Botanical Remains from MRN-115</u>

Botanical remains within the MRN-115 collection speak to the excellent preservation of shell mounds in coastal California and include a number of burned wood planks, plain and diagonal twined basket fragments, and grass thatching all associated with the pit feature (“House-pit 7”) excavated by Meighan (1953). Several wood plank fragments—numbering 24 in the original site report—were identified as either redwood (*Sequoia sempervirens*) or oak (*Quercus* spp.) and are believed to be the remains of a semi-subterranean, conical bark house located on top of the shell mound.

> The individual pieces [of wood range] from 2 to 16 inches in diameter and from 6 to 49 inches in length. Two of the pieces were in a near vertical position, sloping inward slightly and imbedded in the midden about a foot below the area of the house floor. These were burned only at the upper end; they appear to be structural supports which burned down to the ground level but were not uprooted by the fire (Meighan 1953:3).

Meighan (1953:3) adds:

> Adhering to the upper surface of the logs, but not occurring between them, was a layer of burned grass which averaged half an inch in thickness. This was evidently the material used for covering the log supports, although no evidence was found which would indicate the method of attaching the grass to the outside of the structure.

Unfortunately, 60 years of museum storage and intermittent handling have further splintered the wood fragments and transformed the grass thatching into a mass of charcoal dust.

Although no analysis was conducted on the thatched remains, ethnographic evidence provides some insight to the presence and construction of grass thatching for use in daily life. Accordingly, tule and rushes were often employed as basketry material, clothing, bedding, doors, and could also be used as a fire retardant when adhered to the interior of bark homes using adhesives like clay (Collier and Thalman 1996:178; Lightfoot et al. 2009a:211). Fired clay chunks with plant impressions were found at MRN-115 and at other sites in Marin County (Shanks 2006:86), and Tom Smith recalled a mixture of mud and grass applied to the interior of the redwood bark house to prevent leaking (Collier and Thalman 1996:178). "This house lasts longer than ones with grass covering," Smith added (Collier and Thalman 1996:178).

Meighan's excavation in the pit feature also yielded the nested remains of four plain and diagonal twined baskets. The rare preservation of basketry and other organic remains at MRN-115 presents an opportunity to fully explore previously unknown dimensions of Bay Area shell mound-dwellers, and compliments basketry recovered from arid and underwater archaeological contexts in other parts of North America (e.g., Bernick 1998; Geib and Jolie 2008), as well as discoveries of basketry, netting, and other perishables at some archaeological sites in California's Great Central Valley (see Rosenthal et al. 2007:158). The baskets from MRN-115 were recovered from the floor of the house depression at a depth of 14 inches (Meighan 1953:2), and the wood planks were collected from "Unit 1 West" at a depth of 12 to 18 inches. The context is described by Meighan (1953:3), who writes:

> the remains of burned baskets (probably four) were found 30 inches west of the hearth. The basketry had been preserved in a carbonized form but was in poor condition, having been crumpled by a collapsing house timber which lay on top of the fragments.

Detailed analysis of the basketry from MRN-115 was first conducted by Baumhoff (1953), who identified coiled and twined techniques. Subsequent study revealed all 44 basketry fragments to be plain and diagonal twined, and show great variation in weaving techniques including evidence of designs (Shanks 2006:86-87). An array of basketry types—acorn baskets, cooking baskets, seed baskets, sifters, hoppers, storage baskets, cradles, etc.—existed in Coast Miwok daily life (Collier and Thalman 1996:155), and archaeological evidence for raw materials used for Coast Miwok basketry comes from MRN-115 and from basketry impressions found on fired clay fragments excavated from CA-MRN-193 (Shanks 2006:86). Fine tule cordage, willow shoots, and alder shoots were often used as warps, and split sedge root was commonly incorporated as basketry wefts (Lightfoot et al. 2009a; Shanks 2006:87-88). Analysis and results of a radiocarbon study using samples of wood and basketry from MRN-115 are presented in the following chapter.

Faunal Remains

Zooarchaeological remains of mammals, birds, fish, and shellfish compose the faunal assemblage from MRN-114, MRN-115, and MRN-328. In fact, the tremendous diversity of animal remains is a hallmark of most shell mounds in the San Francisco Bay (Lightfoot 1997:134). This section also presents analysis of modified bone artifacts. Excluding shellfish, the faunal assemblage (n=678) is composed of mammalian remains (n=338; 50%), avifauna (n=174; 25%), ichthyofauna (n=155; 23%), reptiles and amphibians (n=5; 1%), and unidentified animal bone (n=6; 1%) (Table 5.3). Identifications of mammal and bird remains from MRN-115 were made by Anneke Janzen (UC Santa Cruz), while faunal remains from MRN-114, MRN-

Table 5.3. Summary of faunal remains (NISP) for MRN-114, MRN-115, and MRN-328.

Taxon	Common Name	MRN-114	MRN-115	MRN-328	Total
Terrestrial Mammals					
Artiodactyla	Deer, elk, antelope	1	0	0	1
Bovid/Cervid	Cloven-hoofed mammal, even-toed ungulate	0	56	0	56
Cervid	Deer/elk	0	11	0	11
Antilocapra americana	Pronghorn	0	1	0	1
Odocoileus hemionus columbianus	Black-tailed deer	14	8	2	24
Carnivora	Carnivore	1	0	0	1
Canis latrans	Coyote	0	2	0	2
Procyon lotor	Raccoon	0	4	0	4
Sciuridae	Squirrel	0	1	2	3
Sciurus griseus	Gray squirrel	0	0	1	1
Sylvilagus spp.	Cottontail rabbit	1	0	2	3
Rodentia	Rodent	6	0	10	16
Microtus californicus	California vole	10	0	9	19
Peromyscus spp.	Deer mouse	2	0	0	2
Scapanus latimanus	Broad-footed mole	0	0	1	1
Thomomys bottae	Botta's pocket gopher	18	1	6	25
Mammalia	Mammal	26	88	5	119
Large Mammal		17	0	16	33
Medium Mammal		2	0	0	2
Small Mammal		2	0	10	12
Sea Mammals					
Enhydra lutris	Sea otter	0	1	0	1
Phoca vitulina	Harbor seal	0	1	0	1
Birds					
Aves	Bird	13	48	8	69
Anseriformes	Duck, goose, swan	1	68	1	70
Anatidae	Duck, goose, swan	4	7	4	15

Table 5.3. Summary of faunal remains (NISP) for MRN-114, MRN-115, and MRN-328 (cont.).

Taxon	**Common Name**	**114**	**115**	**328**	**Total**
Anserinae	Goose & swan	0	1	0	1
Anas spp.	Duck	2	0	0	2
Aythya spp.	Scaup	2	0	0	2
Branta canadensis	Canada goose	1	2	0	3
Podicepidae	Grebe	0	1	0	1
Aechmophorus occidentalis	Western grebe	0	2	0	2
Phalacrocorax sp.	Cormorant	0	4	0	4
Scolopacidae	Sandpiper/phalarope	1	0	0	1
Numenius sp.	Curlew/whimbrel	0	3	0	3
Larus sp.	Gull	0	1	0	1
Fish					
Acipenser spp.	Sturgeon	17	14	3	34
Salmonidae	Trout	21	0	0	21
Oncorhynchus spp.	Salmon	14	1	9	24
Oncorhynchus tshawytscha	Chinook salmon	1	1	0	2
Atheriniformes	Silversides	1	0	0	1
Teleostei	Ray-finned fish	10	0	23	33
Clupeiformes	Herring/Anchovy	1	0	0	1
Clupeidae	Herring/Shad/Sardine	1	0	2	3
Gillichthys mirabilis	Longjaw mudsucker	1	0	0	1
Porichthys notatus	Plainfin midshipman	0	0	5	5
Sebastes spp.	Rockfishes	0	0	1	1
Rays and Sharks					
Myliobatus californicus	California bat ray	7	0	6	13
Notorynchus cepedianus	Broadnose Sevengill shark	0	0	1	1
Squatina californica	Pacific Angel shark	0	2	0	2
Triakis semifasciata	Leopard shark	0	13	0	13
Reptiles					
Aneides lugubris	Arboreal salamander	1	0	0	1
Colubridae	Snake	1	0	0	1
Pituophis melanoleucus	Pine snake	1	0	0	1
Pituophis catenifer	Pacific Gopher snake	0	0	1	1
Testudines	Turtle	0	1	0	1
Unidentified		4	0	2	6

328, and the fish specimens from MRN-115 were analyzed by Dr. Thomas Wake of the Cotsen Institute of Archaeology (UCLA). As with other material categories examined in this chapter, the study of faunal remains from the earlier excavation at MRN-115 presents advantages and limitations that must be considered. One positive aspect of working with the MRN-115 museum collection is extending minimally invasive field methods into a laboratory setting, particularly maximizing information from archived archaeological collections and lessening the amount of material placed in local curation facilities burdened by a curation crisis. Secondly, Meighan's deep excavations produced welcome information for understanding the early construction of shell mounds, and support a long-term perspective on shell mound occupation when combined with data collected during the CCAP project.

However, foremost among the limitations, very few provenience data are available for artifacts in the MRN-115 museum collection. This is especially grave for animal remains, such that 93 percent of the faunal assemblage lacks vertical and horizontal provenience, and only two bone artifacts—a bird bone tube and a deer antler artifact—have known depths (Janzen and Schneider 2009:4). This is similar to other assemblages collected by some archaeologists working in mid-twentieth century California, whose field methods sometimes reflect a "frank indifference to dietary remains" (Rosenthal et al. 2007:150). A second issue related to excavation and screening methods, faunal remains in the MRN-115 collection represent larger and more durable skeletal elements and bone tools as compared to the assemblages from MRN-114 and MRN-328 which contain faunal remains collected from three millimeter screen mesh and from flotation samples (three millimeters and smaller). Despite these research limitations, fauna from all three shell mounds will be examined together to be able to make general intrasite comparisons. Before doing this, I will first examine patterning within the faunal assemblage associated with specific recovery methods.

Table 5.4. Counts (NISP) and densities (per square meter) of faunal remains from surface collection units at the study sites.

	MRN-114		**MRN-115**		**MRN-328**		***Total***
Mammal	4	0.15	9	0.16	10	0.30	23
Bird	6	0.23	1	0.02	5	0.15	12
Fish	1	0.04	0	0.00	0	0.00	1
Total	11		10		15		36

Faunal remains collected during surface collection at MRN-114, MRN-115, and MRN-328 reveal no distinguishable patterns between sites, with all three sites containing relatively similar amounts (and small percentages) of mammal, bird, and fish remains (Table 5.4). Examining fauna collected from systematic auger test units at MRN-114 and MRN-328—where a similar sampling strategy was employed at each site (see Chapter Four)— the presence of certain species at either site probably reflect plausible differences in shell mound use and are not attributed to differences in recovery methods. For example, three times as many animal taxa—rodents, small mammals, waterfowl, and small fish—were identified in the auger collections from MRN-328 compared to MRN-114, and only sturgeon occurred in much greater frequency at MRN-114 (Table 5.5). This could indicate differences in preparation methods conducted at either site relative to certain dishes, or an indication of the portability of some species. For

Table 5.5. Counts (NISP) of faunal remains collected from auger test units at MRN-114 and MRN-328.

	MRN-114						**MRN-328**					
	0-20 cm	20-40 cm	40-60 cm	60-80 cm	80-100 cm	*Total*	0-20 cm	20-40 cm	40-60 cm	60-80 cm	80-100 cm	*Total*
Terrestrial Mammals												
Artiodactyla	0	0	0	0	1	1	0	0	0	0	0	0
Odocoileus hemionus columbianus	0	1	0	1	2	4	0	0	1	1	0	2
Carnivora	0	0	0	1	0	1	0	0	0	0	0	0
Sciuridae	0	0	0	0	0	0	0	0	1	1	0	2
Sciurus griseus	0	0	0	0	0	0	1	0	0	0	0	1
Sylvilagus spp.	0	0	0	1	0	1	0	1	0	1	0	2
Rodentia	0	1	0	0	0	1	5	4	0	1	0	10
Microtus californicus	1	1	0	0	0	2	5	2	2	0	0	9
Peromyscus spp.	0	1	0	0	0	1	0	0	0	0	0	0
Scapanus latimanus	0	0	0	0	0	0	1	0	0	0	0	1
Thomomys bottae	2	2	3	1	0	8	1	3	1	1	0	6
Mammalia	1	0	1	0	0	2	3	1	0	0	0	4
Large Mammal	3	7	2	1	1	14	4	5	2	2	0	13
Medium Mammal	0	1	0	0	0	1	0	0	0	0	0	0
Small Mammal	0	0	0	1	0	1	3	2	1	1	0	8

Table 5.5. Counts (NISP) of faunal remains collected from auger test units at MRN-114 and MRN-328 (continued).

	MRN-114						**MRN-328**					
	0-20 cm	20-40 cm	40-60 cm	60-80 cm	80-100 cm	*Total*	0-20 cm	20-40 cm	40-60 cm	60-80 cm	80-100 cm	*Total*
Birds												
Aves	4	2	1	0	0	7	6	1	1	0	0	8
Anatidae	1	0	0	0	0	1	1	2	1	0	0	4
Branta canadensis	1	0	0	0	0	1	0	0	0	0	0	0
Fish												
Acipenser spp.	0	1	2	0	7	10	0	1	2	0	0	3
Oncorhynchus spp.	0	1	1	7	0	9	0	5	1	0	0	6
Oncorhynchus tshawytscha	0	0	0	1	0	1	0	0	0	0	0	0
Teleostei	0	0	1	0	1	1	2	5	7	2	0	16
Clupeidae	0	0	0	0	0	0	1	1	0	0	0	2
Porichthys notatus	0	0	0	0	0	0	0	0	1	0	0	1
Sebastes spp.	0	0	0	0	0	0	1	0	0	0	0	1
Rays and Sharks												
Myliobatus californicus	1	0	0	0	0	1	1	0	1	1	0	3
Unidentified	2	0	0	1	0	3	1	1	0	0	0	2
Total	16	18	11	15	12	71	36	34	22	11	0	104

Table 5.6. Counts (NISP) of faunal remains from excavation units at MRN-114, and from those excavated at MRN-115 in 1949.

MRN-114	0-10 cm	10-20 cm	20-30 cm	0-20 cm	20-30 cm	30-40 cm	40-50 cm	50-60 cm	*Total*
<u>Terrestrial Mammals</u>									
Odocoileus hemionus columbianus	0	0	5	1	1	1	2	0	10
Microtus californicus	0	0	1	2	0	0	0	2	5
Thomomys bottae	0	0	2	0	3	0	1	4	10
Large Mammal	1	0	0	0	0	1	0	1	3
Medium Mammal	0	1	0	0	0	0	0	0	1
Small Mammal	0	0	0	0	0	1	0	0	1
<u>Birds</u>									
Aves	0	0	0	0	5	0	0	0	5
Anseriformes	0	0	0	0	0	1	0	0	1
Anatidae	0	0	1	0	1	1	0	0	3
Anas spp.	0	0	0	0	1	0	0	1	2
Aythya spp.	0	0	0	0	1	0	0	1	2
Scolopacidae	0	0	0	0	0	1	0	0	1
<u>Fish</u>									
Acipenser spp.	0	0	0	0	2	0	0	5	7
Salmonidae	0	0	0	0	0	0	0	1	1
Oncorhynchus spp.	0	0	0	0	0	0	0	5	5
<u>Rays and Sharks</u>									
Myliobatus californicus	0	0	2	0	0	0	0	3	5
Total	1	1	11	3	14	6	3	23	62

Table 5.6. Counts (NISP) of faunal remains from excavation units at MRN-114, and from those excavated at MRN-115 in 1949 (continued)

MRN-115	Count		Count
Terrestrial Mammals		Sea Mammals	
Bovid/Cervid	56	*Enhydra lutris*	1
Cervid	11	*Phoca vitulina*	1
Antilocapra americana	1		
Odocoileus hemionus columbianus	8	Fish	
Canis latrans	2	*Acipenser* spp.	14
Procyon lotor	4	*Oncorhynchus* spp.	1
Sciuridae	1	*Oncorhynchus tshawytscha*	1
Thomomys bottae	1		
Mammalia	88	Rays and Sharks	
		Squatina californica	2
Birds		*Triakis semifasciata*	13
Aves	48		
Anseriformes	68	Reptiles	
Anatidae	7	Testudines	1
Anserinae	1		
Branta canadensis	2		
Podicepidae	1		
Aechmophorus occidentalis	2		
Phalacrocorax sp.	4		
Numenius sp.	3		
Larus sp.	1		
Total			343

example, as the largest freshwater fish in western North America sturgeon can grow to be very large—typically four to six feet in length, but some larger specimens measuring thirteen feet and weighing 1300 pounds have been recorded—and difficult to transport (Love 1996:81). Being the closest site to the shore, MRN-114 might have been an ideal location for processing and cooking fresh catches of sturgeon.

Comparing excavations at MRN-114 to those conducted by Meighan in 1949, MRN-115 shows a higher representation of large mammals and fewer small mammal remains than MRN-114, which probably reflects recovery biases (Table 5.6). Although both sites contain similar amounts of Black-tailed deer elements, differences in proportions of large and small animal bones likely indicates differences in sampling techniques or possibly differences in the diversity, size, or type of features excavated at either site. Certain bird species appear at either MRN-114 or MRN-115, but not both sites, and an overall higher number of bird remains were collected from MRN-114. This too may indicate differences in feature size, number of features at each site, or feature type. A similar pattern was identified for fish remains excavated at both sites, especially for sharks and rays. Overall however, low numbers of fish remains from MRN-115 likely reflects the apparent lack of screening at this site and inability to collect smaller fish bones. Compared to MRN-115, sea mammal and turtle remains were not recovered from MRN-114. This most likely reflects differences in site use—especially feature size, type and number—and not recovery methods because one would expect more at MRN-114 because of my use of screens. The absence and presence of particular artifact categories may also reflect differences in sample size between the 1949 excavations at MRN-115 and my field operations. The remainder of my discussion will treat the faunal assemblage as a whole.

Mammals

Mammalian remains from MRN-114, MRN-115, and MRN-328 are divided into two broad categories: terrestrial mammals and sea mammals. Excluding sea mammals, which are discussed below, terrestrial mammal remains from the three shell mounds generally include bovids/cervids, carnivores, and rodents. Specifically, identified remains include: the mammal order Artiodactyla (n=1); Bovid/Cervid (n=56); Cervids (n=11); *Antilocapra americana* (Pronghorn; n=1); and *Odocoileus hemionus columbianus* (Black-tailed deer; n=24). Carnivores include: the order Carnivora (n=1); *Canis latrans* (Coyote; n=2); and *Procyon lotor* (Raccoon; n=4). Rodents include: the order Rodentia (n=16); *Microtus californicus* (California vole; n=19); *Peromyscus* spp. (Deer mouse; n=2); *Scapanus latimanus* (Broad-footed mole; n=1); and *Thomomys bottae* (Botta's pocket gopher; n=25). Mammal remains identifiable to the Family Sciuridae (Squirrels; n=3); *Sciurus griseus* (Gray squirrel; n=1); and *Sylvilagus* spp. (Cottontail rabbit; n=3) were also identified. Unidentified mammal remains were sorted into general size classes, namely large (n=33), medium sized (n=2), and small (n=12). Otherwise, Mammalia (n=119) includes unidentified mammal bone fragments that could not be classed by size.

Artiodactyls and carnivores were economically significant at all three project sites, and they are prevalent within mammalian faunal assemblages from most Middle Period (500 B.C. to A.D. 900) archaeological sites in the Bay Area relative to geography, habitat, and other unique environmental conditions (Milliken et al. 2007:107; Simons 1992:74-75). In fact, the "deer economy" intimated for the foothills of northern and central California—whereby deer was the primary prey followed by a backup strategy for hunting birds and small game—influences interpretations of hunter-gatherer "coharvesting" of marine animals in the San Francisco Bay area (Simons 1992:88). A broad-spectrum coharvesting approach allowed for flexible shifts between different resources to account for intermittent resource declines and explosions (Milliken et al. 2007:107). Coast Miwok hunted deer, elk, and antelope communally in drives and through the use of nets, fences, and deer decoy headdresses (Collier and Thalman 1996:135-136). Ceremonial preparations for the hunt had to be observed prior to setting out, and included cleansing the deer head decoy with smoke, singing for luck, and purifying the hunter in a sweat lodge (Collier and Thalman 1996:133-135). Deer was dispatched with a bow and arrow, after which they were gutted and carried back to a village for further processing. Deer meat was typically roasted, but it could also be dried for later consumption. Deer bones could be modified into tools. For example, deer ulnas were often sharpened to create awls. Deer skins were used primarily for clothing and bedding, but were also employed in the manufacture of slings, quivers, and pouches among most central California Indian groups (Lightfoot et al. 2009a:247).

Raccoons were also commonly hunted with bow and arrow, clubbed, or crushed in deadfall traps (Lightfoot et al. 2009a:249), although these remains may also be intrusive as an especially vibrant community of raccoons still occupy the park. Coyotes were explicitly forbidden because they were "not good to eat" and perhaps because of their spiritual significance and association with life and death in Coast Miwok culture (Collier and Thalman 1996:139). Archaeologically however, coyote remains are recovered consistently from Marin sites (DeGeorgey 2007:155), and carnivores in general are associated with diversified Late Period (A.D. 900 to 1800) hunter-gatherer economies (Milliken et al. 2007:109). Such hunting restrictions may also be the result of more recent prohibitions on the hunting of specific animals stemming from their overexploitation and localized population crashes.

Cottontail rabbits were also heavily exploited during the Middle and Late Periods. A good source of protein and highly prized for their fur which could be stitched together to make rabbit skin blankets, the Coast Miwok constructed traps for rabbits, as well as fences with baskets set into them (Collier and Thalman 1996:161). Tom Smith recalled, "Lots of boys—young fellows, not men—and young girls who want to run, chase the rabbits" towards the fence where the rabbits would become ensnared and swiftly dispatched while singing "he-heya" for each rabbit killed (Collier and Thalman 1996:138). Quite edible, squirrels could be shot using a bow and arrow (Collier and Thalman 1996:138). Bioturbation, vertical size-sorting, and other taphonomic processes at MRN-114, MRN-115, and MRN-328 are probably a consequence of burrowing rodents—vole, mole, mice, and gophers—whose remains were identified in the faunal assemblage (e.g., Pierce 1992). However, as evidenced in the ethnographic record gophers were also snared, gutted, roasted, and consumed, which demands a more detailed analysis of small rodent remains. A very small percentage show signs of burning.

Sea Mammals Sea mammal remains are found only in the MRN-115 collection from PAHMA and include *Enhydra lutris* (Sea otter; n=1) and *Phoca vitulina* (Harbor seal; n=1). As I discussed above, this may reflect actual differences in site use and not recovery methods used in 1949. Historically, sea otters were once numerous in the San Francisco Bay: a prime estuarine habitat for sea otters that undoubtedly served as an ideal birthing area and nursery for pups (Simons 1992:87). Yet, unchecked hunting practices and environmental degradation over the past two hundred years have erased Bay Area sea otter populations. Colony Ross, the Russian-American Company's southern-most outpost, was established just north of the San Francisco Bay on the Sonoma coast and from 1812 to 1841was a key location for hunting sea otters and collecting their pelts to be sold on a very lucrative fur market (Lightfoot 2005a). Colony Ross hunting expeditions frequently dipped into Spanish California territory and the San Francisco Bay, and Native Alaskan hunters often camped at Point Reyes and Tomales Bay before portaging across the Marin Peninsula to the bay. Milliken (1995:201-202) notes several hunting trips into the San Francisco Bay, including one party which crossed the Marin Headlands in 1809 bringing with them fifty canoes. Between 1833 and 1835, before becoming administrator of Mission San Rafael and before given title to *Rancho San Pedro, Santa Margarita y las Gallinas* in 1844, an entrepreneurial Timoteo Murphy also earned a living hunting sea otter and selling pelts in colonial California (Potter 1942).

The Coast Miwok also hunted sea otter, although ethnographic sources are silent about otter hunting and processing. Hildebrandt and Jones (1992:382) document shifts in sea mammal hunting strategies from an early focus on large-bodied pinnipeds (ca. 2500-500 B.C.), to the exploitation of large terrestrial game (500 B.C. to A.D. 1000), and then to sea otter and harbor seal (A.D. 1000-contact). Simons (1992:74-75) identifies a similar pattern within the San Francisco Bay, where a sharp increase in the hunting of sea otter was preceded by hunting of terrestrial game and, to a lesser extent, harbor seal. Additional archaeological sites in the Bay Area (e.g., Nelson 1910:378; Uhle 1907:18) and Marin County have produced sea otter remains, including MRN-17 and MRN-20 at Richardson Bay (DeGeorgey 2007:155; McGeein and Mueller 1955:59), MRN-44/H on Angel Island (DeGeorgey 2007), as well as numerous shell mounds located at Point Reyes and Tomales bay (McGeein and Mueller 1955:59). That many of these sites are located on the southern and western ends of the peninsula, sea otter may have been brought to MRN-115 from other parts of the peninsula. Its absence from the ethnographic record may also reflect the species' early extirpation in San Pablo Bay waters. That the sea otter element (PAHMA, Cat # 1-127856; Figure 5.1) has also been modified—cut just below the distal femoral condyles around the circumference of the bone—may too allude to traffic of bone tools, furs, and processed meat. Similar examples of "scored and snapped" bone were recovered from the Native Alaskan Village site at Colony Ross (Wake 1997:273-274).

Harbor seal remains are also recovered at many San Francisco Bay archaeological sites. While especially prevalent during the Middle Period and—to a lesser degree—the Late Period, harbor seals are considered part of "coharvesting constellation" in which seals, sea otter, waterfowl, and fish could be acquired by hunter-gatherers "utilizing a relatively simple technological complex, emphasizing the use of nets and watercraft" (Simons 1992:88). When caught, seals were an excellent source of protein and fat; oil, which could applied topically to treat rheumatism (Collier and Thalman 1996:392); and skin, which could be used for a variety of domestic goods (Collier and Thalman 1996:139). Seals were typically shot with bow and arrow or clubbed (Collier and Thalman 1996:139, 191). The seal bone specimen from MRN-115—an adult harbor seal rib—shows evidence of gnawing.

<u>Birds</u>

Anatid waterfowl—ducks, geese, and swans—comprise the majority (n=93; 54%) of avifauna collected from MRN-114, MRN-115, and MRN-328. This is consistent with most archaeological sites in central California and San Francisco Bay, where large flocks of plump ducks, geese, and swans from northern latitudes would winter between late fall and early spring and attract local hunter-gatherer groups (Broughton 2004). The Anatid assemblage from the three shell mounds in China Camp State Park includes the Order Anseriformes (ducks, geese, and swans; n=70); Family Anatidae (ducks, geese, and swans; n=15); Subfamily Anserinae (swans and true geese; n=1); *Anas* spp. (ducks; n=2), *Aythya* spp. (scaups; n=2), and *Branta canadensis* (Canada goose; n=3). Waterfowl, including coots, were hunted by the Coast Miwok using decoys, bolas, and nets during communal hunts (Collier and Thalman 1996:129), after

Figure 5.1. Bone artifacts from MRN-115. Clockwise from top left: PAHMA, Cat # 1-127911, perforated humerus (*Branta canadensis*); PAHMA, Cat # 1-127851, pressure flaker (Bovid/Cervid); PAHMA, Cat # 1-127856, cut femur (*Enhydra lutris*); and PAHMA, Cat # 1-127906, serrated scapula (Bovid/Cervid).

which ducks were roasted and consumed. Multiple Anseriformes remains indicate burning, and some also were modified into tools, beads, and other artifacts. Duck feathers were also highly prized as decorative elements for baskets and dance regalia (Collier and Thalman 1996:159, 166).

Skeletal elements identified as grebe (n=1) and *Aechmophorus occidentalis* (Western Grebe; n=2) are additional water birds associated with the three shell mounds. Shorebirds include remains from the Family Scolopacidae (sandpipers and phalaropes; n=1) and multiple elements identified as *Numenius* sp. (whimbrel or curlew; n=3). Generally, shorebirds were hunted with nets arranged on the beach near the water and were "good to eat" (Collier and Thalman 1996:129). Marine birds are represented by *Larus* sp. (Gull; n=1) and *Phalacrocorax* sp. (Cormorant; n=4). These species and their eggs were highly prized among central California Indians (Lightfoot 2009a:241-242), and large quantities of cormorant remains from the Emeryville shell mound attest to their importance and eventual extirpation from over-hunting during the Late Period (Broughton 2004). This pattern appears to transfer over to the Marin Peninsula where archaeological sites with significant Middle Period components demonstrate a higher proportion of cormorant remains compared to anatids (DeGeorgey 2007:151). With strong Late Period deposits, ducks and geese are more prevalent at MRN-114, MRN-115, and MRN-328. Furthermore, Coast Miwok ethnography is quiet on the matter of cormorant hunting. Alternatively, gull eggs were collected from nests and boiled, while gulls themselves were hunted with baited gorgets (Collier and Thalman 1996:128-129). Accordingly, "one could get three gulls in a morning… [after which, one would] build a fire and toss the bird in without removing the feathers" (Collier and Thalman 1996:129).

Fish

Fish (freshwater, saltwater, and anadromous), bat rays, and sharks comprise the ichthyofaunal assemblage from MRN-114, MRN-115, and MRN-328. Leaving aside sharks and rays, 37% (n=47) of the fish assemblage is composed of trouts, specifically those of the Family Salmonidae (n=21), *Oncorhynchus* spp. (n=24), and Chinook salmon (*Oncorhynchus tshawytscha*; n=2). These are closely followed by 27% (n=34) sturgeon (*Acipenser* spp.), and 26% (n=33) ray-finned fish (Teleostei). Smaller proportions of the fish assemblage include the Order Atheriniformes (Silversides; n=1); the Order Clupeiformes (Herring or Anchovy; n=1); the Family Clupeidae (Herring/Shad/Sardine; n=3); *Gillichthys mirabilis* (Longjaw mudsucker, n=1); *Porichthys notatus* (Plainfin midshipman; n=5); and *Sebastes* spp. (Rockfishes; n=1). All identified fish species are common to native fisheries of the central California coast, including the San Francisco Bay (Gobalet and Jones 1995).

Despite inconsistencies between the rarity of salmonid remains found archaeologically and an overemphasis on salmon and trout in the ethnographic records (Gobalet et al. 2004), salmonids comprise the majority of fish remains from MRN-114, MRN-115, and MRN-328 similar to other bay sites but comparatively unlike other inland sites (Simons and Carpenter 2009:72). For example, the location of the China Camp shell mounds on Point San Pedro might mirror MRN-44/H which is located on the northern end of Angel Island where fishers could capture an array of fish species mingling at the interface of brackish, fresh, and saltwater, as well as anadromous species moving between the Golden Gate and Sacramento River Delta (DeGeorgey 2007). Though historically salmon had three runs during the year (Scott 1998:176), more recently salmon and steelhead were taken in the winter along creek drainages using spears, nets, and sometimes weirs (Collier and Thalman 1996:141-142). Aside from the important nutritive value of salmon and salmon eggs, ethnographic accounts of Coast Miwok salmon fishing also entail ritual practices such as singing to the salmon spirit which would ensure the fish would not be frightened by the fisherman (Collier and Thalman 1996:142). Salmon were typically split and roasted on hot coals (Collier and Thalman 1996:149), and "in good weather will dry in three days… [and could be] kept in the house, in a basket" for future use (Collier and Thalman 1996:145).

Sturgeon (especially White Sturgeon, *Acipenser transmontanus*) are anadromous bottom-fish and very common in the San Francisco Bay, especially shallow waters (Gobalet et al. 2004). Maria Copa recalled fishing trips to the Petaluma River drainage at the north end of San Pablo Bay, just above Point San Pedro where sturgeon were captured with large meshed seines strung between two tule balsas (Collier and Thalman 1996:143). A similar description of sturgeon fishing is recorded for Suisun Bay (Scott 1998:180). Once ashore sturgeon were processed, partially consumed, then either brought back to a village or traded to the Spanish in exchange for cotton cloth (Scott 1998:180). Archaeologically, sturgeon dominate all temporal periods at MRN-254 suggesting they were readily available off the Marin bay shore (Scott 1998), but in other parts of the bay a decrease in sturgeon remains through time is thought to indicate a collapse of low-cost resources (e.g., deer and sturgeon) and intensification of high-cost smaller fishes and mollusks (Broughton 1997:857). Sturgeon remains are present throughout all deposits at MRN-114 and MRN-328, but with smaller element counts from depths of 0 to 20 centimeters.

Schooling fish include Atheriniformes and Clupeiformes, including Clupeidei. Jacksmelt (*Atherinopsis californiensis*) is one of the most common Atheriniformes found in the San Francisco Bay fishery, and is especially abundant between October and April (Scott 1998:174; Simons and Carpenter 2009:75). Smelt could be caught in the surf using nets, and smelt eggs were boiled then dried (Collier and Thalman 1996:140). Herring and anchovies were available throughout the year and could be collected using seines strung between multiple tule boats, but also with nets with stone sinkers and wood floats (Collier and Thalman 1996:143; Simons and Carpenter 2009:75). Plainfin midshipmen (*Porichthys notatus*) occupy rocky bottom and muddy backwater habitats, and maintain a seasonal vertical migration between deep, cold waters in the fall and shallow, warm waters in the spring and summer (Scott 1998:174). Typically inhabiting rocky reefs and kelp forests (Gobalet and Jones 1995:819), rockfishes (*Sebastes* spp.) can be found inshore at low tide in the spring, at which time they could be caught from the shore using handlines or apparently poisoned, and then dried (Collier and Thalman 1996:143; Simons and Carpenter 2009:76). Inhabiting sloughs and tidal mudflats, Longjaw mudsuckers (*Gillichthys mirabilis*) were probably caught with nets or speared along with other tidal creatures.

Rays and Sharks A significant portion of the faunal assemblage from MRN-114, MRN-115, and MRN-328 includes the remains of California bat ray (*Myliobatus californicus*; n=13) and sharks, namely *Notorynchus cepedianus* (Broadnose Sevengill shark; n=1), *Squatina californica* (Pacific Angel shark; n=2), and *Triakis semifasciata* (Leopard shark; n=13). Collectively known as Elasmobranchs, sharks, skates, and rays were important components of coastal diets in many parts of the world, but they are poorly understood because of improper sampling and because the skeletons of these species are composed primarily of cartilage and do not preserve well archaeologically (Rick et al. 2002), with the exception of teeth and vertebral centra (Kozuch and Fitzgerald 1989; Rick et al. 2002:111).

Archaeologically, several sites on the Marin Peninsula have similar fish assemblages that include sharks and rays, such as MRN-14 (Follett 1974), MRN-20 (Follett 1957), MRN-44/H (DeGeorgey 2007; Simons and Carpenter 2009), and MRN-254 (Scott 1998). Bay ray and

Leopard shark are among the most common species recovered as they are both abundant in the San Francisco Bay. Less common are Pacific Angel sharks and the Broadnose Sevengill shark, which was identified by a burned tooth excavated from MRN-328.

Ethnographically, no information exists on the collection, processing, and consumption of sharks and rays among the Coast Miwok, though Follett (1974:148-149) comments that sharks and rays were probably caught using a seine net. Rick et al. (2002:113) provide comparative examples of Elasmobranch use in coastal societies in other areas of the Pacific Ocean, including the use of shark teeth for cutting tools, weapons, or heirloomed as regalia; shark skin for use as sandpaper; and from southern California, examples exist of shark centra beads. Shark and ray meat is also a rich source of protein, vitamin A, and oil (Rick et al. 2002:113). As sharks tend to sink after dying, Kozuch and Fitzgerald (1989:147) stress active methods of shark and ray procurement through the use of nets, spears, and other implements, as opposed to scavenging shark carcasses along the shore. While rarely preserved archaeologically, weirs and nets were probably also used to capture rays sharks in shallow tidal marshes along with hook and line, clubs, and harpoons as evidenced ethnographically in many parts of California (Lightfoot et al. 2009a). Witnessed in use by early Spanish explorers (Milliken 1995:31-61), tule watercraft also greatly facilitated catches of fish and sea mammals on the open bay (Simons and Carpenter 2009:75-76).

Reptiles & Amphibians

Herp taxa (n=5) recovered from MRN-114, MRN-115, and MRN-328 include snake (*Pituophis melanoleucus* [Pine snake], *Pituophis catenifer* [Pacific Gopher snake], and, generally, the Family Colubridae); turtle (Order Testudines); and Arboreal Salamander (*Aneides lugubris*). Although many reptiles and amphibians typically inhabit subterranean spaces and their remains are sometimes naturally deposited at archaeological sites by birds and other animals, some insights to their cultural deposition are found in ethnographic sources. While some central California Indians ate snakes, they also figure prominently in ritual practices and rites of passage (Lightfoot et al. 2009a:240-241). For example, menstruating women become ill at the sight of a snake (Collier and Thalman 1996:510), and "talking" gopher snakes are closely associated with gifts of human hair. Maria Copa recalled her grandmother "used to say that when you saw a snake, it would talk… the snake says, 'Give me more hair.' My grandmother snatched out some [of her] hair and gave it to him… [hair was] given only to snakes" (Collier and Thalman 1996:494).

Turtles were a consistent part of the California Indian diet (e.g., Broughton 1994a), and among the Coast Miwok turtle meat was revered (Collier and Thalman 1996:128). Tom Smith recalled catching turtles in the area around Santa Rosa in the warmer part of the year "when the rain is over and the creek dries" (Collier and Thalman 1996:128). Smith recalled boiling the meat after removing the shell, while other interior groups roasted the animal whole before removing the shell and entrails (Lightfoot et al. 2009a:329). The turtle specimen from MRN-115 shows no indication of burning. Comparatively, there is little information about the possible uses of salamander among the Coast Miwok. Perhaps mistaken for Coast Range newts which are known to secrete a deadly neurotoxin (California Herps, nd), dried "salamander" was apparently ground and used as poison by the Coast Yuki while its blood was administered to cure those poisoned by salamander (Lightfoot et al. 2009a:240). It is unclear whether the single salamander vertebra recovered from Feature 2 at MRN-114 reflects dietary or malevolent practices, or whether it was naturally deposited since salamanders can burrow and several newts (*Taricha torosa*) have also been identified in the project area.

Modified Bone

Together with lithic tools, animal bone, antler, and teeth were also shaped into tools, maintained, and modified to facilitate an array of daily practices associated with shell mound communities of the San Francisco Bay (Lightfoot 1997:134). Typical tool forms include awls, pins, saws, gouges, wedges, pressure flakers and billets, gorge fish hooks and other implements related to fishing, whistles, counting pieces, gaming pieces, and other decorative elements such as incised tubes and beads (Gifford 1940). Many are present in the modified bone assemblage (n=31) from MRN-114, MRN-115, and MRN-328 (Table 5.7).

Table 5.7. Summary of modified bone artifacts from MRN-115 and MRN-328.

	MRN-115	**MRN-328**	***Total***
Awl	5	0	5
Awl fragment	7	0	7
Bone ornaments	2	0	2
Flat/Spatulate	4	0	4
Hook	1	0	1
Needle	3	0	3
Other	1	1	2
Pick	1	0	1
Pin fragment	0	1	1
Pressure flakers	2	0	2
Serrated bone	3	0	3
Total	29	2	31

Of the entire faunal assemblage, sixteen specimens from MRN-114 and MRN-328 indicate various stages of burning, compared to 32 burned items from MRN-115. Two faunal specimens from MRN-328—both identified as large mammal—have been burned and are worked. Of these, one (Cat # 7/9/08-1) is a pin fragment, and the other fragment (Cat # 7/14/08-3) is highly polished and similar in appearance to steatite. Fifty specimens in the MRN-115 collection exhibit cut marks, the majority of which are identified as artiodactyls (Janzen and Schneider 2009:6). Consistent with avifauna from other Bay Area shell mounds, bird taxa with cut marks include *Branta canadensis* and *Phalacrocorax* sp. (Broughton 2004). Other avian specimens with cut marks could be identified only to Anseriformes. In at least two cases, cut marks on bird bones appear to be related to the manufacture of bone beads; similar examples of which can be found in collections from ALA-328 and CCO-295 (Bickel 1976:141; Nelson 1910:400). One *Canis latrans* bone (PAHMA, Cat # 1-127810) also exhibits cut marks and is severely burned, while the distal femur from a sea otter (PAHMA, Cat # 1-127856; Figure 5.1) had also been worked. As mentioned earlier, the particular cut seen on the sea otter bone appears similar to those recovered from Colony Ross where otter pelts were collected in large quantities but where few other otter elements were recovered (Wake 1997:273-274).

Other modified bone artifacts include pointed bone items: awls (n=5), awl fragments (n=7), needles (n=3), a small pick (n=1), a hook (n=1), and flat/spatulate items (n=4). Awls are defined as "narrow, pointed bone objects with rounded cross-sections" and were often manufactured from deer metapodial bones (Bieling 1998:96). Awls were particularly important tools among the Coast Miwok in the creation of coiled baskets (Collier and Thalman 1996:156; Shanks 2006:91); are common artifacts in many Bay Area shell mounds (e.g., Bickel 1976; Bieling 1998; DeGeorgey 2007; Nelson 1910; Uhle 1907); and a widespread morphological type found in many California archaeological contexts (Gifford 1940). The small pick (PAHMA, Cat # 1-127916) is from a deer accessory metapodial (dewclaw) and may have functioned as an awl or much like a toothpick. The bone "hook" is a cervid metacarpal, and might have figured prominently in a fishing tool kit.

Additional bone artifacts include: serrated bone (n=3), bone ornaments (n=2), bone and antler pressure flakers (n=2), and other modified bone (n=1). The serrated bone tools, or "fleshers" (Gifford 1940), are also widely recovered from Bay Area shell mounds (Figure 5.1). Upon finding these saw-like artifacts at the Ellis Landing shell mound, Nelson (1910:393) despaired "the specimens found do not… give any further clue to the real purpose of these implements." A few years earlier however, Uhle (1907:75-76) commented "as similar as these objects are to saws, it is probable that they were not used as such," but rather "used in some processes of weaving." The "teeth" would serve to separate individual strands that would eventually be woven together, similar to a loom. Bone artifacts from MRN-115 also include an antler pressure flaker and an ulna pressure flaker/gouge with flattened and rounded tip from a bovid/cervid. The latter has been described as a "paper-cutter" type by Uhle (1907:69) and is similar to the C-type bone tool described by Gifford (1940:170-171). A bird bone tube and a perforated humerus fragment from a Canada goose suggest ornamental uses of modified bone, and the cut sea otter femur represents a bone artifact of unknown use.

Marine Shell and Shell Artifacts

Mussel (*Mytilus trossulus*), clam (e.g., *Macoma nasuta*), and oyster (*Ostrea conchaphila*) were early on identified as the three primary mollusk constituents of Bay Area shell mounds (Gifford 1916:6; Nelson 1909:337; Uhle 1907:16). MRN-114, MRN-115, and MRN-328 are no exception. Mussel, clam, and oyster shell fragments and umbos (hinges) number in the tens of thousands within the China Camp Archaeological Project assemblage, which in addition to bivalve remains also includes the remnants of crustaceans, such as barnacle (*Balanus nubilus*) and crab (*Cancer antennarius* and *Cancer productus*), and very small numbers of gastropod remains (e.g., *Acanthina spirata* and *Helix aspersa*). Ethnographic insights on Coast Miwok shellfish harvesting practices are richly detailed in the methods of harvest and patterns of consumption (Collier and Thalman 1996; Greengo 1952), while the collection of shellfish is often mentioned in accounts of mission life (e.g., Beebe and Senkewicz 2001; Margolin 1989). My analysis of archaeological marine shell was conducted to identify changes and continuities in shellfish exploitation through time, and possibly long-term and seasonal patterns of landscape use by hunter-gatherers.

All shell was analyzed in the California Archaeology Laboratory. Debates regarding the appropriate method of quantifying shellfish in archaeological deposits vis-à-vis preservation of shell are on-going and guided my decision to collect data on three core variables (Claassen 1998). All marine shell was sorted into taxa; shell fragments and umbos were totaled for a number of identifiable specimens (NISP); and then weighed. To measure the relative abundance of bivalves, a minimum number of individuals (MNI) was obtained by halving the sum of umbos for each taxon and rounded to the nearest whole integer. Table 5.8 summarizes bivalve MNIs and NISP for marine shell recovered from auger units at MRN-114 and MRN-328, as well as from the two excavation units at MRN-114.

Table 5.8. Shellfish MNI and NISP for MRN-114 and MRN-328.

				MRN-114: Augers			
	Surface	0-20 cm	20-40 cm	40-60 cm	60-80 cm	80-100 cm	*Total*
Mussel	230	1503	3057	2887	2176	1520	11373
MNI	73	559	1054	869	659	493	3705
Oyster	114	88	130	113	82	58	585
MNI	15	23	34	28	15	15	128
Clam	32	22	54	56	63	56	283
MNI	1	1	5	7	2	4	19
Barnacle	44	230	389	265	311	240	1479
Crab	0	1	1	3	0	0	5

				MRN-328: Augers			
	Surface	0-20 cm	20-40 cm	40-60 cm	60-80 cm	80-100 cm	*Total*
Mussel	321	4268	6609	5874	2660	2372	22104
MNI	131	1664	2727	2165	1048	735	8470
Oyster	484	381	343	208	104	82	1602
MNI	102	90	88	47	24	15	364
Clam	20	16	22	20	18	10	106
MNI	1	0	2	5	5	5	14
Barnacle	31	627	885	555	388	308	2794
Crab	0	4	9	6	4	1	24

					MRN-114: Excavations				
	0-10 cm	10-20 cm	20-30 cm	0-20 cm	20-30 cm	30-40 cm	40-50 cm	50-60 cm	*Total*
Mussel	112	164	1368	254	1765	1545	2568	10231	18007
MNI	43	63	534	84	561	773	1000	3751	6807
Oyster	35	35	177	118	160	120	85	176	906
MNI	7	9	41	29	48	42	27	57	259
Clam	24	16	47	11	23	44	26	66	257
MNI	2	2	4	1	3	4	3	10	27
Barnacle	24	22	116	16	76	65	38	397	754
Crab	0	0	1	0	1	2	5	12	21

Using counts from only the auger units, MRN-114 and MRN-328 are basically identical in percentages of bivalves (89%), crustaceans (11%), and gastropods (< 1%) and give a strong indication of the effectiveness of the sampling strategy, the composition of the study sites, as well as the habitats frequented by the Coast Miwok. The museum collection from MRN-115, on the other hand, is composed exclusively of gastropods—13 (41%) *Acanthina spirata* (Angled Unicorn) shells and 19 (59%) non-native *Helix aspersa* (garden snail) shells—but this is probably more an indication of sampling methods practiced by mid-twentieth century archaeologists rather than the preferences of local hunter-gatherers. Interestingly, excavations of the three shell mounds did not produce any California Horn Snail (*Cerithidea hegewishii californica*) specimens despite close proximity to extensive salt marsh habitat. While currently endangered, intensified harvests of native California Horn Snails are hypothesized for the South San Francisco Bay and believed to relate to prehistoric gathering practices in between seasonal mussel harvests (Milliken et al. 2007:109). Although bat ray (*Myliobatis californianus*) and other marsh species are identified in the archaeological assemblages from MRN-114, MRN-115, and MRN-328, the absence of horn snail and large counts of mussel and oyster (with preference for rocky, intertidal habitat) may hint at an environment in transition.

As I discuss in Chapter Four, depositional patterning of mussel shell, clam shell, and oyster shell recovered from auger units at MRN-114 and MRN-328 approximates in some ways the typical pattern identified by Uhle (1907:17), Nelson (1909:338), and later by Jones (1992:4). Accordingly, "it is the mussel which is most abundant in the lower strata while the clam becomes suddenly quite excessive in the upper horizons" (Nelson 1909:338). Exploitation of native oysters is thought to predate both clam and mussel gathering, yet a steady increase of oyster shell in the upper deposits of MRN-114 and MRN-328 and a decline in clam shell contradict the well-documented pattern. Differential patterns of habitat change around the bay; the gradual settling of heavier clam shell; and other taphonomic factors, including deposition by non-human shellfish feeders (e.g., raccoons) and the fragility of oyster shell at lower depths may explain why comparatively little oyster shell was recovered from the lowest strata (Claassen 1998:70-73; Erlandson and Moss 2001). On this last point, shell data from MRN-114 and MRN-328 reinforce Uhle's (1907:339) century-old adage that "the state of preservation of the shells is proportional to their natural hardness." Focusing on the mussel shell alone, however, a noticeable increase in mussel shell counts at between approximately 20 to 40 centimeters below surface at MRN-114 could potentially reflect a period of resource intensification in the Bay Area during the Late Period characterized by a collapse in populations of high-yield mammalian fauna and sturgeon and an increase of lower rank resources such as mussels in archaeological deposits (Broughton 1994b:372, 1997:857).

Shell artifacts (Table 5.9) recovered from MRN-114, MRN-115, and MRN-328 offer support for the timing and intensity of mussel shell harvests in existence prior to Spanish entry into the San Francisco Bay. Although I present a more fine-grained chronometric analysis in the following chapter, clamshell disk beads recovered from the surface of MRN-328 are exemplary of Late Period Phase 2 (A.D. 1500 to 1800) shell artifacts in central California (Milliken et al. 2007:117) (Figure 5.2). At this time, growing human populations and social realignments gave way to intense exchange relationships whereby access to and procurement of particular resources was restricted (Jackson and Ericson 1994:394). Jackson and Ericson (1994:394) add "most California societies probably interacted through high-status politico-economic mediators who organized and manipulated intergroup trade using shell bead exchange media." As documented more recently (Baker 1992; Collier and Thalman 1996:126), some clam beds (especially,

Figure 5.2. Shell artifacts from MRN-114, MRN-115, and MRN-328. Top: *A. rufescens* fragment (MRN-328; Cat # 7/26/07-5). Bottom, from L to R: *A. rufescens* ornament (MRN-115; PAHMA, Cat # 1-98009), clamshell disk bead (MRN-328; Cat#7/25/07-4), clamshell disk bead (MRN-328; Cat#1/29/07-2), *C. biplicata* fragment and columella (MRN-114; both Cat# 7/18/08-1), and *C. biplicata* fragment (MRN-328; Cat# 7/24/07-7).

Saxidomus nuttalli) were privately owned and clamshell beads formed the cornerstone of most economic transactions in Coast Miwok lands.

Table 5.9. Shell artifacts recovered from MRN-114, MRN-115, and MRN-328.

Site	Unit	Provenience	Length (cm)	Width (cm)	Thickness (cm)	Weight (g)
MRN-114						
Callianax biplicata[a] fragment	1078N/1056E	0-20 cm	1.47	0.76		0.24
Callianax biplicata columella	1078N/1056E	0-20 cm	1.50	0.70		0.26
MRN-115						
Abalone rufescens ornament	House pit 7	Surface	1.64	1.35	0.16	0.51
MRN-328						
Abalone rufescens fragment	N989/E1004	Surface	6.28	4.77		20.60
Callianax biplicata fragment	N963/E983	Surface	1.65	1.26		0.58
Clamshell disk bead	N/A	Surface	0.72[b]		0.26	0.20
Clamshell disk bead	N974/E994	Surface	0.71[b]		0.22	0.17

[a]Formerly *Olivella biplicata*
[b]Bead diameter

Removed from a house pit during Meighan's excavation of the MRN-115, the abalone ornament is similar in size and form to those recovered from Late Period deposits in other central Californian sites (Beardsley 1948), and also bears striking resemblance to abalone adornments found on ethnographically recorded flicker feather headbands (Gifford 1947:23) and basketry in central California (Shanks 2006). The abalone spire fragment found on the surface of MRN-328 resembles those described by Gifford (1947:7, 44), and its straight edges might be indicative of an unfinished ornament or a small dish for pigments, adhesives, or food. Furthermore, while no "*Olivella*" beads were recovered during field operations at China Camp, the *Callianax biplicata* fragments from MRN-114 and MRN-328 are suggestive of native diet and possibly the early stages of bead manufacture in which blanks may have been created and exchanged inland.

In sum, shell artifacts from MRN-114, MRN-115, and MRN-328 are indicative of Late Period Phase 2 occupations at each site. The shellfish assemblage hints at a period of time marked by environmental change, regional growth in hunting and gathering populations, as well as subsequent social changes including territorial circumscription and the solidification of exchange networks that spanned the Marin Peninsula and facilitated the movement of goods—abalone ornaments, clamshell disk beads, and stores of food—and ideas.

Lithics

Lithic tools are documented in nearly every indigenous archaeological context in California. In particular, fire-cracked rock (FCR), groundstone tools, and flaked stone of either chert or obsidian are found within most shell mounds and midden deposits in the San Francisco Bay area, including those sites located on the Marin Peninsula. Focus on lithic artifacts from

MRN-114, MRN-115, and MRN-328 addresses my fourth expectation presented in Chapter Three, namely the continuity in material culture pre and post-contact. Specifically, my study of lithic raw material choice and tool manufacturing techniques will help address and reevaluate "prehistoric" shell mounds as places of colonial encounter.

Geologic & Ethnographic Context

The Marin Peninsula is composed of two primary geological basement complexes—the Franciscan and Salinian—which divide the peninsula in half and are reflected in the variety of rocks found on either side of the San Andreas Fault. Rocks found east of the San Andreas Fault include those in the Franciscan basement, namely basalt, radiolarian chert of various hues, graywacke, and serpentinite—a metamorphic rock (Sloan 2006:49-62). Plutonic (igneous) granites are included in the Salinian basement, which is found west of the San Andreas Fault on the Point Reyes Peninsula (Sloan 2006:68-70). Sedimentary fill from the past 65 million years of transition from a marine to terrestrial environment and tertiary volcanic rocks—such as obsidian—contribute to the unique terrain of the San Francisco Bay area, and is also reflected in lithic assemblages recovered from Marin archaeological sites. Furthermore, Coast Miwok did not solely procure locally available raw materials for their stone tools, rather exchange networks brought lithic materials and other goods from distant regions of California, such as steatite (soapstone) imported from the north Coast Ranges and Sierra Nevada range (Heizer 1951:40).

Ethnographically, an array of lithic materials was employed for hunting, processing, and ceremonial activities among California Indians. Chunks of basalt, greywacke, and other sandstones were likely used as hearth enclosures and to create earth ovens for roasting meat, nuts, and roots. Tom Smith recalled that by aligning rocks in this fashion people could "cook anything this way" (Collier and Thalman 1996:149), and FCR—the angular, fragmented remains of heated rocks—is prevalent within many archaeological sites in California and at other locations along the Pacific Coast (Latas 1992:211). Groundstone implements were used in a suite of processing tasks, most notably the use of mortar and pestle to grind seeds, produce pigments, to create poultices for wounds, and—with a basket hopper—pound acorn (Collier and Thalman 1996).

Regarding flaked stone tools, chert—a cryptocrystalline sedimentary rock—breaks predictably when worked into stone tools and its durability makes chert tools widely used for a variety of processing tasks among Bay Area hunter-gatherers. Chert was also procured locally from quarries found at many sources on the eastern Marin Peninsula, but compared to its frequent description in the archaeological literature it is not widely acknowledged in ethnographic sources for Coast Miwoks. This is perhaps representative of the confusion surrounding classification of chert, and the use of the word "chert" to describe several rock types (Luedtke 1992). Regarding the Coast Miwok, there is brief mention of "green stone" gathered near the mouth of the Russian River and its use for knives and drills "to bring out fire" and to create clamshell disk beads (Collier and Thalman 1996:13, 191), but "green stone" could refer to either chert or serpentinite. Yet, despite the availability of local cherts on the Marin Peninsula, a comparatively greater number of quotidian and ceremonial practices were seemingly accomplished using obsidian.

Several obsidian sources exist in the north San Francisco Bay area. Although obsidian is mentioned ethnographically as only being procured directly from Lake County (Collier and Thalman 1996:189), as I examine in the next chapter chemical sourcing of obsidian recovered from archaeological contexts on the Marin Peninsula demonstrates acquisition of obsidian primarily from Annadel and Napa Glass Mountain sources (Jackson 1986). According to Tom Smith, obsidian for projectile points was collected from the source where it was broken into smaller pieces and then carried back to be "worked in the hand… with no skin protector" (Collier and Thalman 1996:189). Direct percussion using a hammerstone and bipolar percussion (hammer and anvil) was probably employed to produce workable flakes, which could then be further shaped into projectile points, knives, and other forms using antler pressure flakers. In addition to its role in hunting, gathering, and processing tasks, obsidian was also a key component of Coast Miwok ceremonial practices. As cutting tools to open wounds during sucking rituals, obsidian blades feature prominently in Coast Miwok curing ceremonies but could also be sources of poisoning when handled incorrectly (Collier and Thalman 1996:362, 366, 371, 375, 397). Evidenced by the presence of obsidian in Tom Smith's medicine bag (Kelly 1978:420) and archaeological examples such as large bifaces in the MRN-115 collection and an obsidian crucifix excavated from nearby MRN-138 (Slaymaker 1974), obsidian contained profound spiritual properties beyond its physical manipulation into practical tools.

Lithic Analysis

Before examining the lithic assemblage from MRN-114, MRN-115, and MRN-328 as a whole, I focus first on artifact patterning that could potentially be associated with different recovery methods or actual differences in site use. Examining assemblages of FCR, groundstone, and flaked stone from systematic surface collections at all three shell mounds (Table 5.10), MRN-115 holds higher counts of all three lithic categories probably because more units were collected from this larger site. Moderate counts of FCR, groundstone, and flaked stone were collected from the surface of MRN-328 and the lowest counts are from MRN-114. This patterning may be due to the relative seclusion of MRN-328; more trampling or casual collection at MRN-114, which is located closer to the main park road; or actual differences in site use by shell mound dwellers.

Table 5.10. Counts and densities (per square meter) of FCR, groundstone, and flaked stone from surface collection units.

	MRN-114		**MRN-115**		**MRN-328**		***Total***
FCR	156	6.00	918	15.83	373	11.3	1447
Flaked Stone	16	0.62	31	0.53	23	0.70	70
Groundstone	0	0.00	9	0.16	11	0.33	20
Other	2	0.08	21	0.36	5	0.15	28
Total	174		979		412		1565

Detailed analysis of specific lithic artifact types collected from auger and excavation units reveal additional patterns. Angular shatter collected from auger units at MRN-328 is three times the amount collected from MRN-114, and twice as many bifacial thinning flakes were collected from MRN-328 compared to MRN-114 (Table 5.11). Furthermore, higher counts of these two lithic artifact types appear in upper 20 centimeters of MRN-114 and in 20 to 40 centimeters and 60 to 80 centimeters at MRN-328. This could reflect actual differences in site use, specifically the location of lithic workshops and alternating cycles of use and abandonment of smaller satellite shell mounds. No noticeable patterns could be distinguished for groundstone

Table 5.11. Summary of lithic artifact types (flaked stone and groundstone) collected from auger test units.

	MRN-114						MRN-328					
	0-20 cm	20-40 cm	40-60 cm	60-80 cm	80-100 cm	*Total*	0-20 cm	20-40 cm	40-60 cm	60-80 cm	80-100 cm	*Total*
Flaked Stone												
Angular shatter	5	2	2	1	2	12	2	10	4	10	1	27
Biface tool	0	0	0	0	0	0	1	0	0	0	0	1
Bifacial thinning flake	1	1	0	0	0	2	2	0	1	3	0	6
Core	0	0	0	0	1	1	0	1	0	0	0	1
Core tool	0	0	0	0	0	0	0	0	0	0	0	0
Flake tool	3	1	3	2	1	10	1	2	4	0	0	7
Groundstone												
Charmstone	0	0	0	0	0	0	0	0	0	0	0	0
Fire-cracked groundstone	0	0	0	0	0	0	0	0	0	0	0	0
Milling handstone	0	0	0	0	0	0	0	0	0	0	0	0
Milling handstone fragment	0	0	0	0	0	0	0	0	0	0	0	0
Mortar fragment	0	0	0	0	0	0	0	0	0	0	0	0
Other	1	0	0	0	0	1	0	0	1	1	0	2
Pestle	0	0	0	0	0	0	0	0	0	0	0	0
Pestle fragment	0	0	0	0	0	0	0	0	0	0	0	0
Total	10	4	5	3	4	26	6	13	10	14	1	44

Table 5.12. Summary of lithic artifacts collected from excavation units at MRN-114, and from those excavated at MRN-115 in 1949.

MRN-114	0-10 cm	10-20 cm	20-30 cm	0-20 cm	20-30 cm	30-40 cm	40-50 cm	50-60 cm	*Total*
Flaked Stone									
Angular shatter	2	1	0	4	5	1	2	5	20
Biface tool	0	0	0	0	1	0	0	0	1
Bifacial thinning flake	0	0	0	0	0	0	0	2	2
Core	0	1	0	0	0	0	0	0	1
Core tool	0	0	0	0	0	0	1	0	1
Flake tool	3	1	0	1	2	3	1	1	12
Groundstone									
Charmstone	0	0	0	0	0	0	0	0	0
Fire-cracked groundstone	1	0	0	0	0	0	0	0	1
Milling handstone	0	0	0	0	0	0	0	0	0
Milling handstone fragment	0	0	0	0	0	0	0	0	0
Mortar fragment	0	0	0	0	0	0	0	0	0
Other	0	1	0	0	1	1	0	0	3
Pestle	0	0	0	0	1	0	0	0	1
Pestle fragment	0	0	0	0	0	0	0	0	0
Total	6	4	0	5	10	5	4	8	42

Table 5.12. Summary of lithic artifacts collected from excavation units at MRN-114, and from those excavated at MRN-115 in 1949 (continued).

MRN-115	0-20 cm	20-40 cm	40-60 cm	60-80 cm	80-100 cm	100+ cm	*Total*
Flaked Stone							
Angular shatter	0	0	0	0	0	0	0
Biface tool	0	1	0	0	0	4	5
Bifacial thinning flake	0	0	0	0	0	0	0
Core	1	0	0	0	0	2	3
Core tool	0	0	0	0	0	1	1
Flake tool	1	0	0	0	0	1	2
Groundstone							
Charmstone	0	0	0	0	0	2	2
Fire-cracked groundstone	0	0	0	0	0	0	0
Milling handstone	0	0	1	0	0	0	1
Milling handstone fragment	0	0	0	0	0	0	0
Mortar fragment	0	0	0	0	0	0	0
Other	0	0	1	0	0	0	1
Pestle	1	0	0	0	0	0	1
Pestle fragment	0	0	0	0	0	2	2
Total	3	1	2	0	0	12	18

collected from auger units, and the relatively small amount of groundstone collected in auger units compared to excavations at MRN-114 and MRN-115 probably reflect size restrictions related to the auger bucket.

A noticeable difference in counts of angular shatter and flake tools is seen when examining lithic artifacts from excavations at MRN-114 and MRN-115 (Table 5.12). Specifically, twenty pieces of angular shatter were recovered from MRN-114—compared to none from MRN-115—and twelve flake tools were collected from MRN-114, as opposed to two flake tools collected from MRN-115 in 1949. This patterning probably reflects differences in recovery methods, specifically the absence of screening and limited collection of smaller lithic artifacts at MRN-115. The pattern could also reflect differences in site use, whereby MRN-114—and MRN-328 based on counts of angular shatter and bifacial thinning flakes collected from auger units—may have functioned more as a lithic workshop or processing areas. Greater densities of flaked stone from MRN-114 and MRN-328 and more charmstones and bifacial tools from MRN-115—where several house pits were recorded—support this second possibility that MRN-115 may have functioned primarily as a residential site. Future work will focus on examining whether there are real differences between site function, or whether differences appear as the result of sample size and recovery methods.

Analysis of the total lithic assemblage from the three shell mounds provides important information on changes and continuities in lithic practices through time. Compared to other shell mound sites in the north San Francisco Bay area (Luby et al. 2006:207), the lithic assemblage from MRN-114, MRN-115, and MRN-328 is composed of a high percentage of FCR, followed by comparatively smaller quantities of flaked stone and groundstone tools. The combined lithic assemblage from MRN-114, MRN-115, and MRN-328 amounts to 2873 lithic artifacts, or 37 (1%) groundstone artifacts, 231 (8%) flaked stone artifacts, and 2605 (91%) pieces of FCR. Figure 5.3 shows a visual representation of this distribution. It is important to remember that artifact counts for MRN-115 reflect materials collected only from the surface of the site, but I believe the high proportion of FCR at MRN-115 is illustrative of the mound's internal composition.

Additional lithic artifacts in the CCAP lithic assemblage include a mica fragment from MRN-115, unworked chert nodules, a red ochre nodule from MRN-115, and small polished rocks, which may have been attached inadvertently to mussel byssus and carried back to the sites after collection. Ground stone artifacts are made from basalt, sandstone, and steatite. Polished steatite artifacts include a plummet ("charmstone") and labret from MRN-115 and a pipe bowl fragment collected from MRN-328 in 2008. Due to the accumulated weight of FCR from the three mounds, FCR from surface collection, auger, and excavation units was weighed and counted in the field and then returned to each unit. Laboratory analysis of lithic artifacts thus focused solely on groundstone and flaked stone, which are summarized by site in Figure 5.4. All three shell mounds yield higher percentages of flaked stone versus groundstone.

Groundstone Tools Surface collections, auger testing, and targeted excavations at MRN-114, MRN-115, and MRN-328 produced a small (n=37) assemblage of groundstone tools, 11 of which are presently in the MRN-115 museum collection. Over 50% of the groundstone tools are manufactured from basalt, but sandstone and steatite artifacts are also present. Artifact types include charmstones (CH); fire-cracked groundstone (FG); milling handstones (MH); a milling handstone fragment (MHF); a mortar fragment (MOF); pestles (PE) and pestle fragments (PEF); and other types (OT) (Figure 5.5; Table 5.13). Table 5.14 shows the distribution of groundstone artifact types by depth at each site. Most are found within the upper 40 centimeters

Figure 5.3. Percentages of FCR, groundstone, and flaked stone artifacts at MRN-114, MRN-115, and MRN-328.

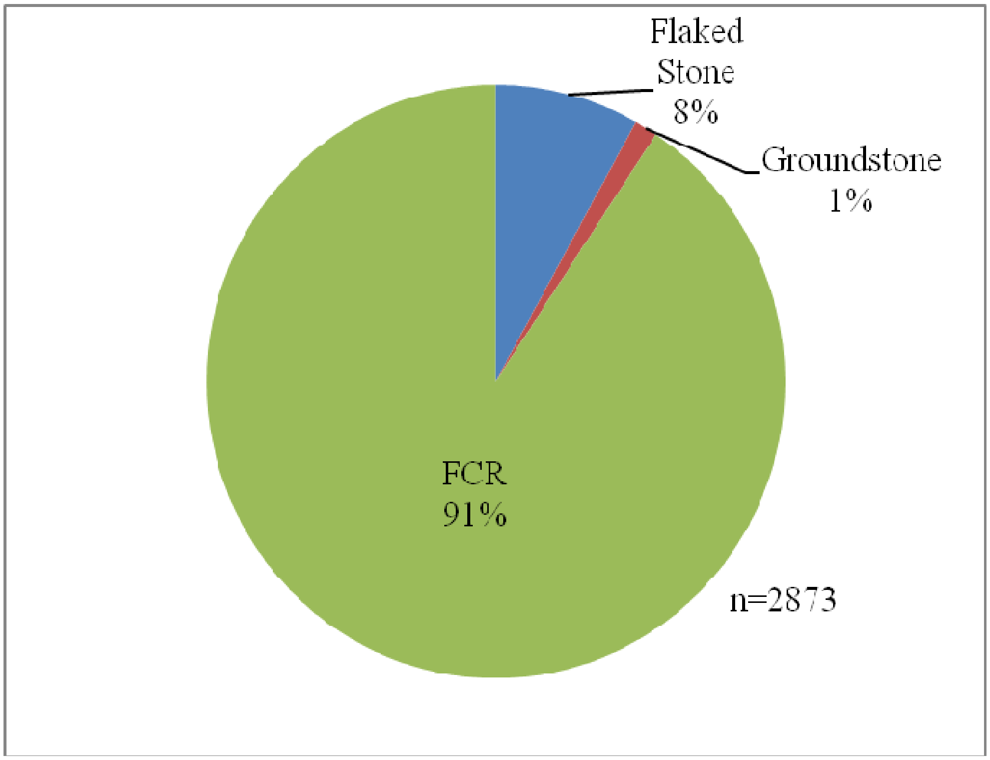


Figure 5.4. Counts of groundstone and flaked stone at MRN-114, MRN-115, and MRN-328.

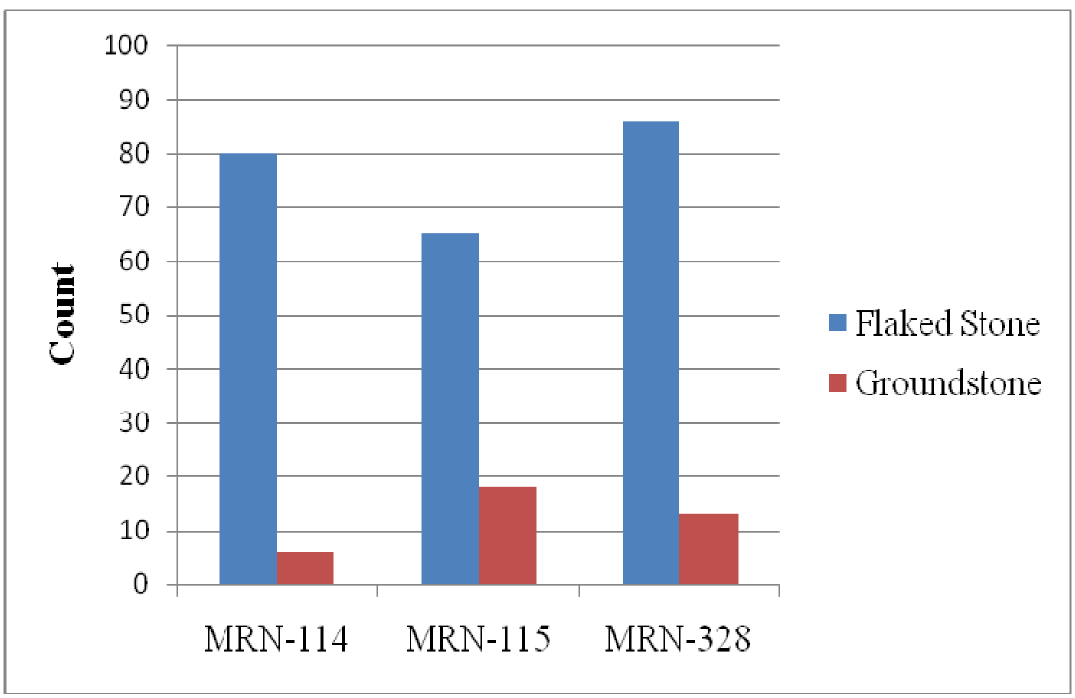


Figure 5.5. Distribution of groundstone artifact types by site.

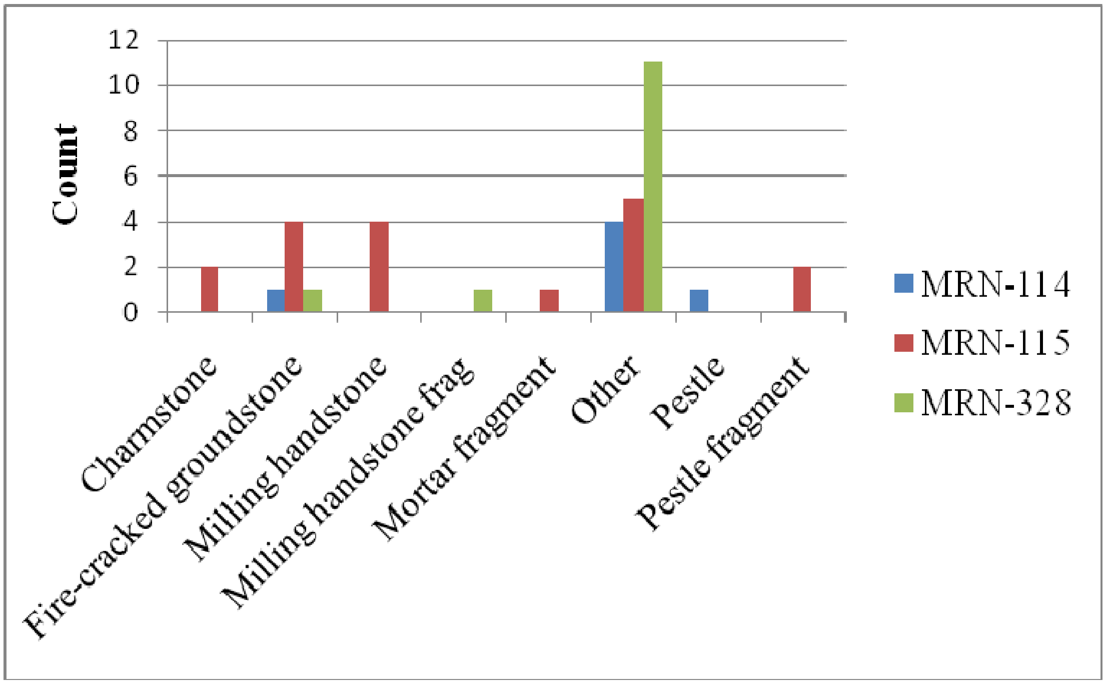


Table 5.13. Groundstone artifact types by site.

Groundstone Artifact	MRN-114	MRN-115	MRN-328	Total
Charmstone (CH)	0	2	0	2
Fire-cracked groundstone (FG)	1	4	1	6
Milling handstone (MH)	0	4	0	4
Milling handstone fragment (MHF)	0	0	1	1
Mortar fragment (MOF)	0	1	0	1
Other (OT)	4	5	11	20
Pestle (PE)	1	0	0	1
Pestle fragment (PEF)	0	2	0	2
Total	6	18	13	37

of each shell mound, with smaller amounts found between 40 and 80 centimeters. In the absence of multiple excavation blocks, use of a 10 centimeter (four inch) bucket auger at MRN-114 and MRN-328 prevented extraction of larger pieces of groundstone beyond 20 centimeters in depth. Groundstone tools range in size between two and 14 centimeters in length, and they weigh between a few grams to upwards of 700 grams for those artifacts excavated from MRN-115. The mean weight is 121.11 grams (with a standard deviation [σ] of 180.98), and the mean groundstone tool length is 5.40 centimeters (σ 3.03).

The greatest number and diversity of groundstone tools are associated with MRN-115, and is considered an indication of the array of activities that took place at mounded villages (Lightfoot and Luby 2002), but may also be representative of differences in sampling strategies and the amount excavation accomplished in 1949 versus my field investigations. Several fragments of fire-cracked groundstone were also collected, and suggest reuse of expired tools in other processing activities. One Coast Miwok elder recalled burying large grinding mortars before moving on seasonal rounds (Collier and Thalman 1996:118). Despite this practical decision, periodic departures and returns may have resulted in the loss of some buried groundstone implements or their inadvertent reuse in an earth oven or fire hearth.

While the small groundstone assemblage is dominated by unidentifiable and fire-cracked groundstone, it also reflects aspects of subsistence technology. Items associated with the preparation of vegetal remains include one pestle excavated from MRN-114 and two pestle fragments from MRN-115, as well as three milling handstones from MRN-115 and a single mortar fragment without vertical provenience. The pestles are similar in form to those associated with hopper mortars, which are typically associated with Late Period archaeological components and ethnographically for pounding acorn into meal (Milliken et al. 2007). Multiple milling handstones are further evidence of food processing activities, such as grinding plant seeds or protein into pastes. One handstone (PAHMA, Cat # 1-127950) is ovoid in form, while two additional handstones collected from the surface of MRN-115 are more amorphous and may have also been utilized as pestles.

Additional groundstone types include charmstones and steatite artifacts. The MRN-115 museum collection contains two charmstones: one created from steatite (PAHMA, Cat # 1-127880) and the other made of granite (PAHMA, Cat # 1-127869). The later is an earlier form associated with Middle Period components, and is generally pyriform with a short stem (Beardsley 1948:13). Its battered surface is similar to other charmstones recovered from coastal sites, and is associated with "rough practical uses" such as when attached to nets as sinkers for net-fishing (Beardsley 1948:13). The steatite charmstone is similar to asymmetric spindle forms associated with the Late Period, although this time period is also characterized by a range of charmstone forms including long-tapered forms and phallic forms (Beardsley 1948). Asphaltum and linear impressions are also visible on the stem of this charmstone, suggesting it functioned as a weight (see also Nelson 1910:388).

Additional steatite artifacts recovered from MRN-114, MRN-115, and MRN-328, include a steatite "labret" (PAHMA, Cat # 1-127891, Meighan 1953) similar to those recovered from MRN-20 (McGeein and Mueller 1955); two nodules from MRN-114, one of which is polished, D-shaped, and broken off on one end; and—excavated from MRN-328—what appears to be an unfinished pipe fragment with a conical bowl and borehole on the opposite end. "Long, tubular, steatite pipes" appear in greater frequency during the Late Period, and the pipe bowl from MRN-328 is strikingly similar to those removed from the upper deposits of nearby shell mounds (e.g., Uhle 1907:57-59). Commenting on the small size of one of the pipes excavated from the Emeryville shell mound, Uhle (1907:58) theorizes "it seems to have been more of a miniature or toy than an article in common use." Had the pipe from MRN-328 been completed, a reed mouthpiece might have been attached to the bowl using asphaltum (Collier and Thalman 1996:152; Powers 1976 [1877], Figure 43; Uhle 1907:58), and despite Uhle's skepticism the pipe and strong tobacco would have worked well. As Tom Smith recalled, "the first time I smoked with other boys. We went in the sweathouse… one man there had a pipe. All the boys tried it. I got drunk, couldn't walk straight" (Collier and Thalman 1996:152).

Table 5.14. Distribution of groundstone artifact types by depth at MRN-114, MRN-115, and MRN-328.

	Depth (cm)	**CH**	**FG**	**MH**	**MHF**	**MOF**	**OT**	**PE**	**PEF**	**Total**
MRN-114	0-20	0	1	0	0	0	1	0	0	2
	20-40	0	0	0	0	0	3	1	0	4
	40-60	0	0	0	0	0	0	0	0	0
	60-80	0	0	0	0	0	0	0	0	0
	80-100	0	0	0	0	0	0	0	0	0
MRN-115	0-20	0	4	3	0	0	3	1	0	11
	20-40	0	0	0	0	0	1	0	0	1
	40-60	0	0	0	0	0	0	0	1	1
	60-80	1	0	0	0	0	0	0	0	1
	80-100	1	0	0	0	0	0	0	1	2
	> 100	0	0	0	0	0	0	0	0	0
MRN-328	0-20	0	1	0	1	0	9	0	0	11
	20-40	0	0	0	0	0	0	0	0	0
	40-60	0	0	0	0	0	1	0	0	1
	60-80	0	0	0	0	0	1	0	0	1
	80-100	0	0	0	0	0	0	0	0	0
Total		2	6	3	1	0	19	2	2	35

CH = Charmstone
FG = Fire-cracked groundstone
MH = Milling handstone
MHF = Milling handstone fragment
MOF = Mortar fragment
OT = Other
PE = Pestle
PEF = Pestle fragment

Flaked Stone Artifacts Analysis of flaked stone was conducted to identify changes and continuities in raw material choice and tool manufacturing techniques among Coast Miwok before and after Spanish settlement in the Bay Area. Specifically, methods of lithic reduction—as human behaviors—are patterned, culturally determined, and reflected in the archaeological record (Flenniken 1985). Furthermore, the specific methods of lithic reduction selected and learned by individuals is understood as an extension of skill, and tools are at once bearers of social information and symbolic of continuities in technological (and cultural) traditions (Flenniken 1985; Wiessner 1983). To this end, two categories of analysis were selected for studying the lithic assemblage: *typological analysis*, which determines the stages within a stone tool reduction sequence, and *attribute analysis* in which metric and morphological attributes of flaked stone— length, width, weight, edge modification, striking platform attributes—are studied (Andrefsky 2005). Determination of raw material type was also conducted to track changes in raw material usage through time and to make generalizations about resource procurement within the broader Marin landscape.

Andrefsky's (2005) chipped stone typology served as a guide to aid identifications of flaked stone (n=231) collected from MRN-114, MRN-115, and MRN-328. Artifact types within the study assemblage include: angular shatter (51%), biface tools (5%), bifacial thinning flakes (6%), cores (5%), core tools (3%), and flake tools (30%) (Table 5.15). Angular shatter (AS) is defined as lithic material with irregular dimensions created as byproduct from the process of tool manufacture. A biface (BI) is "a tool that has two surfaces (faces) that meet to form a single

Table 5.15. Flaked stone artifact types by site.

Flaked stone	MRN-114	MRN-115	MRN-328	Total	%
Angular shatter (AS)	40	23	55	118	51
Biface tool (BI)	1	9	2	12	5
Bifacial thinning flake (BTF)	7	0	7	14	6
Core (CORE)	3	7	2	12	5
Core tool (CT)	2	3	1	6	3
Flake tool (FT)	27	23	19	69	30
Total	80	65	86	231	100

edge that circumscribes the tool. Both faces usually contain flake scars that travel at least half-way across the face" (Andrefsky 2005:253). Projectile points are classified as "bifacial tools" in the present study, and are discussed more closely below. Bifacial thinning flakes (BTF) are created in the process of creating bifacial tools, and they are the "detached pieces from bifaces for the purpose of trimming the face of the objective piece" (Andrefsky 2005:123). Thinning flakes range in size depending on the stage of reduction, and the use of larger mesh sizes for screening archaeological soils can often lose smaller thinning flakes and impact interpretations about a particular site. For example, the prevalence of formal lithic tools in the MRN-115 museum collection—compared to flake debitage—is a direct reflection of mid-twentieth century excavation and screening methods (e.g., Meighan 1950a). Cores (CORE) are "objective pieces which are primarily used as sources of raw material" (Andrefsky 2005:144), and core tools (CT) show evidence of use aside from its function as a source of detached flakes. Finally, a flake tool (FT) shows evidence of modification or use-wear (Andrefsky 2005:255). Figures 5.6 and 5.7 show the distribution of these flaked stone artifact types by site.

Figure 5.6. Distribution of flaked stone raw material by site.

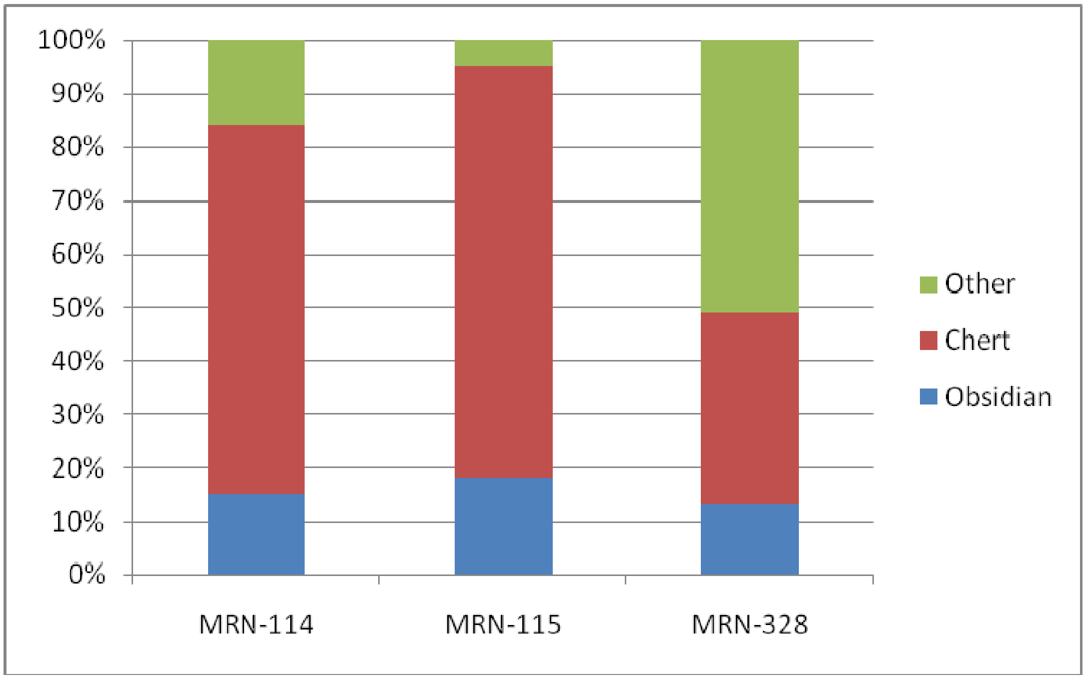


Figure 5.7. Distribution of flaked stone artifact type by site.

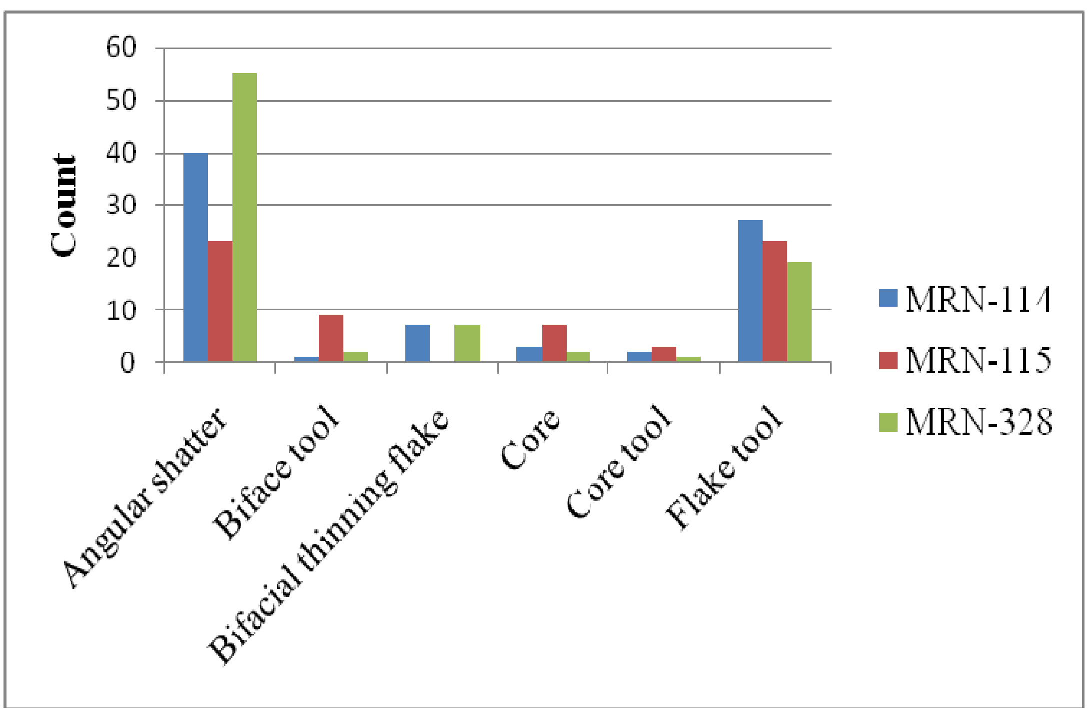


Table 5.17. Distribution of flaked stone artifact types by depth at MRN-114, MRN-115, and MRN-328.

	Depth (cm)	AS	BI	BTF	CORE	CT	FT	Total
MRN-114	0-20	19	0	4	1	1	12	37
	20-40	9	1	1	1	0	7	19
	40-60	9	0	2	0	1	5	17
	60-80	1	0	0	0	0	2	3
	80-100	2	0	0	1	0	1	4
MRN-115	0-20	22	1	0	5	0	7	35
	20-40	0	1	0	0	0	0	1
	40-60	0	0	0	0	0	0	0
	60-80	0	0	0	0	0	0	0
	80-100	0	0	0	0	0	0	0
	> 100	0	4	0	2	1	1	8
MRN-328	0-20	30	2	3	1	1	13	50
	20-40	10	0	0	1	2	0	13
	40-60	4	0	1	0	0	4	9
	60-80	10	0	3	0	0	0	13
	80-100	1	0	0	0	0	0	1
Total		117	9	14	12	6	52	210

AS = Angular shatter
BI = Biface tool
BTF = Bifacial thinning flake
CORE = Core
CT = Core tool
FT = Flake tool

Table 5.16. Counts and percentages of flaked stone raw material by site.

	Obsidian	**Chert**	**Other**	**Total**
MRN-114	12	55	13	80
MRN-115	12	50	3	65
MRN-328	11	31	44	86
Total	35	136	60	231
	Obsidian	**Chert**	**Other**	**Total**
MRN-114	15%	69%	16%	100%
MRN-115	18%	77%	5%	100%
MRN-328	13%	36%	51%	100%

Chert artifacts constitute approximately 59 percent of the total flaked stone assemblage, followed by smaller amounts of obsidian (15%) and other raw material suitable for flaking (26%). Bearing in mind differences in sampling strategies, Table 5.16 summarizes percentages of flaked stone raw material types by site. The majority of flaked stone artifacts from MRN-114 and MRN-115 are chert, while a greater percentage of other workable material was collected from MRN-328. Obsidian is the least common raw material at all three shell mounds. When examining quantities of obsidian, chert, and other flaked stone artifacts per unit of depth, the majority of flaked stone is found in the upper 20 centimeters of each site with a decreasing linear trend below 20 centimeters (Table 5.17). When examining only data from MRN-114 and MRN-328, flaked stone artifacts are found consistently in each 20 centimeter stratum, although they again drop off below 80 centimeters. Calculated percentages of each artifact type created from either chert, obsidian, or other raw material reveal a preference for obsidian to create bifacial tools and chert for the production of expedient tools for processing tasks (Table 5.18). This may be an affirmation of the kinds of activities that took place at the shell mounds over time, as much as an indication of the workability of particular kinds of raw materials for certain tool types. That is, angular shatter and flake tools are manufactured predominately from chert and appear in large numbers at the surfaces and upper 20 centimeters of each shell mound suggesting more recent emphasis on food processing using tools manufactured locally.

Table 5.18. Counts and percentages of artifact type manufactured from chert, obsidian, or another material.

Artifact	**Chert**		**Obsidian**		**Other**	
Angular shatter	70	60%	5	4%	43	36%
Biface tool	0	0%	11	92%	1	8%
Bifacial thinning flake	5	36%	9	64%	0	0%
Core	10	83%	2	17%	0	0%
Core tool	6	100%	0	0%	0	0%
Flake tool	45	65%	8	12%	16	23%

Table 5.19. Flaked stone metric data, summarizing means and standard deviations of maximum length, maximum width, maximum midline thickness, and weight.

Artifact	Max Length (cm)	Max Width (cm)	Midline Thickness (cm)	Weight (g)
Angular shatter	2.40 (σ1.04)	1.65 (σ0.79)	0.36 (σ0.00)	6.69 (σ14.22)
Biface tool	5.06 (σ2.32)	2.24 (σ1.35)	0.94 (σ0.83)	18.28 (σ36.42)
Bifacial thinning flake	0.65 (σ0.29)	0.68 (σ0.38)	0.18 (σ0.08)	0.08 (σ0.10)
Core	3.72 (σ1.00)	3.13 (σ1.12)		37.64 (σ35.74)
Core tool	4.01 (σ1.29)	3.16 (σ0.91)		26.44 (σ28.92)
Flake tool	3.03 (σ1.26)	2.76 (σ1.11)	0.86 (σ0.49)	9.73 (σ11.28)

As part of the attribute analysis, maximum length, maximum width, midline thickness, and weight were measured for all flaked stone artifacts. Means and standard deviations for these metric variables were calculated for each artifact type and are presented in Table 5.19. As expected, cores and core tools are generally larger and heavier than other lithic tool types excavated from the shell mounds. A closer inspection of flake attributes focused on flake tool morphology, specifically flake termination and striking platform type, width, and thickness. Flake termination "is the condition or character of the distal end of detached pieces" and is a reflection of the percussion technique used to manufacture flaked stone (Andrefsky 2005:87), as well as a proxy for understanding the proficiency of flintknappers. Flake terminations evident in the CCAP lithic assemblage are either feathered, stepped, or hinged depending on the force used to create the flake. Smooth flake terminations that cleanly shear off are called feathered; rounded terminations are called hinge terminations; and when a flake snaps off during removal it leaves a stepped termination (Andrefsky 2005:87-89). Examining termination with respect to raw material, 36 percent (n=17) of chert artifacts exhibit feathered terminations, followed by 23 percent (n=11) hinged and 41 percent (n=19) stepped. For obsidian artifacts, 27 percent (n=4) show a feathered termination, 33 percent (n=5) reveal a hinged termination, and 40 percent (n=6) have a stepped termination. Evidence of thermal alteration is shown indirectly by the high frequency of feathered terminations found on chert flake tools, which typically are more difficult to produce because of inconsistencies in the way chert fractures (Parsons 1987; Whittaker 1994:73). High frequencies of all three terminations visible on obsidian flake tools may reflect a manufacturing technique similar to one used for producing chert tools. Specifically, the strong force required to detach chert flakes may have been applied unnecessarily to more-brittle obsidian resulting in high occurrences of hinged and stepped fractures. This could be attributed to unfamiliarity with the material, either because of its infrequent use or because of the experience of the knapper.

Platform type—complex, cortical, or flat—and platform width and thickness are additional indicators of platform preparation for producing flakes, the stage of tool manufacture, and the kind of hammer used to produce flakes (Andrefsky 2005:89-90) . Platforms with multiple flake scars—an indication of platform preparation—are considered complex; cortical platforms show unmodified cortical surface on the flake platform and indicate minimal core preparation for producing flakes; and flat platforms are recognized by flat surfaces often produced as the result of detaching flakes from non-bifacial tools (Andrefsky 2005:94-98). Over

60 percent (n=39) of flake tools from the three shell mounds exhibit flat platforms, followed by cortical platforms (n=18; 29%) and complex platforms (n=5; 8%). By depth, cortical and complex platforms appear more recently and flat platforms appear consistently throughout deposits at MRN-114 and MRN-328. Mean platform width and thickness of flakes (bifacial thinning flakes and flake tools) was also calculated (Table 5.20). The trend for both variables reveals an increase in platform width and thickness, which could indicate fewer experienced knappers or simply reflect the increased role of chert in lithic tool production. Generally, however, striking platform width appears to correlate with the size of debitage produced from various stages of reduction (Andrefsky 2005:90), where larger platforms indicate initial stages of reduction.

Table 5.20. Mean flake platform measurements (with standard deviations) and dorsal cortex and scar calculations.

	Depth (cm)	Platform Width (cm)	Platform Thickness (cm)	Avg. Dorsal Cortex Score	Avg. Dorsal Flake Scar Score
MRN-114	0-20	1.46 (σ1.10)	0.68 (σ0.71)	0.857	1.357
	20-40	1.37 (σ1.20)	0.62 (σ0.52)	0.857	1.667
	40-60	1.58 (σ1.01)	0.70 (σ0.66)	1.200	1.400
	60-80	1.38 (σ0.30)	0.41 (σ0.20)	0.000	1.000
	80-100	1.29 (σ0.00)	0.36 (σ0.00)	0.000	1.000
MRN-115	0-20	1.86 (σ0.83)	0.76 (σ0.34)	1.571	1.285
	20-40	0.00	0.00	0.000	0.000
	40-60	0.00	0.00	0.000	0.000
	60-80	0.00	0.00	0.000	0.000
	80-100	0.00	0.00	0.000	0.000
	> 100	0.00	0.00	0.000	3.000
MRN-328	0-20	1.36 (σ0.86)	0.85 (σ1.36)	0.888	2.444
	20-40	2.23 (σ1.04)	0.59 (σ0.23)	1.000	1.000
	40-60	0.78 (σ0.51)	0.34 (σ0.34)	0.000	2.333
	60-80	0.75 (σ0.74)	0.19 (σ0.08)	0.000	3.000
	80-100	0.00	0.00	0.000	0.000

While bearing in mind both natural and cultural sources of use-wear on lithic tools (Tringham et al. 1974), edge modification of flake tools was determined using a low-power 100X dissecting microscope for ease and speed of identification (Odell and Odell-Vereecken 1980). Fifteen percent (n=34) of the flaked stone assemblage from MRN-114, MRN-115, and MRN-328 exhibited edge modification, and flake tools were organized into two types—unimarginal (generally modified on either one side) or bimarginally modified edge (modified on both the ventral and dorsal surface)—to determine how lithic tools were employed (Andrefsky 2005:79). Of the 34 artifacts, only 17 could be classified as having evidence of unimarginal (n=10) or bimarginal (n=7) retouch. Similarly, all of the core tools show evidence of unimarginal retouch, and all but one of the cores indicate multidirectional reduction (Andrefsky 2005). One obsidian core (PAHMA, Cat # 1-127857) exhibits evidence of bipolar reduction:

often considered a “resource encouraged” behavior where raw materials were either small in size or scarce (Rondeau 1987:41; Shackley 2005:20). That many lithic tools appear to have been produced expeditiously from locally available cherts; that several demonstrate unimarginal retouch; and that at least two chert tools show signs of thermal alteration—a practice known to improve the knapping qualities of chert (Parsons 1987)—suggests local inhabitants maximized the number of useable tools from available resources for an array of processing activities.

Dorsal cortex scores and dorsal scar scores were calculated as part of the typological analysis of flake stone tools to further understand changes in lithic tool manufacturing over time. A “triple cortex” typology is often used to classify lithic debitage as representative of either primary, secondary, or tertiary phases of reduction. As it has not been demonstrated “that flakes with more cortex are necessarily removed earlier in the reduction sequence than flakes with less cortex” (Andrefsky 2005:116), values were assigned to flake tools and bifacial thinning flakes according to percentages of visible dorsal cortex: 0 = no cortex present; 1 = ≤ 50% cortex; 2 = > 50% cortex; 3 = 100% cortex (Andrefsky 2005:107). Once tabulated, the values were then averaged to produce a mean dorsal cortex score per 20 centimeter unit of depth at each site (Table 5.20). At MRN-114 and MRN-328, the mean cortex score is higher than scores for the upper 20 centimeters of each site, but scores on average increase through time in upper deposits at all three sites. A similar scoring system was created for examining dorsal flake scars, such that 0 = no flake scars; 1 = one flake scar; 2 = two flake scars, and 3 = three or more dorsal flake scars. Mean scar scores for flaked stone artifacts at all three shell mounds show an increase in scores over time with averages of approximately one or two dorsal flake removals (Table 5.20). Reflecting the production of expedient, unifacial chert flake tools, dorsal cortex and flake scar scores suggest finished bifacial tools were probably less prevalent in the daily lives of shell mound dwellers.

Projectile Points & Bifacial Tools As discussed above, the lithic assemblage from MRN-114, MRN-115, and MRN-328 contains several flaked stone tools, 12 of which are bifacially worked. Included in this small subassemblage are five obsidian projectile points and a single biface tool manufactured from a material other than obsidian (Figure 5.8). Biface tools underwent an attribute analysis similar to other flaked stone artifacts, but included additional measurements of axial length, neck width, and basal width of projectile points whenever possible following Thomas (1981) with some modification (Table 5.21).

A large biface tool (Cat # 7/18/08-2E) of an unknown material was excavated from 20 to 30 centimeters in Unit 1078N/1056E at MRN-114 (Figure 5.9). While chunky in form, the stone artifact has multiple sharp edges and appears slightly burnished from wear. Furthermore, at least two additional finds within this unit are believed to be associated with the biface tool, including an obsidian flake tool (30 to 40 centimeters) and a navicular-cuboid (hoof bone) from a deer (*Odocoileus hemionus*). The stone-lined hearth feature in this excavation unit was found at 20 to 45 centimeters below surface, while a compacted living surface was recorded directly above the feature (see Chapter 4). Returning to the bifacial tool, it may have functioned as a chopping implement for processing plants and shellfish, and might also have been employed in the service of defleshing deer skins or rubbing deer skins to soften them such as described ethnographically (Collier and Thalman 1996:154).

MRN-115 contains additional biface tools, including one (PAHMA, Cat # 1-127872) described as an “obsidian saw or blade” (Meighan 1953:12). It is not certain whether the tool was used as such, but the appearance of denticulate edges are the result of bimarginal retouch

Figure 5.8. Obsidian artifacts collected from MRN-114, MRN-115, and MRN-328. From L to R: Excelsior (Cat # 7/19/07-9A); unknown point type (Cat # 7/24/07-5); Stockton Notched Leaf (Cat # 7/17/08-1); biface tool (Cat #7/19/08-1).

Table 5.21. Summary of biface tool and projectile point types including metric data.

Site	Provenience	Artifact	Type[a]	CAT #	Max Length (cm)	Max Width (cm)	Midline Thickness (cm)	Weight (g)	Axial Length (cm)	Neck Width (cm)	Basal Width (cm)
MRN-114	20-30 cm	Biface		7/18/08-2E	5.98	6.32	3.48	131.99			
MRN-115	9 in (23 cm)	Proj. Pt.	Rattlesnake Corner Notched	1-127864	3.41	1.41	0.35	1.23	3.41	0.69	
MRN-115	backdirt	Proj. Pt.		1-127852	1.08	1.50	0.40	0.59			1.39
MRN-115		Proj. Pt.		1-127863	2.22	1.53	0.50	1.45	2.19	0.76	0.68
MRN-115	41 in (104 cm)	Biface	CCSC[b]	1-127872	7.20	2.60	1.02	20.93			
MRN-115	72 in (183 cm)	Biface	CCSC	1-127860	6.32	1.61	0.81	8.72			0.78
MRN-115	82 in (208 cm)	Biface	Excelsior	1-127861	8.13	2.19	0.82	14.16			1.00
MRN-115	90 in (229 cm)	Biface	CCSC	1-127918	7.89	2.16	1.09	16.19	7.85		
MRN-115	surface	Biface	CCSC	7/19/07-9A	4.51	2.39	0.80	7.10	4.51	2.39	0.49
MRN-115		Biface	CCSC	1-98007	6.79	2.25	0.89	11.72	6.79	1.58	1.31
MRN-328	0-20 cm	Proj. Pt.	Stockton Notched Leaf	7/17/08-1	3.27	1.29	0.62	2.10	3.27	0.76	1.00
MRN-328	surface	Proj. Pt.		7/24/07-5	3.88	1.68	0.53	3.23	3.88	1.24	1.43

[a]Justice 2002; [b]Coastal Contracting Stem Cluster (CCSC) includes Houx Contracting Stem and Excelsior types

similar to other obsidian bifaces in the MRN-115 assemblage. These include PAHMA, Cat # 1-98007, 1-127860, 1-127861, 1-127918, and one biface—Cat # 7/19/07-9A—collected from the

Figure 5.9. Biface tool (Cat # 7/18/08-2E) from 20-30 cm, Unit 1078N/1056E, MRN-114.

surface of MRN-115. In fact, it is uncertain whether these biface tools were hafted and used as "tools" for daily hunting and processing tasks, and the slender appearance of some appear similar to those in the doctoring kit of Tom Smith (Kelly 1978:420). All are identified as belonging to the Coastal Contracting Stem Cluster, which includes Houx Contracting Stem and Excelsior types: prevalent point types in the North Coast Ranges and north San Francisco Bay area (see Maps 27 & 28 in Justice 2002:267, 274). Justice (2002:265) describes the blade of Houx Contracting Stem as "basically straight with slight variation from excurvate to incurvate… [while] the base of the haft typically varies between pointed and rounded contours joining the contracting lateral margins that taper to the base and the edges are even and aligned with the blade edges." Excelsior points are described as "essentially a lanceolate or leaf-shaped from with basal variation ranging from convex to pointed and often lacking noticeable demarcation between haft and blade" (Justice 2002:269). Houx Contracting Stem points range from 2500 B.C. to A.D. 500, and Excelsior points date from 2000 B.C. to A.D. 500 (Justice 2002:266, 271).

Two obsidian projectile points—Cat # 7/24/07-5 and 7/17/08-1—were collected from MRN-328, and three obsidian points—PAHMA, Cat # 1-127852, 1-127863, and 1-127864—are housed in the MRN-115 collection. Unlike the two points collected from MRN-328, all of the points from MRN-115 are incomplete and two—PAHMA, Cat # 1-127852 and 1-127863—are unprovenienced. The third “tanged” point from MRN-115—PAHMA, Cat # 1-127864—is temporally diagnostic and was found in association with the burned house remains located on top of the shell mound (Meighan 1953:4). This point resembles those in the Rattlesnake point cluster (A.D. 1200-1400), which were continually produced up to A.D. 1800 (Justice 2002:403). As Late Period and Historic period diagnostics, Rattlesnake points were also produced from historic glass (Justice 2002:403).

Citing this particular point type and other artifactual and depositional lines of evidence, Meighan (1953:5) suggested “it is possible that the occupants of this village were taken to one of the Spanish missions.” In addition to the temporally diagnostic Rattlesnake point excavated from MRN-115, additional Late Period diagnostics recovered from MRN-328 include the two clamshell disc beads and a serrated obsidian projectile point (Cat # 7/17/08-1) identified as a Stockton Notched Leaf type, a prevalent point type in Late Period sites and possibly the Historic period (Justice 2002:353-359). The second point from MRN-328 (Cat # 7/24/07-5) is tentatively identified as Round Valley Corner Notched, which falls within the Rattlesnake point cluster but has “no secure cultural sequence” (Justice 2002:409).

Ceramic, Glass, and Metal Artifacts

The final material category associated with MRN-114, MRN-115, and MRN-328 includes artifacts manufactured from ceramic, glass, and metal (Table 5.22). Ceramic vessels were not produced by the Coast Miwok prior to European settlement. However, fired clay figurines are documented at some Marin County archaeological sites (Elsasser 1963; Heizer and Beardsley 1943; Heizer and Pendergast 1955), and amorphous clay chunks and daub were discovered from MRN-114, MRN-115, MRN-328, and other shell mounds (e.g., Nelson 1910:395). Many native groups such as those inhabiting southern California, the Baja peninsula, and even groups in the southern San Joaquin Valley did produce smoking pipes and vessels which were frequently exchanged with neighboring groups (Jackson and Ericson 1994:398). Ceramics were also manufactured at most Alta California missions by California Indians and offer insights to daily practices and the fluidity of social identity at colonial settlements (Ginn 2009; Panich 2009).

Table 5.22. Summary of ceramic, glass, and metal artifacts.

	MRN-114	**MRN-115**	**MRN-328**	**Total**
Ferrous Metal	7	1	24	32
Non-ferrous Metal	16	5	12	36
Ceramic	6	3	0	9
Glass	12	4	34	50
Total	41	13	70	127

Although locally produced ceramics are rarely found in Marin archaeological sites, non-native ceramics are documented at many coastal California sites where Indians salvaged or traded for ceramic vessels and other goods from shipwrecks and incorporated these items into daily practices (e.g., Heizer 1941; Layton 1990, 1997; Russell 2008). For example, some archaeological sites at Point Reyes have produced sixteenth century Chinese porcelains, some of which were ground and perforated to create beads. Ceramic artifacts recovered from MRN-114, MRN-115, and MRN-328 are likely associated with the Chinese shrimp fishing communities that lined Point San Pedro between the 1870s and the early 1900s and were probably not incorporated in the social practices of Coast Miwok occupying bay shell mounds. Two porcelain fragments in the MRN-115 collection—the base of a bowl (PAHMA, Cat # 1-127874) and a small fragment with a floral decal (PAHMA, Cat # 1-127878)—were removed from the surface of the site and are most likely Chinese export porcelains (Meighan 1953). The porcelain bowl is probably a Japanese rice bowl, transfer printed in the style referred to as "dashed line" and found in many overseas Chinese communities after 1849, and especially the late nineteenth and early twentieth centuries (Costello and Maniery 1987:25-27; Greenwood 1996:87). Six additional salt-glazed stoneware fragments—possibly from storage containers—were recovered from MRN-114 and are similar to those found at other overseas Chinese communities in northern California (e.g., Felton et al. 1984; Greenwood 1996). One fragment was removed from Stratum 5 (50 to 60 centimeters) in an excavation unit at MRN-114, and probably reflects bioturbation.

Glass artifacts—beads, refashioned bottle glass, and window glass—are commonly recovered from colonial settlements in North America, as well as at some shell mounds (e.g., Bieling 1998). In return for offerings of food, glass beads, bells, and other trinkets were often given to Indians by European visitors during initial encounters; a practice probably designed to soften an otherwise alarming moment for the parties involved. For example, while anchored off the Marin Peninsula in summer of 1775, the crew of the *San Carlos* was visited by a contingent of Indians. Chaplain Vincente de Santa María writes:

> Although at first they refused to join us, nevertheless, when we called to them and made signs of good will and friendly regard, they gradually came near. I desired them to sit down, that I might have a brief pleasure of handing out to them the glass beads and other little gifts I had the foresight to carry in my sleeves. Throughout this interval they were in a happy frame of mind and made me hang in their ears, which they had pierced, the strings of glass beads that I had divided among them (Milliken 1995:44).

Although excavations at MRN-114, MRN-115, and MRN-328 did not yield any glass beads, several fragments of bottle glass were identified. Of these, several pieces of green and brown bottle glass are believed to be recently deposited—trash from a carousing park visitor or a projectile tossed from the adjacent park road—and were discarded in the laboratory. Of the remaining glass artifacts, two are temporally diagnostic. The first, discovered on the surface of MRN-115, is a fragment from a Mason jar lid (reads "ASO") made from milk glass. The glass lid was patented in 1869. The second, collected from the surface of MRN-328, is a pale green, patinated bottle glass fragment with embossed script that reads "Cantrell". Cantrell & Cochrane's Aerated Sarsaparilla was produced in Dublin, Ireland between 1922 and 1956 (Fike 1987:157). Both artifacts are likely associated with the local Chinese shrimp fishing industry or ranchers who worked in the area prior to the creation of the State Park.

Ferrous and non-ferrous metal artifacts were also collected from the three shell mounds. Ferrous metal artifacts include tin cans, cut nails, and an iron tack, while the majority of non-ferrous metal artifacts are spent bullet cartridge casings (Figure 5.10). Ferrous metal artifacts from MRN-114 include a complete sanitary can (ca. 1889-present; Rock 2000), five cut iron nails, and an iron tack. MRN-115 produced a fragment from a tin can rim, and ferrous metal from MRN-328 include several tin can fragments and unidentifiable ferrous artifacts. That many of the can fragments contain bullet holes speaks to the large quantity of fragments recovered, as

Figure 5.10. Select bullet cartridge casings. Calibers from L to R: 0.22 short (“US”); 0.22 (“S”); 0.32 (“REM UMC 32 SH Colt”); 25 20 (“U.S.C. Co 25-20”); 7 mm (“WW Super 7mm Mauser”); and 12 gauge (“UMC Co N^{o} 12 Union”).

Table 5.23. Temporally diagnostic artifacts manufactured from metal and glass.

Non-ferrous Metal

MRN-114	MRN-115	MRN-328	Total	Caliber	Maker	Intro.	Discont.	Headstamp
0	0	1	1	0.22	Federal Cartridge Corp.	1922	present	HP
0	0	1	1	0.22	Imperial Chemical Industry[d]			ICI (written in arrow)
3	0	0	3	0.22	Omark/Cascade Cartridges Inc.	1967	present	C
3	0	0	3	0.22	Remington Arms Co., Inc.[a, d]	1921	present	U Hi Speed
1	0	0	1	0.22	Remington Arms Co., Inc.[d]	1953	present	U w/ dot in center
0	0	1	1	0.22	Simpson-Sears Dept. Stores	1957	1978	S
0	0	1	1	0.22	U.S. Cartridge Co.[a, d]	1857	1936	US
3	2	0	5	0.22	Union Metallic Cartridge Co., Remington Arms-Union Metallic Cartridge Co., Remington Arms Co.[d]	1867	present	U
1	0	0	1	0.22	Western Cartridge Co., Winchester-Western Division[a, d]	1857	present	Super X (live round, not collected)
0	1	0	1	0.22	Western Cartridge Co., Winchester-Western Division[d]	1922	present	Super X 22
1	0	3	4	0.22	Winchester Repeating Arms Co.	1866	1931	H
1	0	0	1	0.22 WRF	Union Metallic Cartridge Co., Remington Arms-Union Metallic Cartridge Co., Remington Arms Co.[d]	1867	present	U
0	0	3	3	0.32	Remington Arms-Union Metallic Cartridge Co.[a, c, d]	1911	1920	REM UMC 32 SH Colt

Table 5.23. Temporally diagnostic artifacts manufactured from metal and glass (continued).

MRN-114	MRN-115	MRN-328	Total	Caliber	Maker	Intro.	Discont.	Headstamp
0	0	1	1	12 gauge	Union Metallic Cartridge Co.[b]	1890	1912	UMC Co No 12 Union (star design)
0	0	2	2	25-20	U.S. Cartridge Co.[a]	1869	1936	U.S.C. Co 25-20
0	0	1	1	32-20	Western Cartridge Co.	1898	1931	Western 32-20
0	0	1	1	7 mm	Winchester-Western[a, c, d]	1892	present	WW Super 7mm Mauser

[a]Barnes 1997:380; [b]Cook 1989; [c]Dillon 1995:94; [d]White and Munhall 1963:37

Other

MRN-114	MRN-115	MRN-328	Total	Description	Intro.	Discont.	Comments
0	0	1	1	Aluminum can w/ "tab top"[b]	1962	1964	
0	0	1	1	Automatic bottle fragment[a]	1922	1956	Cantrell & Cochrane's Aerated Sarsaparilla, Dublin, Ireland
3	0	0	3	Cut iron nail[d]	1820	1891	
1	1	5	7	Double/Sanitary tin can[c]	1889	present	
0	1	0	1	Mason jar lid fragment	1869		Milk glass
1	0	0	1	U.S. quarter	1990	present	

[a]Fike 1987:157; [b]Maxwell 2000:301; [c]Rock 2000; [d]Wells 2000:332

well as to the pastimes of more recent site occupants. Considering the cut iron nails, three are tentatively dated to approximately 1820-1891 (Wells 2000:332) and could be associated with ranching activities in the area, such as the construction of fences. The metal tack could belong to a number of objects, including boots and horse tack. A flashlight reflector, a square fastener, an aluminum "tab-top" lid (ca. 1962-1964; Maxwell 2000:301), a battery, lead slugs, and a 1990 U.S. quarter are among the non-ferrous items collected from the three shell mounds.

Over 75 percent (n=23) of the bullet cartridge casings are of 0.22 caliber representing various production dates (Barnes 1997:380; White and Munhall 1963:29, 37), while the remaining eight bullet shells include 0.32 caliber Short Colt shell casings (ca. 1911-1920; Barnes 1997:244, Dillon 1995:94, White and Munhall 1963:169); 25-20 shell casings (ca. 1869-1936; Barnes 1997:416); 32-20 casings (ca. 1898-1931); a 12 gauge shotgun shell casing made from cardboard (1890-1912; Cook 1989); and a seven millimeter cartridge casing for a bolt-action Mauser rifle (ca. 1892-present; Barnes 1997:43; Dillon 1995:93; White and Munhall 1963). The mean "introduction" and "discontinued" dates for all of the temporally diagnostic metal and glass artifacts are approximately 1903 (σ43) and 1974 (σ 41) (Table 5.23). These dates can be used in turn as proxies for dating the most recent deposits at MRN-114, MRN-115, and MRN-328. Accordingly, artifacts of glass, metal, and ceramic suggest visits to the three sites nearing the end of the Chinese presence on Point San Pedro, throughout the twentieth century, and up to the creation of China Camp State Park in 1977.

Summary

The diverse material assemblage from MRN-114, MRN-115, and MRN-328 provides insight to the array of activities that took place at the three shell mounds and in the lives of its inhabitants, and also demonstrates changes and continuities in Coast Miwok social practices over the long term. Analysis of botanical and faunal remains, lithic artifacts, and ceramic, glass, and metal artifacts presented in this chapter was conducted to document such changes, as well as the maintenance of particular technologies and practices—in short, cultural traditions—of Coast Miwok before, during, and after Spanish settlement in the San Francisco Bay area. In addition to the research questions presented in the previous chapter that framed field work at China Camp State Park as well as laboratory analysis—that is, how and when were shell mounds inhabited in colonial California—five key assumptions regarding the occupation of Marin shell mounds by refugee Coast Miwok were continually brought to bear during the study of plants, animals, stone, and other deposited remains. To briefly summarize: MRN-114, MRN-115, and MRN-328 are assumed to have been occupied during the late prehistoric and early historic periods; the shell mounds were continually inhabited by Coast Miwok-speakers; Coast Miwok returned to familiar shell mounds to continue pre-contact subsistence practices, possibly to supplement sparse mission diets; these returns reinforced ties to the Marin landscape, and in doing so provided opportunities to persist culturally and physically; and, lastly, this culture persistence will be evident in the material record at each shell mound and specifically in the presence of a mixture of native and European artifacts.

Identified botanical remains collected from Features 1 and 2 at MRN-114 reflect an array of native and intrusive species. The presence of Amaranthaceae and *Chenopodium* spp., for example, represent both native species but also invasive ones, and could be more telling of the radically altered environment shaped over the past 100 years, rather than the vegetal preferences of hunter-gatherers over the past 1,000 years. That said, however, many botanical remains exhibit burning and the majority of botanical remains reflect the important role of plants in the foodways, manufactured goods, and medicines of Coast Miwoks. An array of nuts, berries, seeds, and leafy greens provided sustenance throughout the year, raw material for baskets and dwellings such as the conical bark houses on MRN-115, as well as medicinal comfort. Yet, without additional botanical samples from MRN-115 and MRN-328, identifications of plant remains at MRN-114 are more synchronic than telling of plant exploitation through time.

Mammal remains (including sea mammals), birds, fish, reptile and amphibian remains, and shellfish (bivalves, gastropods, and crustaceans) also speak to the immense diversity of animal species gathered by Coast Miwok, the diversity of remains encapsulated within most shell mounds, as well as the timing of animal harvests on seasonal and long term timescales. Deer remains and the remains of other large terrestrial ruminants are especially indicative of Middle Period deposits, but are also found in later occupations. The presence of sea otter, harbor seal, and the remains of other small terrestrial mammals—Cottontail rabbit, raccoon, and coyote—are especially reflective of Late Period sites, but also a broad subsistence base that enabled Coast Miwok to account for periodic changes in animal populations through "coharvesting" practices. Accordingly, a similar tool kit composed of nets and other bone and lithic tools could be used in multiple hunting and fishing scenarios. This strategy and the taking of birds—especially waterfowl—and fish such as sturgeon and salmon suggest year-round occupation at MRN-114, MRN-115, and MRN-328. These sites were well-positioned to exploit an array of terrestrial species, amphibians, reptiles, and birds; intertidal creatures, such as bat ray, Longjaw mudsuckers, crustaceans, and shellfish; marine animals, including sea otter, seal, and sharks; and other intermittent visitors such as anadromous salmon and sturgeon cruising between saltwater and freshwater and migratory waterfowl wintering in the immense San Francisco Bay estuary.

Shellfish, particularly mussel shell, are also examined to identify changes in subsistence practices through time. Quantifying mussel shell recovered from auger units in 20 centimeter increments reveals a peak in mussel shell at approximately 20 to 40 centimeters depth and is believed to represent resource intensification in the Late Period brought on by increased human populations and the depletion of large game. Shell artifacts—clamshell disk beads, an abalone ornament and fragment, and *Callianax biplicata* fragments—recovered from the three shell mounds again indicate occupation during the Late Period, but also ethnographic occupations as indicated by the pentagonal abalone pendant and clamshell beads. They also provide indirect evidence of territorial circumscription brought about by growing human populations. At this time, the exchange of clamshell disk beads from the Pacific coast and obsidian from the north San Francisco Bay intensifies as tribelet territories contract and as community identities are continually shaped.

Lithic artifacts—groundstone, flaked stone, and bifacial tools—were examined to further evaluate the timing of shell mound occupations, as well as change and continuity in Coast Miwok material culture, especially in the dimensions of raw material choice and stone tool manufacturing techniques. Pestles—as part of mortars, and possibly hopper mortars—and steatite artifacts—a charmstone, a labret, and a pipe bowl—are associated with Late Period archaeological contexts and reflect both utilitarian and ceremonial arenas of use. Obsidian biface tools and projectile points are presented as further evidence of long-term occupation at MRN-114, MRN-115, and MRN-328, and especially occupation during the Late Period Phase 2 and possibly later.

Lithic reduction techniques—specifically, the production and high occurrence of expedient, unifacial chert tools—offer insight to the kinds of activities that took place at the three shell mounds; changes in flintknapping methods (core preparation and reduction techniques);

and possibly reduced encounters with obsidian as a resource for creating stone tools. The high occurrence of stepped terminations on obsidian flaked stone and evidence of bipolar reduction suggest obsidian became increasingly scarce during the Late Period, while locally procured chert—possibly thermally altered—found growing importance in daily life and, as evidenced by increased platform width and thickness through time, was probably utilized for most processing tasks by individuals with a range of knapping experience.

Used throughout this chapter, ethnographic sources provide context for the exploitation of plants and animals, the manufacture of lithic and bone tools, as well as the ceremonial importance of plants, animals, and minerals in daily practices. Deer, rabbit, shellfish, and fish remains found in the three archaeological sites indirectly hint at both individual and communal harvesting. For example, Coast Miwok elders indicate participation of entire villages—men, women, and especially children—in driving rabbits toward nets. Processing acorns and other plant and animal species was also likely a social event (see Jackson 1991), whereby shell mound dwellers might gather around a hearth one cool evening to relay fishing stories while a meal of venison and sturgeon sizzled away alongside a fresh batch of pinole. In this sense, clusters of shell mounds represent a shell mound community where an array of activities—flintknapping, hide processing, cooking, dwelling—were dispersed across each site but often included a suite of participants. In this sense, archaeologists may begin to explore how shell mound community identities are forged and maintained through daily and seasonal hunts, inhabiting a distinct place, the manufacture of stone tools and baskets, and in the interactions with kin and other tribelets in which goods—obsidian, sea otter furs, clamshell disk beads, plants—and information flowed across the Marin Peninsula.

Artifacts of glass, metal, and ceramic collected from the three shell mounds were also analyzed, and provide important temporal context for the upper few centimeters of each site. Specifically, cut nails, some bullet cartridge casings, and salt-glazed ceramics indicate nineteenth century activity at the three shell mounds, but these artifacts were most likely deposited by individuals affiliated with the Chinese shrimp fishing operation or possibly ranchers, but not Coast Miwok. Although data presented in this chapter show strong evidence of Late Period and potential ethnographic-era occupations by Coast Miwok, mixtures of native and European (colonial) artifacts such as glass beads—as evidence of cultural change and persistence—were not encountered. The following chapter provides temporal resolution by way of radiometric dating and isotopic analysis to further refine the timing of Coast Miwok shell mound occupations in colonial California.

CHAPTER SIX

SPECIALIZED ANALYSES & TEMPORAL RESOLUTION

Chronometric analysis and data related to the seasonal harvests of local resources are used to further detail long-term cycles of residence at the three study sites by Coast Miwok during the Late Period and throughout the mission period. Presented in the previous chapter, a diversity of plant and animal species were identified in the archaeological assemblages from MRN-114, MRN-115, and MRN-328, and an equally detailed ethnographic record provides context to when and how specific resources were utilized by the Coast Miwok. Another method for understanding seasonality involves elemental and isotopic analysis of mussel shell carbonate and water temperature to calculate season of death. As a proxy for understanding seasonal harvesting patterns and site residence, future stable isotope research will attempt to tie these data with written records documenting the arrival and departure of Indians from missions. While underway, the analysis is incomplete and not presented in this dissertation.

This chapter presents the methods and results associated with three specialized analyses: energy-dispersive X-ray fluorescence (EDXRF); AMS radiocarbon dating; and obsidian hydration dating. In the absence of mixed deposits of native and European artifacts dating to the colonial era, these laboratory methods were conducted to resolve the timing of shell mound residence before, during, and after Spanish settlement in the Bay Area. These methods intimate that visits to bay shore shell mounds by Coast Miwok did not cease with the establishment of Spanish missions. Rather, such returns suggest a dual role: persistent engagement with the landscape at social salient places *and* the maintenance of native subsistence pursuits that bridge historic and prehistoric times.

Obsidian Source Provenance

Since the earliest sourcing studies of excavated obsidian artifacts (Jack and Heizer 1968), chemical source characterization of archaeological obsidian continues to enhance our understanding of California's prehistoric and historic landscape. X-ray fluorescence spectrometry (XRF) in particular plays a pivotal role in the study of California hunter-gatherer exchange networks and provides critical data on raw material choice, social networks, and mobility (e.g., Eerkens and Rosenthal 2004; Jackson 1986; 1989; Shackley 2005, 2008; Silliman 2005b).

One form of XRF—energy-dispersive X-ray fluorescence (EDXRF)—involves irradiating an obsidian sample with a beam of high-energy primary x-ray photons, which excite inner-orbital electrons and eject them from atoms within the artifact creating electron "holes" in the atom (Shackley 2005:96). These holes are then filled by electrons from outer orbitals to stabilize the atom, and these electron movements are accompanied by energy emissions—called fluorescence—which can be measured (Shackley 2005:96). This fluorescent energy is also characteristic of particular elements, and different concentrations of elements within obsidian artifacts can be telling of specific obsidian sources. Although archaeologists never truly "source" obsidian artifacts—and, accounting for variability within each obsidian flow, we rely on statistics and other tools to make a best guess—the advantages of conducting XRF analysis make it increasingly common in archaeological analysis. It is an expedient (six to eight minutes per sample), cost-effective, non-destructive, and highly advantageous analytical technique for understanding past human practices concerning obsidian procurement, obsidian use, and mobility (Shackley 2005, 2008).

X-ray fluorescence analysis was conducted to chemically characterize sources of archaeological obsidian collected from MRN-114, MRN-115, and MRN-328 and to answer questions about hunter-gatherer mobility and exchange on the Marin Peninsula over the long-term. The assemblage of obsidian artifacts (n=35; Table 6.1) from MRN-114, MRN-115, and MRN-328 was analyzed with a Thermo Scientific *Quant'X* EDXRF spectrometer at the Geoarchaeological XRF Laboratory, Department of Anthropology at the University of California, Berkeley. By site, the total obsidian assemblage from the three shell mounds includes 12 obsidian artifacts from MRN-114, 12 obsidian artifacts within the MRN-115 collection at PAHMA, and 11 obsidian artifacts were collected from MRN-328. Of the 35 obsidian artifacts, only 22 (63%) were chemically characterized due to size limitations (Davis et al. 1998).

Following sampling descriptions and instrumentation parameters outlined by Shackley (2005, 2006, and 2009), all samples were analyzed whole with little or no formal preparation. Data were collected for "mid-Z," or incompatible, trace elements including titanium (Ti), manganese (Mn), iron (as Fe-T), zinc (Zn), rubidium (Rb), strontium (Sr), yttrium (Y), zirconium (Zr), and niobium (Nb). These elements are called incompatible because they are not substituted by other elements during the formation of volcanic glass—they remain in different concentrations within different obsidian sources but are also intrasource invariable (Shackley 2005:94). In addition to the reported values here, Co, Ni, Cu, Ga, Pb, and Th were also measured, but these are rarely useful in discriminating obsidian sources and are not reported. Known sources of obsidian in the greater San Francisco Bay area were used to make source determinations (Jackson 1986, 1989; Silliman 2005b), and trace element data exhibited in Table 6.2 are reported in parts per million (ppm), a quantitative measure by weight.

Napa Valley (Glass Mountain and Blossom Creek) and Annadel sources constitute 68 percent (n=15) and 32 percent (n=7) respectively of the total obsidian assemblage from MRN-114, MRN-115, and MRN-328. Source discrimination is based on bivariate plots of Sr and Rb elemental concentrations to identify clusters, which were then compared to mean ppm values for known obsidian sources (Jackson 1986: Appendix 1, 1989:87-88). Figure 6.1 presents my data (designated as China Camp Archaeological Project, or CCAP) and trace element data compiled by Jackson (1986) for Napa Glass Mountain, Annadel, and Blossom Creek sources. Blossom Creek obsidian source is represented by a single artifact from MRN-115 (PAHMA, Cat # 1-127857), and involved additional source discrimination using Sr and Zr values (Figure 6.2). Although marekanites from Blossom Creek are smaller on average than those collected from other Napa sources (Jackson 1986:56), PAHMA, Cat # 1-127857 is included here as part of the Napa Valley source because of the close proximity of Blossom Creek to Napa Glass Mountain (12 km) and the similar location of these sources within the Upper Member of the Sonoma Volcanics (Jackson 1986:46). At both MRN-114 and MRN-328, Napa Valley and Annadel sources constitute 40 percent (n=2) and 60 percent (n=3) of the sourced obsidian artifact assemblage, respectively (Figure 6.3). At MRN-115, Napa Valley and Annadel sources constitute 92 percent (n=11) and eight percent (n=1) respectively (Figure 6.3). Differences in the proportions of specific obsidians at each site are examined at the conclusion of this chapter.

Table 6.1. Summary of obsidian artifacts from MRN-114, MRN-115, and MRN-328.

Site (MRN-)	Date	Unit	Depth (cm)	Depth Conversion (cm)	Fraction	CAT#	EDXRF
114	2007	1076N/1050E	Surface			7/26/07-19A	Yes
114	2007	1075N/1063E	Surface			7/27/07-4A	Yes
114	2007	1080N/1056E	0-10			7/31/07-1A	Yes
114	2007	1080N/1056E	0-10			7/31/07-1B	No
114	2007	AU1088N/1064E	0-20		1/2"	7/31/07-4	Yes
114	2007	AU1078N/1049E	0-20		1/8"	9/28/07-5A	No
114	2007	AU1078N/1049E	0-20		1/8"	9/28/07-5B	No
114	2007	AU1078N/1049E	0-20		1/8"	9/28/07-5C	No
114	2007	AU1070N/1057E	20-40		1/8"	11/2/07-5A	No
114	2008	1078N/1056E	30-40		1/4"	7/19/08-1	Yes
114	2008	1078N/1056E	50-60		>1/8"	7/21/08-2A	No
114	2008	1078N/1056E	50-60		1/16"-1/8"	7/21/08-2C	No
115	1949					1-98007	Yes
115	1949		"backdirt"			1-127852	Yes
115	1949	Pit 1S	3" below surface	7.62		1-127857	Yes
115	1949	Pit C3	72" below surface	182.88		1-127860	Yes
115	1949	Pit C3	82" below surface	208.28		1-127861	Yes
115	1949	Pit A	14" below surface	35.56		1-127863	Yes
115	1949	Pit A3	9" below surface	22.86		1-127864	Yes
115	1949	Pit C2	81" below surface	205.74		1-127867	Yes

Table 6.1. Summary of obsidian artifacts from MRN-114, MRN-115, and MRN-328 (continued).

Site (MRN-)	Date	Unit	Depth (cm)	Depth Conversion (cm)	Fraction	CAT#	EDXRF
115	1949	Pit C3	41" below surface	104.14		1-127872	Yes
115	1949		Surface			1-127876	Yes
115	1949	Pit D1	90" below surface	228.6		1-127918	Yes
115	2007	1038N/1043E	Surface			7/19/07-9A	Yes
328	2008	AU968N/978E	0-20		1/4"	7/17/08-1	Yes
328	2007	959N/998E	Surface			7/24/07-5	Yes
328	2008	AU982N/996E	0-20		1/8"	7/9/08-3	No
328	2008	AU982N/991E	40-60		1/8"	7/9/08-4	No
328	2008	AU971N/992E	60-80		1/8"	7/11/08-1	No
328	2008	AU969N/994E	20-40		1/4"	7/14/08-3	Yes
328	2008	AU963N/993E	40-60		1/4"	7/15/08-1A	Yes
328	2008	AU969N/989E	60-80		1/8"	7/15/08-2	No
328	2008	AU972N/979E	0-20		1/8"	7/16/08-2A	No
328	2008	AU972N/979E	40-60		1/4"	7/16/08-2	Yes
328	2008	AU978N/996E	60-80		1/8"	7/9/08-5	No

Table 6.2. Obsidian source provenance data for MRN-114, MRN-115, and MRN-328.

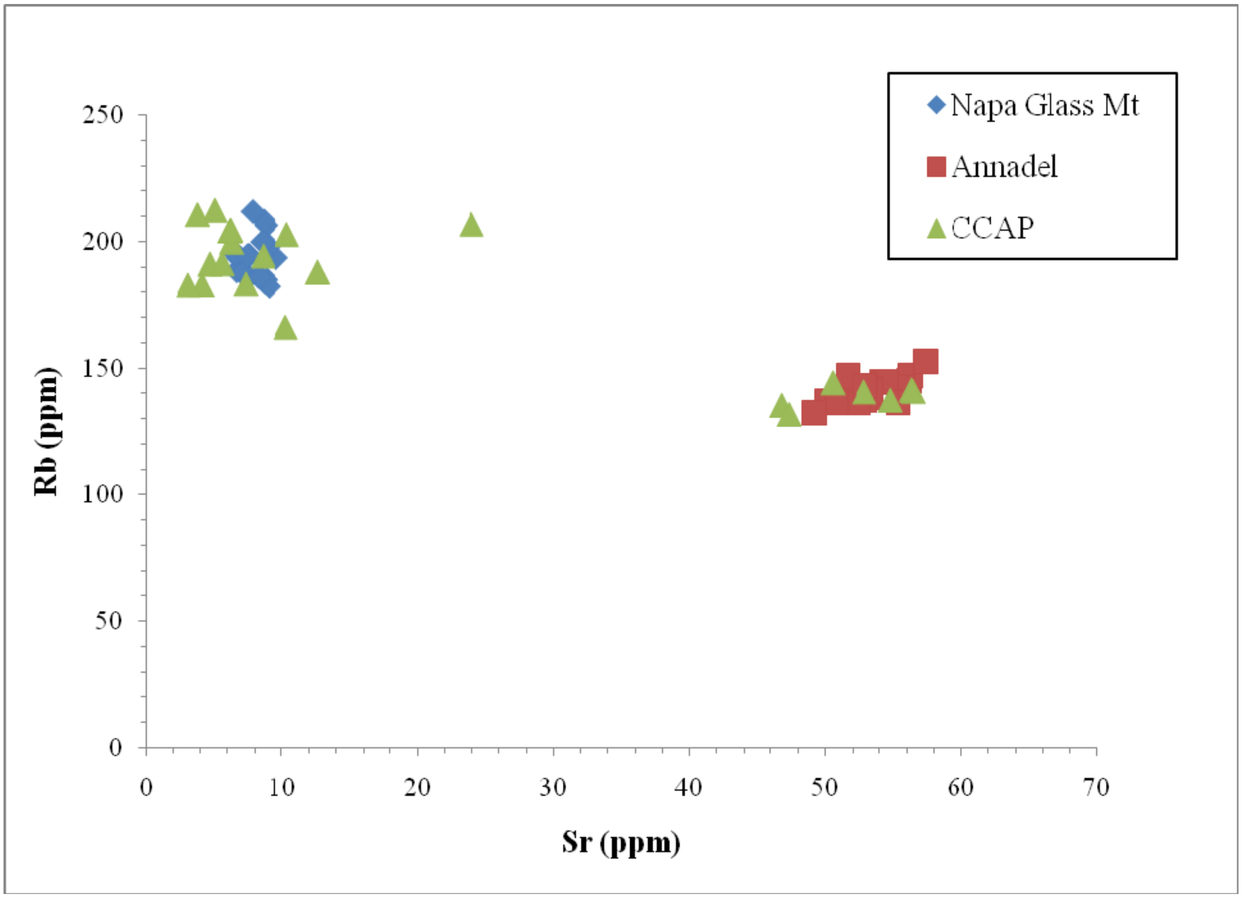
Site (CA-)	Lab/Sample #	Unit	Depth	Ti	Mn	Fe
MRN-328	72407-5	959N/998E	Surface	1262.38	323.45	15948.21
MRN-328	71608-2A	972N/979E	40-60cm	1035.21	220.97	11893.51
MRN-328	71408-3	969N/994E	20-40cm	1005.99	240.85	11264.44
MRN-328	71508-1A	963N/993E	40-60cm	1399.76	389.45	17326.84
MRN-328	71708-1	968N/978E	0-20cm	1282.23	352.04	15458.52
MRN-115	1-127867	Pit C2	81" below surface	999.59	215.71	11373.66
MRN-115	1-127876	N/A	Surface	1470.19	371.59	16956.41
MRN-115	1-127857	Pit 1S	3" below surface	1402.30	241.86	13313.52
MRN-115	1-127860	Pit C3	72" below surface	1101.51	226.58	12469.54
MRN-115	1-127872	Pit C3	41" below surface	993.51	212.08	11004.78
MRN-115	1-98007	N/A	N/A	978.50	225.11	11910.53
MRN-115	1-127918	Pit D1	90" below surface	1135.91	248.50	13761.51
MRN-115	1-127861	Pit C3	82" below surface	21631.15	237.92	13116.86
MRN-115	1-127864	Pit A3	9" below surface	977.57	200.62	11030.58
MRN-115	1-127863	Pit A	14" below surface	1118.29	241.76	12967.96
MRN-115	1-127852	N/A	surface/"backdirt"	1068.72	234.38	12564.14
MRN-115	71907-9A	1038N/1043E	Surface	1028.46	203.09	11084.39
MRN-114	73107-4	1088N/1064E	0-20cm	986.78	213.45	10954.86
MRN-114	73107-1	1080N/1056E	0-10cm	1265.32	332.36	15898.22
MRN-114	72607-19A	1076N/1050E	Surface	1333.04	357.36	16830.42
MRN-114	72707-4	1075N/1063E	Surface	1045.67	236.72	12688.82
MRN-114	71908-1	1078N/1056E	30-40cm	1544.36	449.37	17857.47
Standard	RGM1			1588.90	279.76	13490.02

Table 6.2. Obsidian source provenance data for MRN-114, MRN-115, and MRN-328 (cont.).

Site (CA-)	Lab/Sample #	Zn	Rb	Sr	Y	Zr	Nb	Source[a]
MRN-328	72407-5	83.37	135.15	46.84	48.75	270.74	11.01	ANDL
MRN-328	71608-2A	114.61	194.39	8.61	45.09	227.38	13.66	NGM
MRN-328	71408-3	65.36	188.09	12.62	44.05	219.34	11.15	NGM
MRN-328	71508-1A	127.63	140.62	56.49	47.77	267.31	10.43	ANDL
MRN-328	71708-1	82.05	137.21	54.83	46.35	270.45	12.37	ANDL
MRN-115	1-127867	70.89	191.19	4.71	43.79	230.97	11.29	NGM
MRN-115	1-127876	114.55	141.31	56.36	51.32	279.39	12.05	ANDL
MRN-115	1-127857	58.30	206.99	23.96	35.18	214.96	12.51	BCK
MRN-115	1-127860	78.75	199.85	6.28	47.85	233.77	12.54	NGM
MRN-115	1-127872	111.56	166.07	10.26	40.89	222.05	11.21	NGM
MRN-115	1-98007	82.79	191.37	5.60	44.92	232.46	12.64	NGM
MRN-115	1-127918	90.64	212.56	5.07	46.05	239.48	13.00	NGM
MRN-115	1-127861	101.18	204.30	6.16	43.09	228.10	9.23	NGM
MRN-115	1-127864	83.62	182.90	4.14	45.67	222.32	9.93	NGM
MRN-115	1-127863	120.62	202.86	10.35	46.35	253.79	8.74	NGM
MRN-115	1-127852	179.02	204.60	6.22	45.53	229.48	8.29	NGM
MRN-115	71907-9A	73.31	183.36	7.33	47.17	224.94	13.07	NGM
MRN-114	73107-4	63.18	182.87	3.10	44.12	226.59	6.40	NGM
MRN-114	73107-1	76.51	131.56	47.38	50.58	268.44	6.19	ANDL
MRN-114	72607-19A	172.40	144.07	50.57	49.09	274.39	8.71	ANDL
MRN-114	72707-4	166.35	210.81	3.80	49.62	234.20	12.40	NGM
MRN-114	71908-1	94.17	140.47	52.88	51.29	276.86	11.36	ANDL
Standard	RGM1	22.42	147.19	101.49	22.55	207.11	6.81	

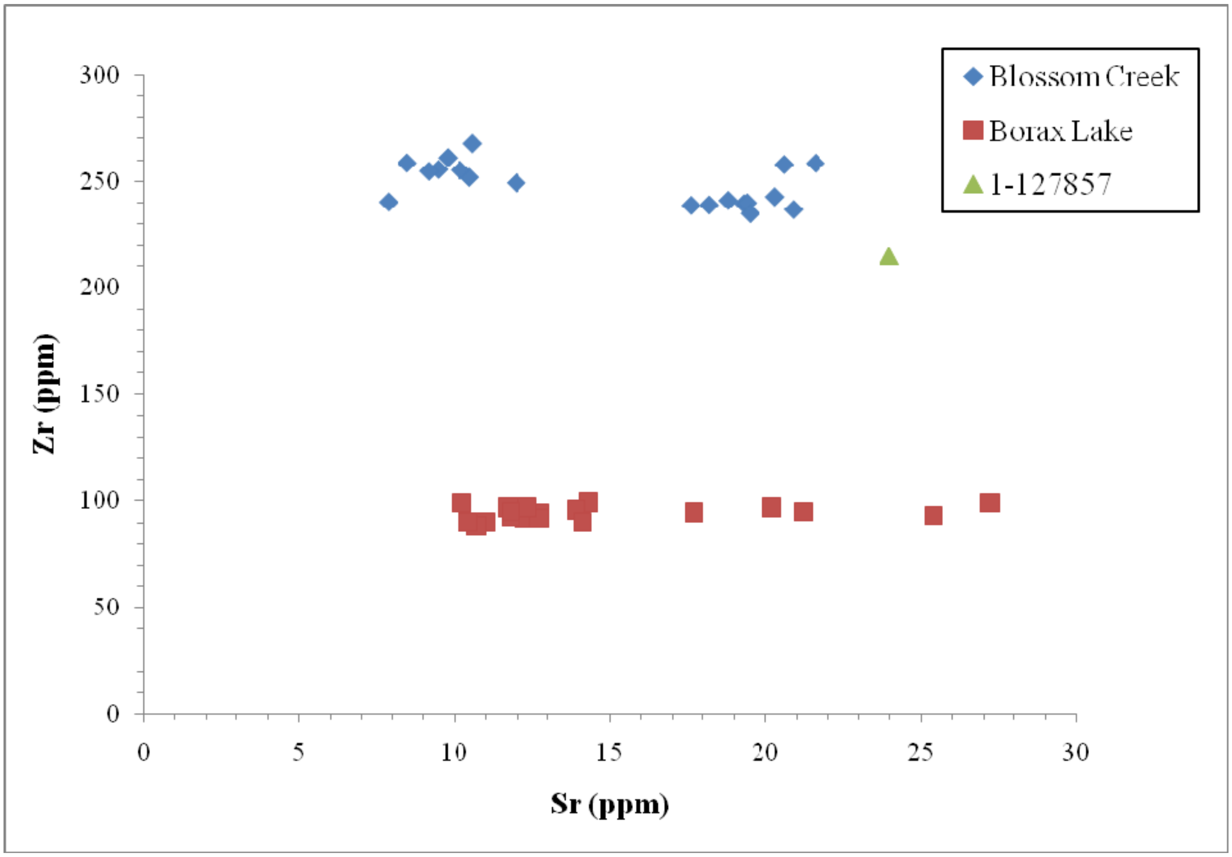
[a]ANDL=Annadel, NGM=Napa Glass Mountain, BCK=Blossom Creek

Figure 6.1. Bivariate plot of raw Sr and Rb values from archaeological obsidians[a] (n=22).



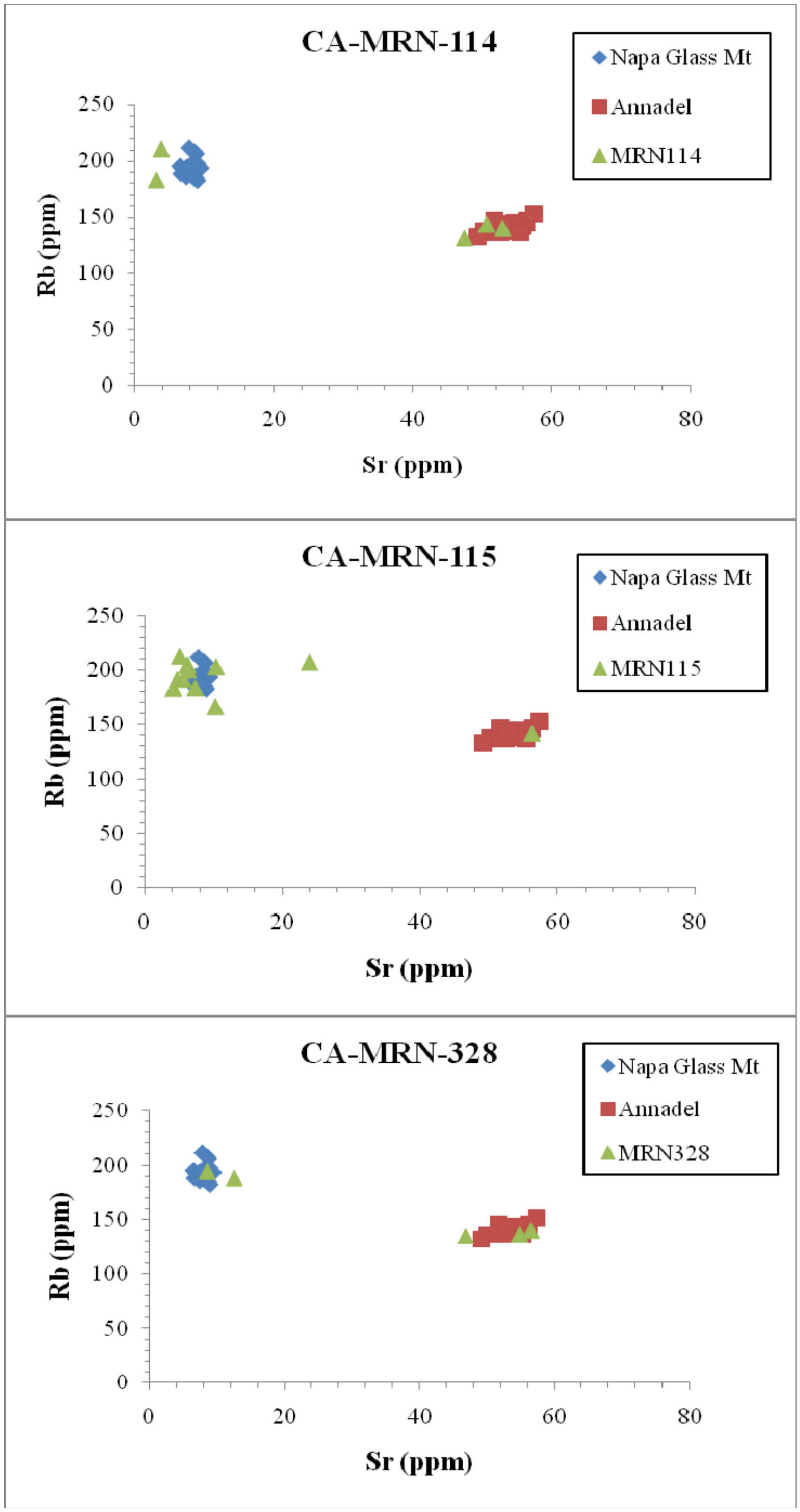
[a]CCAP obsidians are from MRN-114, MRN-115, and MRN-328; all other source data from Jackson (1986).

Figure 6.2. Bivariate plot of raw Sr and Zr values discriminating for Blossom Creek obsidian source.[a]



[a]Borax Lake and Blossom Creek data from Jackson (1986).

Figure 6.3. Bivariate plots of raw Sr and Rb values showing obsidian source discrimination by site. Napa Glass Mountain and Annadel source data from Jackson (1986).



Obsidian Hydration Dating

Obsidian hydration dating measures the water absorption rate of volcanic glass. Specifically, after an obsidian flake is produced it will absorb water over time and form microscopic hydration bands. The thickness of these bands are measured in microns (μm) and—using a diffusion curve (calibration for time before present) for specific obsidian sources—used to determine how long the surface of the obsidian flake has been exposed to moisture. The rate in which obsidian absorbs water varies regionally depending on atmospheric conditions and ambient soil temperatures (Silliman 2005b:85), and is therefore not a "reliable member of the chronometric toolkit" (Shackley 2008:199). While not widely accepted as a calendrical dating method, obsidian hydration dating remains a valuable relative dating technique, and the dominance of obsidian raw materials within California and Great Basin archaeological contexts has generated considerable research and refinement of local hydration rates (Hall and Jackson 1989; Meighan 1983; Origer and Wicksrom 1982). Obsidian hydration is also a destructive method; requiring laboratory technicians to make two small cuts in the obsidian artifact to remove a small one millimeter thin section, which is then ground to the appropriate thickness for viewing the hydration bands (see Appendix D). Accordingly, permission was asked from the Federated Indians of Graton Rancheria before conducting this analysis.

Table 6.3. Summary of obsidian hydration data.

Slide #	Site (MRN-)	Cat #	Depth (cm)	Hydration Mean (μm)	Source	Date (YBP)	Calendar Date
1	114	7/26/07-19A	Surface		Annadel		
2	114	7/27/07-4	Surface	1.2	Napa	221	1788
3	114	7/31/07-4	0-20	1.4	Annadel	503	1506
4	114	7/19/08-1	30-40		Annadel		
5	115	7/19/07-9A	Surface		Napa		
6	328	7/17/08-1	0-20		Annadel		
7	328	7/24/07-5	Surface		Annadel		
8	328	7/14/08-3	20-40	0.9	Napa	124	1885

Eight specimens from MRN-114 (n=4), MRN-115 (n=1), and MRN-328 (n=3) were submitted to Thomas Origer (Origer's Obsidian Laboratory) for obsidian hydration dating. Obsidian artifacts in the MRN-115 museum collection were not submitted. Of the eight obsidian samples, only three showed measureable bands (Table 6.3). It appears most of the obsidian specimens were exposed to excessive heat, which prevented formation of visible hydration bands. Of the three specimens that could be analyzed, six hydration band measurements were taken at several locations along the edge of each thin section and then averaged to produce a mean band width (in microns). This includes two artifacts from MRN-114—Cat # 7/27/07-4 with a hydration mean of 1.2 microns, and Cat # 7/31/07-4 with a hydration mean of 1.4 microns—and one obsidian artifact (Cat # 7/14/08-3) from MRN-328 with a hydration mean of 0.9 microns. Respective calendar dates—based on hydration rates for different obsidian sources—for the two artifacts from MRN-114 are approximately 221 years before present, or

A.D. 1788, and approximately 503 years before present, or A.D. 1506. The obsidian artifact from MRN-328 yielded a date of approximately 124 years before present, or A.D. 1885.

AMS Radiocarbon Dating

Eight organic samples were submitted to Beta Analytic Inc. for AMS radiocarbon dating. Two samples were taken from a basketry fragment and wood beam excavated by Meighan from the house pit at MRN-115. Two samples were collected from the bottom of the hearth feature excavated at MRN-114, and an additional four samples were selected from the top and bottom of a single auger unit at MRN-114 and at MRN-328.

As part of the analysis of materials from the Thomas site, Robert Heizer submitted two organic samples (Sample Number C-186; Libby 1955:112) from the deepest portion of Meighan's excavations for radiocarbon dating—the first radiocarbon dates from a California archaeological site (Fitzgerald 2007:31). A larger sample size requirement for radiocarbon dating in the 1950s forced Heizer to select carbon samples from different excavation units at two different depths—108 inches (2.7 meters) and 114 to 132 inches (2.9 to 3.4 meters) below surface (Meighan 1953:6). Two radiocarbon values were obtained: 633 ± 200 B.P. and 911 ± 80 B.P. (Libby 1955:112). These determinations were then averaged to produce a mean radiocarbon value of 720 ± 130 B.P., or cal A.D. 1035-1432 (2σ) (Meighan 1953:5). While radiocarbon sampling methods and analysis have changed considerably since its initial use in the mid-twentieth century and despite Meighan's belief that his radiocarbon data were inconclusive (Meighan's 1953:6), MRN-115 contains at minimum a Middle/Late Period Transition component (A.D. 700-1100) based on artifact and radiocarbon analyses.

To further situate MRN-115 in time, two AMS radiocarbon determinations were obtained from a 251 milligram sample of basketry (PAHMA, CAT # 1-127961i) and a 226 milligram sample of charred wood (PAHMA, CAT # 1-127818) from the collection at PAHMA. The charred wood fragment—possibly redwood or oak (Meighan 1953:2)—was sampled despite issues related to the collection of radiocarbon data from wood that might have been reused by prehistoric hunter-gatherers over several hundred years, or collected from the older heartwood of trees. As opposed to the arid environment of the American Southwest where these issues were clearly identified (Schiffer 1986), I believe the temperate environment of the San Francisco Bay region would have forced coastal hunter-gatherers to replace rotted wood sooner in architectural structures, much like other regions of the Pacific coast. Although some trees, such as species in the cedar family, are imbued with a natural chemical defense to moisture and fungi that allow for longer house life spans, the service life of cedar heartwood timbers averages about 20 years (Trieu Gahr 2006:72). An equivalent rate is estimated for redwood and oak sapwood (Highley 1995:412; Morrell et al. 1999), with a shorter service life for bark slabs such as those used in the construction of conical bark dwellings. As part of a suite of radiocarbon determinations from a variety of materials, I believe the wood fragments collected from MRN-115 can provide accurate temporal data to help answer questions about when the structure and site were used.

Basketry remains and charred wood specimens were collected from "House-pit 7." Specifically, the nested baskets were recovered from the floor of the house depression at a depth of 14 inches (35.6 centimeters) (Meighan 1953:2), and the wood fragment was removed from a larger burned wood house plank collected from "Unit 1 West" at a depth of 12 to 18 inches (30 to 45 centimeters). The context is described by Meighan (1953:3), who writes:

> the remains of burned baskets (probably four) were found 30 inches west of the hearth. The basketry had been preserved in a carbonized form but was in poor condition, having been crumpled by a collapsing house timber which lay on top of the fragments.

Detailed analysis of the basketry was first conducted by Baumhoff (1953), who identified coiled and twined techniques. Sixty years of storage and decay have since fragmented these basket remains and subsequent study revealed all forty-four basketry fragments to be plain and diagonal twined. Recent study of these and other central California baskets by Shanks (2006:86-87) shows great variation in weaving techniques including evidence of designs. Evidence for raw materials used for Coast Miwok basketry comes from MRN-115 and basketry impressions in clay excavated from CA-MRN-193 (Shanks 2006:86). Fine tule cordage, willow shoots, and alder shoots were often used as warps, and split sedge root was commonly incorporated as basketry wefts (Shanks 2006:87-88).

Figure 6.4. Twined basketry fragments from MRN-115 in the collection of the Phoebe A. Hearst Museum of Anthropology, UC Berkeley (PAHMA, Cat # 1-127961i).

With approval from the Federated Indians of Graton Rancheria and the Phoebe A. Hearst Museum of Anthropology to conduct destructive analysis and after consulting a museum conservator, a basketry sample from MRN-115 (Figure 6.4) was identified and collected following methods described by Geib and Jolie (2008:89-90). In this manner, an easily accessible and non-diagnostic portion of the basketry fragment (e.g., a non-rimmed fragment) was identified and snipped off. Basketry and wood samples were then weighed and wrapped in aluminum foil for shipment to Beta Analytic Inc. for analysis.

Standard AMS radiocarbon analysis of plant remains demands a 20 milligram sample and a 50 milligram sample for charcoal, but because of the possibility of contamination of the museum artifacts by archival adhesives and DDT—a carbon-containing pesticide—larger samples were collected to be able to isolate an uncontaminated fragment from each sample. With assistance from the Hearst Museum's Head Conservator, Madeleine Fang, an ultraviolet lamp was used to identify specimens with minimal adhesive saturation, and additional extraction methods, such as cellulose and solvent extractions, required larger samples to avoid other contaminants and to obtain datable organic material. Of the submitted basketry and charcoal samples, 3.7 milligram of basketry and 2.5 milligram of charcoal was used to make the AMS radiocarbon determinations.

Four radiocarbon samples were selected from auger units from MRN-114 and MRN-328. Specifically, radiocarbon samples were collected from 20 to 40 centimeters and 120 to 140 centimeters below surface in one auger unit at MRN-328, and 20 to 40 centimeters and 80 to 100 centimeters below surface in an auger unit at MRN-114. High quantities of mussel shell were noticeable at a depth of approximately 40 centimeters at MRN-114, and a marked soil change and absence of shell and artifacts characterize sterile soils at approximately 130 centimeters at MRN-114 and approximately 140 centimeters at MRN-328. Compacted layers of midden below the first 20 centimeters ensured clean auger "slices" and contrasts with highly pulverized loose, dry shell matrix nearing the surface of each site.

Two issues were critically evaluated before collecting organic samples from the two auger units. First, auger buckets drill through archaeological sediments in a helical motion; disturbing context as the auger blades churn downward. The probability of contaminating distinct deposits is therefore high, especially as an auger is removed from a unit to empty its contents and then returned to continue excavation (Cannon 2000a:69). Second, some argue that because deposits are churned by the cutting bit any archaeological samples should not be used for chemical analysis or radiocarbon dating (Cannon 2000a:69, 2000b:732; Stein 1986:517-518). Coring—the use of a hollow cylinder to remove a single vertical cut of the archaeological deposit—is recommended as an alternative, but this method can be more difficult to maneuver through deposits with high concentrations of large shells, high quantities of FCR, and other naturally occurring geologic deposits such as those encountered at MRN-114 and MRN-328. These factors—as well as, funding and time restrictions—informed my decision to collect organic samples from excavated auger units.

Two additional radiocarbon samples were collected from the basin of the stone-lined hearth feature ("Feature 1") excavated at MRN-114. The feature was identified during electrical resistivity/conductivity survey and subsequently tested through targeted excavation. In profile, Feature 1 is semicircular and extends from 20 to 45 centimeters below surface along the north wall of the unit. Excavation also revealed a dense layer of compacted shell, ash, FCR, and lithic tools at a depth of 10 to 20 centimeters suggesting a living surface flush with the top of Feature 1. A charcoal fragment and mussel shell sample were collected for AMS radiocarbon dating from the basin of Feature 1 at 45 to 50 centimeters below surface before the remainder of the feature was collected for flotation.

CA-MRN-115

Detailed results from the eight AMS radiocarbon determinations are provided in Table 6.4, and official Reports of Radiocarbon Dating Analyses from Beta Analytic Inc. are provided in Appendix E. To summarize, at MRN-115 the conventional radiocarbon age for the basketry fragment (-25.3 ‰, Beta-250547) is 280 ± 40 B.P., with two possible calibrated age ranges of cal A.D. 1490-1670 and cal A.D. 1780-1790 (2σ) (460-280 and 160-160 cal B.P.; calibration at two sigma according to Vogel et al. [1993]). The conventional radiocarbon age for the fragment of wood (-22.2 ‰, Beta-250548) is 260 ± 40 B.P., with four possible calibrated age ranges of cal A.D. 1520-1590, 1620-1670, 1770-1800, and 1940-1950 (2σ) (430-360, 330-280, 180-150, and 10-0 cal B.P.; calibration at two sigma according to Vogel et al. [1993]).

Despite a wide range of calendar dates for radiocarbon samples from MRN-115 significant overlap is evident near the end of the seventeenth century A.D. when using a *terminus ante quem* (TAQ) of A.D. 1900 in the Oxcal 4.0 calibration program. The TAQ was established using a range of historic bullet cartridge casings collected from the surfaces of the mounds. Significant two sigma peaks also occur in the basketry and burned house plank samples at around A.D. 1800, a period of time during which Spanish missionizing efforts among Coast Miwok-speakers were well underway (Milliken 1995:176-179). At minimum, both samples—and the house pit—from MRN-115 fall within the accepted range for the Late Period (A.D. 900-1800) and, most notably, the Late Period Phase 2 (A.D. 1500-1800).

CA-MRN-114 & CA-MRN-328

Late Period components are also evident at MRN-114 and MRN-328. Results for MRN-328 are tentative—due to the possibility of post-depositional disturbance—but nevertheless comparable to MRN-114 and MRN-115. Specifically, mussel shells collected from the top and bottom of one auger unit at MRN-328 yielded conventional radiocarbon ages of 940 ± 40 B.P. (-2.8 ‰, Beta-254230) and 870 ± 40 B.P. (0.0 ‰, Beta-254231). Two sigma calibrated results for Beta-254230 are cal A.D. 1540-1720, 1740-1750, and 1790-1800 (or, 410-220, 210-200, and 160-150 cal B.P.; calibration at two sigma according to Vogel et al. [1993]), and cal A.D. 1650-1880 for Beta-254231 (300-70 cal B.P.; calibration at two sigma according to Vogel et al. [1993]).

Conventional radiocarbon ages of 870 ± 40 B.P. (-3.1 ‰, Beta-254228) and 1870 ± 40 B.P. (-3.5 ‰, Beta-254229) are associated with mussel shell collected at depths of 20 to 40 centimeters and 80 to 100 centimeters respectively from an auger unit at MRN-114. The two sigma calibrated result for Beta-254228 is cal A.D. 1650-1880 (300-70 cal B.P.; calibration at two sigma according to Vogel et al. [1993]), and cal A.D. 700-940 for Beta-254229 (1240-1010 cal B.P.; calibration at two sigma according to Vogel et al. [1993]).

The charcoal fragment from Feature 1 at MRN-114 produced a conventional radiocarbon value of 380 ± 40 B.P. (-24.7 ‰, Beta-254226), or cal A.D. 1440-1640 (2σ) (510-310 cal B.P.; calibration at two sigma according to Vogel et al. [1993]), and the mussel shell sample from Feature 1 returned a value of 640 ± 40 B.P. (-1.7 ‰, Beta-254227), or cal A.D. 1480-1680 (2σ) (470-270 cal B.P.; calibration at two sigma according to Vogel et al. [1993]). A carbon reservoir, ΔR, value of 300 ± 35 was applied to all shell samples and calculated by averaging known ΔR values for San Pablo Bay (Ingram and Southon 1996).

Table 6.4. Summary of AMS Radiocarbon Data Obtained from MRN-114, MRN-115, and MRN-328[a].

Site	Lab #	Material	ΔR	^{14}C Years B.P.	Age Range (1 σ)	Age Range (2 σ)
CA-MRN-114	Beta-254226	charcoal		380 ± 40	cal A.D. 1450-1520, cal A.D. 1590-1620	cal A.D. 1440-1640
CA-MRN-114	Beta-254227	shell	300 ± 35	1020 ± 40	cal A.D. 1520-1650	cal A.D. 1480-1680
CA-MRN-114	Beta-254228	shell	300 ± 35	870 ± 40	cal A.D. 1680-1810	cal A.D. 1650-1880
CA-MRN-114	Beta-254229	shell	300 ± 35	1870 ± 40	cal A.D. 770-890	cal A.D. 700-940
CA-MRN-115	Beta-250547	basketry		280 ± 40	cal A.D. 1530-1560, cal A.D. 1630-1660	cal A.D. 1490-1670, cal A.D. 1780-1790
CA-MRN-115	Beta-250548	charcoal		260 ± 40	cal A.D. 1640-1660	cal A.D. 1520-1590, cal A.D. 1620-1670, cal A.D. 1770-1800, cal A.D. 1940-1950
CA-MRN-115	C-186[b]	charcoal		633 ± 200, 911 ± 80		cal A.D. 1035-1432
CA-MRN-328	Beta-254230	shell	300 ± 35	940 ± 40	cal A.D. 1640-1690	cal A.D. 1540-1720, cal A.D. 1740-1750, cal A.D. 1790-1800
CA-MRN-328	Beta-254231	shell	300 ± 35	870 ± 40	cal A.D. 1680-1810	cal A.D. 1650-1880

[a]Complete AMS radiocarbon reports from Beta Analytic Inc. are provided in Appendix E
[b]Radiocarbon dates obtained by Libby (1955) and calibrated by me using Oxcal 4.0

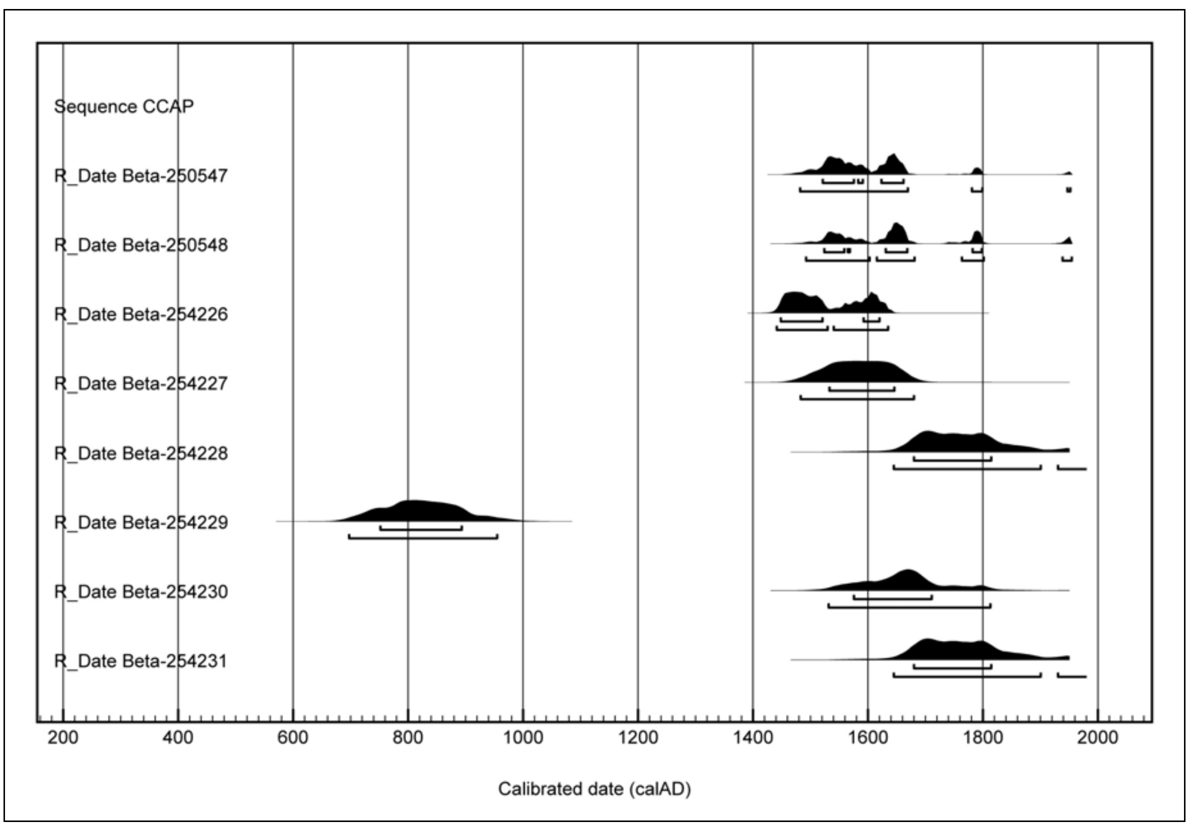
Summary & Intrasite Comparisons

Results from obsidian hydration dating and an assay of eight AMS radiocarbon determinations provide important temporal detail on prehistoric and historic occupation of MRN-114, MRN-115, and MRN-328, as well as the timing of Coast Miwok use and reuse of shell mounds over the long term. Two radiocarbon determinations from charcoal samples collected from the deepest part of Clement Meighan's excavation at MRN-115, and an AMS radiocarbon determination from a shell sample collected from the deepest portion of an auger unit at MRN-114 lend support to the contemporaneous occupation of both sites—if not all three—during the Middle Period (500 B.C. to A.D. 900), the "golden age" of shell mound communities (Lightfoot and Luby 2002:276) (Figure 6.5). As Meighan (1953:6) concluded:

> The group of artifacts from below the 72 inch line includes large projectile points, charmstones, bone pins, an antler wedge, and an awl made from the vestigial outer metatarsal of deer. All of these could be fitted into the complex of artifacts from the McClure facies of the Middle Horizon, and until further work is done the level is tentatively assigned to that level.

Obsidian bifaces of the Coastal Contracting Stem cluster are presented in support of Middle Period shell mound occupation, and it is possible to consider even earlier archaeological components at MRN-115 based primarily on the presence of cultural deposits located below sea level at other shell mounds in the region (Nelson 1909:323, 329-330).

Figure 6.5. Oxcal 4.0 plot of 1σ and 2σ calibrated AMS radiocarbon data.



Especially significant for identifying most recent Coast Miwok components of the three study sites, results from the obsidian hydration dating analysis and the AMS radiocarbon assay indicate all three shell mounds contain Late Period (A.D. 900-1800) components, and specifically components dating to the Late Period Phase 2 (A.D. 1500-1800) (Figure 6.5). In addition to the temporally diagnostic Rattlesnake point excavated from MRN-115, additional Late Period diagnostics recovered from MRN-328 include clamshell disc beads, a steatite pipe bowl, and a serrated obsidian projectile point identified as a Stockton Notched Leaf type, a prevalent point type in Late Period sites and possibly the Historic period (Justice 2002:353-359).

The chronological sequence at MRN-114, pieced together by four AMS radiocarbon determinations, traces site occupation from cal A.D. 770 to 1810 (1σ). Although shellfish are a constant food source through time, a noticeable increase in mussel shell at approximately 40 centimeters below surface at MRN-114 is associated with radiocarbon dates of approximately cal A.D. 1400 to 1600 (1σ). This timing appears to reflect a period of resource intensification in the San Francisco Bay area brought about by growing human populations, a collapse in populations of terrestrial game, and an intensified collection of small game and shellfish (Broughton 1994b:372, 1997:857).

Considering intensified exchange of obsidian and clamshell disk beads during the Late Period Phase 2, AMS radiocarbon data may also support a model of territorial circumscription whereby resource stress, growing human populations, and an increased emphasis on seasonally available foods led to subsequent shifts in meaning and function of older shell mound sites. Accordingly, older shell mound communities became important loci of social decision making and ceremonial activity during the Late Period (Lightfoot and Luby 2002:267). They functioned *less* as places to live throughout the year and *more* as territorial symbols and important locations to gather from time to time. Ethnographically recorded seasonal settlement patterns and tribelet territories also provide evidence for a shift during the Late Period towards alternating occupations of bay shore shell mounds and inland sites (Lightfoot and Luby 2002:275-276; Milliken 1995:19-20).

Results from the obsidian source characterization study provide further clues to interpreting residence at bay mounds over the long term. Specifically, a predominance of Napa Valley (Glass Mountain) and Annadel obsidians at MRN-114, MRN-115, and MRN-328 mirrors most other obsidian assemblages collected from archaeological sites on the Marin Peninsula (Jackson 1986:83). Yet, ethnographic observations of apparent animosities between Coast Miwok residing in eastern and western Marin Peninsula have been used to explain proportional differences in Annadel and Napa Glass Mountain archaeological obsidians collected from sites in these two regions (Jackson 1986). Specifically, archaeological obsidians from Napa Valley appear in greater proportion at sites located in east Marin (e.g., MRN-138, MRN-193, and MRN-471), whereas Annadel obsidian dominates archaeological assemblages from west Marin (e.g., MRN-201, MRN-216, MRN-232, MRN-298, MRN-307, and MRN-402) (Jackson 1986:80) (see Figure 3.1). Unlike other archaeological sites located in east Marin, including MRN-115, MRN-114 and MRN-328 have higher percentages of Annadel obsidian and mirror obsidian assemblages from west Marin Peninsula.

Compared to the assemblage of artifacts from MRN-115, the high proportion of Annadel obsidian at MRN-114 and MRN-328 may indicate one of three things, or a combination of several factors. First, differences in obsidian proportions at each site may reflect issues related to researcher error, namely complications arising from the relatively small sample size or differences in the recovery methods used by Meighan in 1949 and during my research. Though Meighan's field notes remain missing, MRN-115 was probably excavated using a shovel broadcast technique. This method was popular among some archaeologists at the time as a means to efficiently and accurately excavate shell middens, which were typically excavated with shovels and screened using half-inch mesh. The excavation of middens at Drake's Bay also included a chute to dump soils on nearby beaches for washing, and the use of screens in general was "considered as a check only," as they were "a [poor] reflection on one's archaeological ability" (Meighan 1950a:15). Perhaps a consequence of this methodology, the MRN-115 collection is dominated by larger, formal artifact types and very little lithic debitage. Obsidian projectile points—the focus of Jackson's analysis—comprise only a small proportion of the obsidian assemblage collected during more recent excavations. Obsidian debitage was collected from MRN-114 and MRN-328, but did not undergo EDXRF analysis because of instrument size restrictions (Davis et al. 1998). Therefore, different recovery methods from those practiced by Meighan may have yielded a comparatively dissimilar assemblage.

A second possibility, obsidian source data indicate a reoccupation of MRN-114 and MRN-328 by Coast Miwok from western Marin County village sites with economic ties to and preference for Annadel obsidian (Jackson 1986). Building on Jackson's (1986) interpretation of eastern and western Coast Miwok groups with unique social and economic links, it may be possible to theorize inhabitants of MRN-115—connosieurs of Napa Valley obsidian—may have initially fell victim to epidemic diseases that possibly raced through the Bay Area before Spanish settlement (Lightfoot and Simmons 1998). Following Spanish missionization, MRN-114, MRN-115, and MRN-328 might have been reoccupied during the mission period and afterward by hunter-gatherers from west Marin—by Coast Miwok with economic ties to the Southern Pomo and access to Annadel obsidian. Examined in the following chapter, an archaeological and historical study of Coast Miwok from Nicasio (western Coast Miwok) and their efforts to regain pre-contact tribal lands following secularization of Spanish missions lends credence to this particular scenario (Dietz 1976).

Third, the pattern may also reflect shifting social and economic networks brought about by intensified exchange of obsidian and clamshell disk beads and tightened tribal boundaries evident during the Late Period and possibly exacerbated by colonial settlement (e.g., Broughton 1994b, 1997; Jackson and Ericson 1994:395). Through time, once formalized social boundaries between east and west Coast Miwok villages may have relaxed with the onset of Spanish missionization in the San Francisco Bay in 1776. Coast Miwok who had not fallen victim to disease and other social disruptions would have made good on existing social ties to southern Pomo neighbors and other Indians as a means to survive. Social and economic relations with the Wappo would have also remained, but possibly to a lesser degree due to the establishment of Mission San Francisco Solano later in 1823. Farris (1989:492) identified a similar pattern at the Russian Colony Ross, where the flow of obsidian westward from Napa and Annadel sources to the Kashaya living at the colony was interrupted by inland Spanish missions. Similarly, ethnolinguistic research conducted by Johnson (2006) provides perspective on tribal interconnectivity in the north San Francisco Bay region and the area immediately south of Wappo territory and Napa Glass Mountain. Johnson (2006:196) examines oral traditions relayed around 1876 by an elder of the "Napa tribe," *Constancio Occaye*, as emblematic of missionization which "moved peoples speaking different languages into territories where they were not the original inhabitants."

Long-term colonial occupation and tribal mixing may have relaxed once rigidly defined social and economic networks, engendering instead new kin networks and innovative means to secure raw materials while also maintaining linkages to native lands. Viewed in another Californian context, projectile points produced by Ishi (Yahi) are believed to more closely resemble lithic technology of the Wintu/Nomlaki, long time enemies of the Yahi (Shackley 2001). Under severe environmental and social stress inflamed by American settlement, older tribal enmities relaxed and intermarriage became a mechanism of survival. Ishi, an amalgam of different cultural practices, "learned to produce projectile points as a Wintu/Nomlaki but live the life of a Yahi" (Shackley 2001:709). Social ties to the southern Pomo may have also widened, placing Coast Miwok increasingly into economic networks with links to Annadel obsidian. As I explore in the following chapter, the rigid social arrangements of missions also provided opportunity for Indians to continue the very cultural practices in danger of being eradicated as archaeological, historical, and oral sources can attest.

CHAPTER SEVEN

PLACING REFUGE AND LONG-TERM ENTANGLEMENTS IN THE SAN FRANCISCO BAY AREA

Prehistoric and historical archaeology, ethnohistory, ethnography, oral traditions and oral history—the tools of historical anthropology—enable archaeologists to identify processes of culture change at microscale and macroscale levels of analysis (Lightfoot 2005a). This powerful approach is used in the present study to account for short-term, synchronic developments at MRN-114, MRN-115, and MRN-328, and to evaluate diachronic developments in the broader San Francisco Bay area over the long-term, or *longue durée* (Braudel 1980; Knapp 1992). This chapter draws from these various sources to contextualize and interweave archaeological data presented in the previous three chapters. More succinctly, the mechanics of daily life in Alta California missions are examined with an eye towards the opportunities available for Indians to come and go from missions—illicitly or with permission, as on *paseo*—and to return to distant "prehistoric" spaces.

I begin with a brief description of the Spanish foothold in the San Francisco Bay, and I underscore the broader web of missions, pueblos, and presidios in which Mission San Francisco de Asís was but one focal point. I follow with an examination of the Spanish policy of "going on *paseo*" and other concessions intended to balance the labor and confinement of neophytes at Spanish missions. While it is essential to bear in mind the undisclosed biases and "silences" associated with some historical narratives (Hayes 2008), two key sources—one report completed after the exodus of over 200 neophytes from Mission Dolores, and a questionnaire completed by missionaries between 1813 and 1815—offer compelling support for missions as paradoxical entities that, while enforcing policy designed to recruit, confine, and convert California Indians, were also highly permeable places from which Indians departed frequently with and without permission from the padres. The chapter concludes with a discussion of the Coast Miwok following the secularization of Spanish missions post-1830s. Interweaving archaeological finds from the three project sites and incorporating insights captured during interviews with living Coast Miwok and Southern Pomo elders, I attempt to connect my study of places of refuge to a longer tradition of persistent places actively maintained by the Coast Miwok.

Indians in the San Francisco Presidio District

Established in 1776, the presidio district of San Francisco included the *Presidio de San Francisco*, the *Pueblo de Yerba Buena*, and *Mission San Francisco de Asís* (Mission Dolores). In subsequent years, a mosaic of several additional pueblos, such as the *Villa de Branciforte*, and five additional missions—Mission Santa Clara, Mission San Jose, Mission Santa Cruz, Mission San Rafael, and Mission San Francisco Solano—were incorporated into the presidio district of San Francisco (Costello and Hornbeck 1989:311). Strategically placed at four locations along the California coast, soldiers stationed at presidios guarded Spain's tenuous frontier foothold of Alta California from French, British, Dutch, Russian and American expansion and also protected the missions and pueblos established nearby (Voss 2008a). The presidios were also the seat of government for each district and enforced administrative, judicial, and economic policy (Voss 2008a:54). Pueblos formed the third element of the tripartite Spanish settlement system, and were created to supply presidios and missions with agricultural products and other goods.

Understanding this regional network of Spanish settlements is important to bear in mind for interpreting the broader colonial landscape with which California Indians engaged and negotiated, and equally important for contextualizing the spectrum of colonial identities present within these pluralistic communities at any given time.

Along with the Presidio of San Francisco, Mission Dolores was founded in 1776; the sixth of twenty-one missions that would eventually be established in Alta California. Two Franciscan missionaries were supposed to staff each mission in Alta California, although the number of priests varied between one and four (Newell 2009:9). "The most studied and the most controversial of Spain's colonial institutions in Alta California" (Voss 2008a:59), the missions were created to convert Indians to the Roman Catholic faith and to make them loyal "vassals of the [Spanish] Crown" and participants in civilized society (Guest 1973:204). Missionaries claimed lands around the missions, holding this land in trust for baptized Indians with the intention of delivering it to a new class of agrarian, Christian Indians following the secularization of each mission after ten years. This never happened, and the missions were secularized in the 1830s following anticlerical policy in the Mexican government (Newell 2009:10). Instead, high mortality rates among neophytes stemming from confinement and the circulation of venereal diseases, tuberculosis, and dysentery from drinking contaminated water demanded a constant influx of newly recruited Indians, as well as measures to prevent open hostility and revolt (Jackson 1994).

The daily life of a mission Indian was divided between labor and prayer. With an interest in reducing the expense of operating an oversea empire, the Spanish Crown sought to ensure the missions of Alta California could be operated with "a minimum of royal support" (Hackel 2005:273-274). Initially, each missionary received an annual allowance of approximately 350 pesos from a state-controlled Pious Fund, established to support Jesuit missions (Engelhardt 1930:301-301; Hackel 2005:274), and in spite of subsequent attempts to increase salaries missions could not be self-sufficient as intended. Food supplies arrived late, rations were often cut short, and missionaries frequently relied on local provisioning from their Indian charges in addition to their labor (Hackel 2005:274; Sandos 1998:209; Wade 2008:172-173).

"Nearly everything grown or manufactured in the missions, presidios, and pueblos resulted from the labor of Indians" (Hackel 1998:122), and at the presidios, pueblos, and missions Indians occupied positions as cooks, cleaners, millers, water-carriers, servants, and maids, while young girls were sometimes employed as baby-sitters (Kenneally 1965b:212). At the missions, Indians also participated in ranching, ploughed fields, harvested crops, tended gardens, produced crafts, and manufactured tile and adobe bricks (Engelhardt 1930). After the mid-1790s, Indians were also employed as blacksmiths, gunsmiths, masons, leather workers, and were occasionally "loaned" to other Spanish settlements for sundry jobs (Hackel 1998:123; Lightfoot 2005a:67). Yet, with each encounter and mounting experience in particular tasks, Indians also integrated into the Spanish colonial world: for men, attaining new status as *alcades* (overseers) with an ability to move between native and colonial worlds and exercise power over other baptized Indians (Hackel 1998:206); and for others, creating "webs of spiritual kinship" with colonists, as in the practices of intermarriage and godparenting (Newell 2009:125). As President of the California missions (1784-1803), Father Fermín Francisco de Lasuén rejoiced:

> To the best of my knowledge, twenty-four Indian women have married those who are *de razón* since first we settled in this new country. Think for a moment of the many contacts

> between parents, relatives, and friends of all parties concerned that must have followed from, or perhaps even preceded, marriages such as these (Kenneally 1965b:212).

While scholars differ in their opinions as to how best to characterize the labor system at missions, others agree it represented a form of forced communal labor (Lightfoot 2005a:66; Silliman 2001b). As Lasuén stated, "the missions are communities whose resources have to come from the labor of individuals" (Kenneally 1965b:203). Yet, the padres maintained control of the scheduling and allocation of duties, and exchanged food, clothes, and shelter for Indian labor. In this "immersion system… everything had its appropriate daily time" (Sandos 2004:8). On a typical morning, the mission bell rang one hour after sunrise, after which Indians would assemble for Mass, eat breakfast, and gather to receive their daily chores (Engelhardt 1930; see also Margolin 1989:84-88 for La Pérouse's description of the daily routine at Mission Carmel). The mission bell rang again at noon signaling dinner, which was again followed by work for approximately three to four hours, evening prayer, and a third meal (Margolin 1989:87-88). The routine is similar to that maintained at missions in other regions of North America centuries earlier and in Alta California well after La Pérouse's first-hand account of daily life in 1786 (Geiger and Meighan 1976; Wade 2008:199). Alternatively, responding in 1801 to charges brought against the missions for harsh labor practices Father Lasuén expressed cynicism towards the work ethic of native laborers at Alta California missions stating:

> In the summer the Indians as a rule devote from five to six hours to work, and in the winter from four to five. Rarely and only in a few places will one chance to see even half of the people working. Apart from those who have run away, or been given leave to go, and the sick and those who take care of them, the healthy are cleaver at feigning sickness, and they know that they are generally believed, and that even when there is only a doubt, the missionary will always dispense them from work. If they are put to work, nobody goads them on. They sit down; they recline; they often go away, and come back when it suits them. These are the ones who are engaged in piece work, and this is the more common way of working at the missions (Kenneally 1965b:207).

In light of the rigorous labor program carried out at missions throughout Alta California, the question of why Indians joined the missions continues to be asked by scholars (e.g., Hackel 2005; Lightfoot 2005a; Milliken 1995). While the underlying goal of the mission was to convert Indians to Christianity, it has been suggested that initial encounters with the missions were fundamentally experimental (Hackel 2005:127-128), or spurred "by a naïve desire to take part in something new and exciting, while others were sent by family elders who had made a calculated decision to ally themselves with the powerful newcomers" (Milliken 1995:221). Conversion of native peoples, by law, was voluntary (Lightfoot 2005a:82), and Indians throughout the Spanish empire were typically cajoled with offerings of glass beads, clothing, and food (e.g., Deeds 2003:122). Yet, forced recruitment and physical coercion were sometimes carried out to balance high mortality rates at missions or to recapture runaway neophytes (Milliken 1995:95-101; Sandos 2004:102-103). Once baptized, it became impermissible by law for Indians to live beyond the missions to which they belonged, even though they might not have, "truly forsaken their old ways and belief systems for the new ones" (Sandos 2004:82). As Guest (1973:204-205) outlines, fugitive neophytes posed a problem for the missions because: first, once baptized, an Indian was a member of the Roman Catholic Church and if an Indian were to "wander from the mission and return to the wilderness, he might lapse back into paganism"; second, once baptized, an Indian was also under the jurisdiction of the state and not allowed to renounce loyalty to the King of Spain; third, the goal of the mission was to create Christians and participants in civilized society, which could not be done if "he keeps disappearing, at odd intervals, into the forest"; fourth, Indians were legal minors subject to the missionaries as their guardians; and, fifth, maintaining a steady population of baptized Spanish subjects strengthened the Spanish foothold on the northern frontier. According to Hackel (2005:332), "absent Indians set a bad example and, if left unchallenged, could induce others to abandon the missions."

It has also been argued that some Indians travelled to the missions because they had little choice (Milliken 1995). The combined effects of population collapse within native communities, the spread of contagious diseases, and the quieter—but no less devastating—impacts of weeds and grazing livestock that altered local hydrology and communities of native plants and animals, also altered coastal hunter-gatherer subsistence economies (Preston 1998). Compounded by cycles of drought, missionaries observed clear increases in the number of baptisms during periods of drought (Lightfoot 2005a:87). Scholars examining missions in Australia note a parallel trend among Aboriginal hunter-gatherers, who incorporated missions into traditional settlement patterns as an optimizing strategy practiced to reduce risks associated with procuring food items and raw materials (Birmingham 2000). In this context, Spanish missions became sites of refuge for hunter-gatherers negotiating a swiftly changing world (see also Lydon and Ash 2010:5); venues to obtain food and shelter; and places to remake native traditions and kin networks under the hopeful eyes of the Franciscan padres.

Aside from punitive raids, missionaries more often administered other concessions to be able to retain a steady population of neophyte Indian laborers, preempt uprisings, and curb incessant fugitivism that plagued most, if not all, missions. One strategy is a defining characteristic of Franciscan missions located in southern Alta California and ultimately a key factor of tribal persistence and federal recognition by the United States Government (Lightfoot 2005a). Specifically, at these missions, padres appear to have been more flexible in allowing baptized Indians to reside within their home villages, scattered in the mission hinterland "outside the direct daily control of the missionaries" and much like the pliable living arrangements of native Californians at the Russian Colony Ross (Lightfoot 2005a:102).

Whereas missions located in northern California adhered to a stricter policy of *reduccíon* or *congregación*—whereby by padres resettled Indians into a centrally located mission settlement—the arid land of southern California made it difficult for missionaries to feed native converts especially during periods of drought. Consequently, and also depending on the leniency of particular padres, baptized Indians at southern California missions were only required to visit the mission once every two weeks to participate in Mass, festivals, and other church activities (Hackel 2005:259; Lightfoot 2005a:65-66). This "necessary evil," as Father Lasuén called it, was implemented in the southernmost missions out of necessity and not practiced at missions in the San Francisco Bay area (Kenneally 1965b:277). As Lightfoot (2005a:207) argues, trips away from the mission for Indians living in southern California afforded opportunities to visit home villages, recall ancestral traditions, and shore up threatened cultural identities "whenever they scanned the horizon or kicked over an artifact." Although restricted from living away from Mission Dolores, I suggest Coast Miwok and other mission Indians found alternative ways to do the same.

Going on *Paseo* and Indian Apostates

It is clear from the accounts of the Franciscan padres and native texts that mission life was something less than intended. High death rates among neophyte Indians, punishment—typically flogging, jail, or being placed in stocks—and other forms of physical violence carried out at the discretion of the padres, confinement, and hunger plagued efforts to create a stable community of Christians. As I discuss in Chapter 2, resistance to these continued hardships was met by Indians in a variety of forms, including a veritable spectrum of actions ranging from outright revolt and murder to the myriad of "hidden transcripts" followed throughout the day (Scott 1990), or afterhours at neophyte communities, "sequestered between the houses and behind closed doors" (Lightfoot 2005a:113). Two key texts—comments from missionaries between 1813 and 1815 concerning mission life in general (Geiger and Meighan 1976), and a series of *respuestas* (replies) from soldiers, missionaries, and Indians regarding the treatment of neophytes at the missions and the flight of 280 baptized Indians from Mission Dolores in 1795 (Beebe and Senkewicz 2001:266-269; Milliken 1995:299-303)—are important for understanding the machinations of mission life and the opportunities available for mission Indians to reengage with ancestral homelands and hunting and gathering practices.

Although baptized and residing at missions, neophytes consistently maintained the social practices of their former hunting and gathering existence, obtaining native foods to supplement rations supplied by the missionaries and recalling the cultural traditions of previous generations during dances, meals, and while sharing stories with other Indian residents. The Indians, Father Lasuén commented, "are accustomed to their abominable fiestas, and the memory of them is invoked at all hours" (Kenneally 1965b:276). Between 1813 and 1815, missionaries throughout Alta California replied to a questionnaire concerning the daily habits, work ethic, recreational activities, and overall treatment of mission Indians (Geiger and Meighan 1976). These responses provide a unique window into the lives of mission neophytes, and are replete with references to the persistent social habits of the padres' Indian charges. For example, in answer to a question concerning the retention of any superstitions, Fathers Ramón Abella and Juan Sainz de Lucio of Mission Dolores state:

> the Indians have some foolish practices when they go hunting and fishing which if they fail to practice they forgo the hunt and fishing. For instance, they plant a stick with feathers and seeds or they abstain from meat. The means we use have had the effect of enlightening some of them. There are many, however, even the majority who return from the countryside where they have been with the pagans such as their parents who hold on to the old practices (Geiger and Meighan 1976:51).

In answer to the same question, Fathers Narciso Durán and Buenaventura Fortuny of Mission San Jose said neophytes "practice witchcraft by using herbs, stones, thorns, and other things to injure, kill, and take vengeance on others" (Geiger and Meighan 1976:51). Similarly, at Mission Santa Clara, Fathers Magín Catalá and José Viader comment:

> they worship the devils offering them seeds and they fast and dance in their honor in order to placate them. They practice vain observances. By using certain herbs, roots and feathers and other items they believe they can free themselves from their enemies and from illness (Geiger and Meighan 1976:51).

However, at Mission Dolores and Mission Santa Clara, missionaries were contradictory about whether neophytes retained any of the customs and traditions of their ancestors (Geiger and Meighan 1976:94-95). In comparison, at Mission San Juan Capistrano in southern California missionaries reported “these pagans retain *all* the customs of their ancestors” (Geiger and Meighan 1976:93, emphasis added). Although seemingly equivocal about the habits of neophytes at Bay Area missions, it is clear that native cultural traditions were omnipresent, maintained, and even elaborated upon in these new native spaces. This phenomenon is especially exemplified in the treatment of the dead at Mission Dolores, where in place of Christian burials cremations of well-known individuals often took place and adhered to the cultural guidelines of inhumations practiced beyond the missions. Accordingly:

> the effects belonging to the deceased are, as a rule, burned or placed with him in such a way that no one will make use of anything which had come into contact with the dead person. These effects which are the sum total of what even the best provisioned among them might have had are a fishing net, two caritas similar to baskets but very closely woven, a small deer skin, a bow and arrow, and a few wild seeds from the country (Geiger and Meighan 1976:120).

Artifacts believed to be related to indigenous curing ceremonies—charmstones, stone and bone tubes, and rock crystals—have also been unearthed by archaeologists working within neophyte contexts and hint at the presence of shamans and other important community leaders (Lightfoot 2005a:108). Indians also maintained preference for native dishes while living at the missions (Guest 1995:99). Described above, food rations at missions were frequently insufficient to support entire neophyte populations, and as a consequence missionaries often granted permission for Indians to leave the missions to gather and hunt for their own benefit (Deeds 2003:75; Hackel 2005:274; Margolin 1989:90; Newell 2005:70, 2009:57-58; Sandos 1998:209, 2004:55; Wade 2008:172-173); a pattern also seen in other mission contexts around the world (e.g., Birmingham 2000; Lydon 2009). Responding to a question about how many meals neophytes receive daily and the sorts of foods typically consumed, padres at Mission Dolores stated:

> Ordinarily they eat whenever they wish to. They eat the seeds which nature supplies them in the open country. These they roast and grind in a mortar and eat at any hour during the day or at any time of the night they might awaken. Three times a day, morning, noon, and night the mission serves them horsebeans, peas, wheat, barley, corn and meat on Saturdays, all according to what is at hand. I will not venture to determine the value of a meal for an individual since they supplement our food with their seeds, the produce of the sea and the hunt which items have no fixed value in this land since they require little labor (Geiger and Meighan 1976:88).

Missionaries at San Jose provided a similar answer:

> The Indians eat no determined amount of meals for they are eating all the time as long as they are hungry and have something to eat and this day and night. Their food consists of various wild seeds depending on the season. They also subsist on the chase of the terrain and on fish from the sea and the rivers. It costs them nothing but the effort to look for

> them. This, of course, refers to their state in paganism for at the mission on Saturdays they are given a meat supply for the entire week and a daily ration of seeds (Geiger and Meighan 1976:88).

Despite the strict enculturation program enforced at Bay Area missions, Indians still found ways to maintain some traditional practices and remake others to suit their needs. They remained cognizant of the demands of tradition and tuned to the precise timing of the seasons; knowing when and how to hunt and gather, as the missionaries at San Francisco and San Jose confessed:

> They know spring by the appearance of flowers; they know summer because the grasses dry and seeds mature; they know fall because the wild geese and ducks appear and the acorns ripen. Winter they recognize because of the rainfall. They eat whatever they wish if there is anything at hand. In their pagan state they did no other work than to look for food and this they did when the best opportunity was at hand. They look for roots and seeds during the day but they prefer to go hunting for ducks and to go fishing at night because the sea is quieter and the ducks are congregated in greater number in the lagoons and estuaries. They rest after they have obtained what they want or when they believe nothing further is to be had (Geiger and Meighan 1976:84).

Archaeological remains from neophyte quarters provide added evidence for the retention of native cultural practices at Spanish missions, and maintenance of public and private spaces (Lightfoot 2005a:96). Continuities between prehistoric and colonial indigenous practices are heralded by lithic assemblages consisting of flaked stone and groundstone tools; clamshell disk beads; modified bone, such as whistles and awls; and basketry in spite of different living conditions within and outside the mission complex (Lightfoot 2005a:96). This continuity in particular indigenous artifact types within the mission quadrangle could explain the absence of European artifacts at distant shell mounds. Conversely, the intersection of colonial and native worlds is well-noted and reflected in the modification of European materials (glass, ceramic, and metal) into regalia and tools (Lightfoot 2005a:96-97); the consistent presence of native foods harvested using traditional hunting, gathering, and fishing techniques, and often prepared using hearths as one would within a traditional conical bark dwelling (Lightfoot 2005a:97-98); and, in the absence of metal tools, incorporation of indigenous ones—flaked stone scraping tools, bone awls, baskets, and, in southern California, ceramics—into daily work routines (Lightfoot 2005a:103). For example, at Mission La Purísima flaked stone and bone tools were employed in tanning cow hides (Deetz 1963), while examples of native innovation in laboring contexts are identified at other colonial venues in California (e.g., Silliman 2004).

Despite accommodations made by Spanish padres to permit neophytes to continue curing rituals, consume native dishes, utilize flaked stone and bone tools, and conduct dances and other ceremonies in plain view of the padres and even afterhours in their private quarters, Indians persistently found ways to leave missions and return to familiar landscapes in the Spanish hinterland. As missionaries and visitors attest, it was clear that Indians, "however much they might want to join a mission community, did not wish to be separated permanently from their beloved forest. They did not wish to have to live away from their little *patria chica*, their little homeland whence they had come" (Guest 1979:12). Not long after the first missions were established, Franciscan missionaries working in Alta California realized the inevitability of this enduring connection. Commenting on the ebb and flow of Indians from missions, a listless Father Junípero Serra commented “it will happen that one day, because they are punished or reprimanded, another day, because they fear punishment, yet another day because they have friends over there [in the wild], *little by little they will flee*” (Tibesar 1955:409, emphasis added).

Baptized Indians departed from missions with and without permission. An approved form of departure—*paseo*—was granted to Indians at the discretion of the missionaries and was intended for collecting food, visiting friends and relatives, and generally to ameliorate the burden of being away from home. The system of allowing Indians to move in and out of missions with a pass, Milliken (1995:95) explains, originated from a desire to keep track of friend and foe outside mission walls. Although the literal translation of the term “*paseo*” is best understood as something akin to going “on walkabout” (Newell 2009:194), approved leaves of absence were ostensibly linked to a necessity for Indians to provide food for themselves in times of shortage, and to also visit villages and relax with friends and family (Hackel 1998:209; see also Hackel 2005:84-85, 286; Milliken 1995:95; Newell 2009:101; see also Newell 2005:70). Innovative research by Newell (2009:161-164) suggests Indians sometimes timed their *paseos* to correspond with major life events such as childbirth and death.

Recruitment of unbaptized Indians and “denaturalization” were two underlying motives in the implementation of *paseos* by priests. “To convert hunter-gatherer populations the missionary needed not only to congregate them but also to keep them tethered” (Wade 2008:265). In this manner, missionaries believed neophytes would ideally return to native villages to profess the benefits of a Christian lifestyle and, in doing so, make comparisons between mission life and the apparent hardships of their prior “pagan” existence. As Father Lasuén writes, the Indians:

> are treated with tolerance, or dealt with more or less firmly, depending on the longer or shorter time that has elapsed since their conversion, while awaiting the time when they gently submit themselves to rational restraint, something they had not known before. *At the same time they can see that those who are ill and those who are well receive what is necessary for their daily needs without too much effort on their part, and that they are sure of daily sustenance when before they lived from hand to mouth* (Kenneally 1965b:202-203, emphasis added).

The duration and frequency of *paseos* varied at the discretion of the missionaries, and ranged from a few days to several weeks throughout the year (Guest 1979:11; Hackel 2005:84-85; Sandos 2004:94). At Mission Santa Barbara, leaves of absence for baptized Indians were not granted at times of harvest or during particular weeks containing a holy day (Engelhardt 1930:583). At all other times of the year at Mission Santa Barbara, an estimated one-fifth of the entire neophyte population was permitted to depart from the mission every week and the duration of each *paseo* varied according to distances to home villages: one-week passes for those whose villages were closest and two-week passes for those Indians who had to travel a greater distance (Engelhardt 1930:583; Sandos 2004:199). However, the frequency of departures—every fifth week—suggests an annual furlough of approximately ten weeks for every neophyte capable of making the journey and, while this seems like a generous calculation, Sandos (2004:199) estimates multiple departures throughout the year was normal.

As suggested above, most baptized Indians remained tuned to the seasons and aware of the periodic availability and collection of important food sources despite the efforts of the missionaries to reset this clock. As Father Lasuén lamented "and when such persons are returned from their flight, they intimate that they are hungry… they have told me (after eating all or maybe most of what they have been served) that they cannot swallow *atole* made from corn or flour, that what they need is fish" (Kenneally 1965b:203). In most, if not all, Alta California missions Indians continued to hunt, gather, and collect native foods, including acorns, seeds, fruits, fish, shellfish, waterfowl, and game (Engelhardt 1930:581, 583-584; Geiger and Meighan 1976:84, 88; Kenneally 1965b:203-204; Lightfoot 2005a:98; Margolin 1989:90; Newell 2009:57-58). In at least one example from the San Francisco Bay, an Indian is described hunting for sea otter from a local beach (Milliken 1995:297): a brief glimpse of a centuries old practice (Hildebrandt and Jones 1992:382). For some baptized Indians at Mission Santa Barbara, fruiting Islay (Holy-Leafed Cherry, *Prunus ilicifolia*) was a strong seasonal attraction so much so that padres attested "in the years when they abound, a little more than one kettle of *pozole* is sufficient for all the people in the mission" (Engelhardt 1930:584). Conversely, death reports associated with the improper consumption of wild foods, such as shellfish, reveal a *loss* of traditional knowledge among some mission Indians about when to gather particular foods (Newell 2009:57).

Although deaths resulting from eating bad clams were rare, missionaries were cognizant of the activities of Indians while on leave and remained deliberate in making such opportunities available to them. The administration of approved departures undoubtedly varied by mission, by the inclinations of certain missionaries, and according to the seasons, particularly when certain crops required multiple laborers for harvesting and processing tasks (Engelhardt 1930:583-584; Hackel 2005:84-85; Sandos 2004:94). Visiting Mission Dolores in 1816, Louis Choris noted passes were given only to "those Indians upon whose return [the priests] believe they can rely… it often happens that few of these return" (Mahr 1932:95). At Mission Santa Barbara following Sunday Mass, priests read aloud the names of Indians who were granted *paseo* and recorded them in a journal to keep track of those who could and could not leave the following Sunday (Engelhardt 1930:583). Future research will attempt to locate such journals.

Baptized Indians also departed missions without permission. Sherburne Cook (1976) studied fugitivism at the Alta California missions, and distinguished two classes of fugitive: those whose escape was *temporary* and those who escaped long enough to be dropped *permanently* from the mission rolls. Additionally, Cook (1976:73-90) outlined four reasons why baptized Indians fled the Alta California missions: emotional resistance to compulsory conversion; homesickness; revolt against overaggregation (a term used for over-population within a confined area due to the reducćion program by which missionaries brought together California Indian groups, in many cases Indians from different linguistic and cultural traditions to a single mission site [Cook 1976:85]); and resistance to enforced confinement, as in the case of women's dormitories, or *monjerias* (see Voss 2000).

Cook (1976:58) estimated that up to 1831, one baptized Indian out of every 24, or 3464 neophytes, fled the Spanish missions in California, while 5428 neophytes fled in the years 1832, 1833, and 1834. Through the year 1817, 4060 Indians—approximately twelve percent of the total mission population (20,427) for fifteen missions—had successfully escaped. A much larger percentage of Indians also fled unsuccessfully, either aborting their flight or being recaptured. For example, Maria Copa relayed many of the stories of mission life her grandparents once told her including those of her grandfather who "used to wash the priest's clothes. Ironed them, too [and] used to play the violin for mass" (Collier and Thalman 1996:26). Maria Copa's grandfather also "ran away from the mission. He was afraid to go back. But every time he tried to take a drink of water he heard something hissing. It frightened him so that he went back to the mission" (Collier and Thalman 1996:26). This example further alludes to continuities in spiritual observances; perhaps in this case an association between snakes and their ability to portent unfortunate events. Alternatively, Cook (1976:62) argues the total number of runaway neophytes decreased through time as more and more lost touch with outside villages, deciding to remain at the missions "to bear those evils which they had, rather than fly to others they knew not of." Whether or not this trend reflects missionaries failing to report all runaways remains unclear. At any particular time, however, an estimated ten percent of the entire mission population in Alta California was illicitly in transit to the Spanish hinterland (Cook 1976:62; Lightfoot 2005a:90).

While opportunities were available for Indians to leave missions for specified lengths of time, mission administrators were inconsistent in making them available and the enforcement of policy appears mostly subjective on the part of the padres. In response to a mass exodus of 280 neophytes from Mission Dolores in 1795, a military inquiry headed by José Argüello interviewed captured runaways, soldiers, and priests to understand motives for Indian apostasy. The investigation was ordered by Governor Don Diego de Borica and conducted in August of 1797.

Sworn depositions from four colonists—Sergeant Pedro Amador, who led the expedition to retrieve the fugitives, Corporal Alexo Miranda, Ensign Raymundo Carrillo, and a *mayordomo* Diego Olbeza—at the judicial proceedings attested "too much work, too much punishment, and too much hunger" led to the flight of over two hundred neophytes from Mission Dolores (Guest 1973:210). In addition to these "three *muchos*" (Guest 1973:210), one of the two missionaries at Mission Dolores, Father Antonio Dantí, is described at different times by Guest (1973:284) as "a problem, an eccentric, a crank," "fiery and irascible" (Guest 1973:284), "as explosive as gunpowder" (Guest 1973:209), and a central figure in the mistreatment of baptized Indians leading up to the mass exodus. Furthermore, that hunger appears again a source of contention at Mission Dolores may be telling of the importance placed on locally purveyed foods despite assurances that neophytes were given three meals a day (Kenneally 1965b:203). As opposed to cooked meals, Guest (1973:210) notes mission Indians were often given insufficient quantities of *dry* rations of barley, beans, and wheat and had little time to prepare them. Even more telling of the actual conditions at Mission Dolores is a terse note sent to José Argüello from Father Lasuén after Governor Borica was made aware of the 280 runaways:

> These are what the Lord Governor [Borica] wishes: that the work of the Indians be made light; that there be more moderation in punishing them; and that they be given their rations *cooked*. All this has been put into effect quietly (Kenneally 1965a:400-401, emphasis added).

Testimonies from recaptured neophyte runaways capable of testifying are presented in Beebe and Senkewicz (2001:266-269) and Milliken (1995:299-303). One runaway, Tarazon, declared "he had no motive [to runaway]… Having been granted license to go on *paseo* to his land, he had felt inclined to stay" (Beebe and Senkewicz 2001:267; Milliken 1995:300). At the time, this would have been a clear offense. Yet, another respondent, López, explained that "he went one day over to the presidio to look for something to eat. Upon returning to the mission, he went to get his ration, but father Dantí did not want to give it to him, saying that he should not go to the countryside to eat herbs" (Beebe and Senkewicz 2001:269; Milliken 1995:302).

Still other runaways allude to the meager mission diet and need to supplement rations with native foods. One man, Homobono, testified "his brother had died on the other shore, and when he cried for him at the mission they whipped him. Also, the *alcalde* Valeriano hit him with a heavy cane for having gone to look for mussels at the beach *with*… permission" (Beebe and Senkewicz 2001:267, emphasis added; Milliken 1995:301). Próspero declared "he had gone one night to the lagoon to hunt ducks for food. For this Father Antonio Dantí ordered him stretched out and beaten. Then, the following week he was whipped again for having gone out on *paseo*. For these reasons he fled" (Beebe and Senkewicz 2001:269; Milliken 1995:303). Still another captured runaway, Mílan, declared he was "working all day in the tannery without any food for either himself, his wife, or his child. One afternoon after he left work he went to look for clams to feed his family. Father Dantí whipped him. The next day he fled to the other shore, where his wife and child died" (Beebe and Senkewicz 2001:268; Milliken 1995:302).

Running away is often overlooked due to its apparent simplicity and ubiquity in many colonial contexts. By dismissing native flight from California missions as an inevitable process of colonial encounter, the complex tangle of decision and utter emotion that culminated in a final act of flight is masked. Similarly, where did they go, those who escaped? Did they seek hidden canyons or other isolated regions of refuge just beyond the colonial gaze? Or, did some return to the places from whence they originally came, much like those who left the missions on *paseo*? That is, did familiar village sites take on renewed meaning as sites of refuge for mission runaways; places to refashion some daily practices; and venues to continue the very cultural traditions that were in danger of being erased?

Similar to descriptions of Indians' daily procurement of foods and gaining permission to leave at certain times of the year to collect seasonally available foods, the testimonies of recaptured neophytes are further telling in that they too describe the persistence of pre-contact hunting and gathering practices that drew from previous knowledge of how and where to gather wild plants, shellfish, and game. In short, trips away from missions afforded opportunities to re-immerse in a hunting and gathering existence. Furthermore, knowing when and where to procure these items would not have been totally abandoned with European settlement nor solely born from the extreme circumstances of living at the missions, but periodically recalled on trips away from the mission. In addition to local getaways and *persistence through subsistence*, some testimonies also mention escape to "the other shore", or *en la otra banda*, in some instances to ancestral homelands where family members passed away and, presumably, to places where funeral rites were practiced (see also Newell 2009:161-164). For example, while feeling "inclined to stay" away from the mission after fleeing, Milliken (1995:300) also discovers Tarazon's daughter, *Xantipa Ssaquenmaie*, passed away in 1800 after her flight from Mission Dolores in 1795. Malquiedes, another recaptured neophyte, confessed "he went to visit his mother, who was on the other shore," yet the death of his fugitive wife while away from the mission did not appear in his testimony (Milliken 1995:301). Having lost his son three years prior (Milliken 1995:301), perhaps twenty-three year old Malquiedes consulted his mother about appropriate curing rituals to treat his ailing wife and did not mention her name after her death in accordance with culturally specific mourning practices. Compelling examples such as these speak to cultural continuity around the Bay Area and lend support to the possibility that some prehistoric archaeological sites were utilized throughout the mission period as places of refuge and realms of on-going cultural practice during and after missionization.

Secularization and Coast Miwok Persistence

By 1832, 2,828 Indians from the Marin Peninsula had entered the missions at San Francisco, San Jose, San Rafael, and Sonoma, while nearly three-quarters of this population (2,073) had been baptized at Mission Dolores by 1817 (Milliken 2009:32). At Mission San Jose alone, nearly 54 percent of the 390 baptized Coast Miwok speakers perished between 1817 and 1829 (Milliken 2009:43). By 1803, Milliken (1995:179) estimates that Coast Miwok villages on the southern Marin Peninsula had been emptied of people. The "Coast Miwok" entry in the Smithsonian's Handbook of North American Indians (1978) reflects the "fatal impact" of colonialism for the native occupants of Marin (Thomas 1994:15):

> A number of persons today have some Coast Miwok blood but apparently no knowledge of native culture and no interest in it. Effectively people and culture have disappeared (Kelly 1978:414).

Yet, on February 17, 2001 Coast Miwok and Southern Pomo descendants of the newly federally acknowledged Federated Indians of Graton Rancheria gathered at Point Reyes National Seashore to celebrate their history, their families, and their future as a sovereign tribe (Sarris 2001). This section examines the lives of Coast Miwok at the end of Spanish California and after secularization of the Franciscan missions in the 1830s. To "places of refuge," Coast Miwok fled to escape Spanish missions and convene periodically to practice familiar traditions and remake themselves in the midst of colonial challenges. In addition to historical sources, oral traditions and oral histories collected during interviews with Coast Miwok elders help demonstrate social reinvention and enduring connections to a landscape that was *and continues to be* deeply reflected in Coast Miwok identity.

Throughout the early 1800s, Indians at Mission Dolores continued to perish in horrifying numbers. Although the years 1801 and 1802 are marked by a heavy influx of Indians from the Marin Peninsula and the East Bay, mortality rates fluctuated widely at the end of the 1700s and early 1800s (Milliken 1995:170). Mass baptisms of Coast Miwoks punctuated a more general trend of steadily increasing Indian deaths at Bay Area missions (Milliken 1995:172). Periodic lulls in Coast Miwok converts are also evident in 1804 and between the years 1806 and 1807, and potentially reflect a conscious decision among Coast Miwoks not to visit the missions (Milliken 2009:22). Chronic death rates were fueled by improper diet and water-borne diseases, and further compounded by a series of epidemics that swept through Alta California missions and forced missionaries to probe the hinterland for recruits and runaways (Phillips 1993:45). One of the deadliest epidemics occurred between 1806 and 1810, when measles claimed the lives of at least one quarter of the mission Indian population of the San Francisco Bay (Milliken 1995:193).

By 1809, the San Francisco Bay was also frequented by Native Alaskan hunters who were attached to Russian expeditions following the Pacific Coast in search of sea otters and safe ports. At this time, Milliken (1995:202) notes, the Spanish started to consider more seriously controlling lands and people north of Mission Dolores. They constructed more sea-worthy open-air launches for navigating bay waters and for bringing missionaries to the Marin Peninsula to proselytize. Taken together, the Russian presence just north of the San Francisco Bay at Colony Ross beginning in 1812; mounting neophyte deaths at Mission Dolores, Mission San Jose, and Mission Santa Clara; fugitivism; and a reinvigorated recruitment effort on the Marin Peninsula led colonial administrators to consider additional mission sites in Alta California.

Mission San Rafael Arcángel, an *asistencia* or hospital mission, was founded in 1817 and originally populated with baptized Indians from Mission Dolores and Mission San Jose, including an estimated 230 Coast Miwok (Milliken 2009:31). An inland chain of missions was planned for the San Joaquin Valley and Tulares region (Weber 1982:61-62)—a vast maze of tule marshes and sloughs that provided ample refuge for runaway Indians along the margins of Spanish California—but did not come to fruition as missionaries confessed Indians here could not "be taken out without peril and without troops" (in Phillips 1993:46). The last of twenty-one missions established in Alta California—Mission San Francisco Solano—was founded at Sonoma in the north San Francisco Bay in 1823, two years after Mexico claimed independence from Spain.

With the majority of Coast Miwok baptisms taking place at Mission Dolores before 1817, another 629 Coast Miwok were baptized at Mission San Rafael between the years 1817 and 1822, followed by an additional 129 Coast Miwok after 1822 (Milliken 2009:32). After 1817 Spanish missionaries increasingly turned their eyes westward and northward, seeking to proselytize Coast Miwok at Tomales Bay and Bodega Bay as well as Southern Pomo living to the north of the Coast Miwok. Since the founding of Mission San Rafael, especially 1817 to the early 1820s, numerous *Segloque* from the Tomales Bay region and other Coast Miwok-speakers moved to San Rafael (Milliken 1995:254). Alternatively, the time between 1822 and 1831 was an era of predominantly Pomo recruitment at Mission San Rafael, including Southern Pomo tribelets such as the *Bitakomtara*, *Konhomtara*, and *Kabemali*, as well as smaller numbers of Wappo neighbors (Milliken 1995). Of the last thirty-two Coast Miwok to be baptized at Mission San Rafael in 1831 and 1832, twenty-six were from Bodega Bay and many of these were reported as having kinship ties to Indians laboring at the Russian Colony of Ross and its outstations (Milliken 2009:35).

Prior to 1833, when Mexican congress passed the secularization law, deaths, periodic attacks on the missions, and runaways continued to plague the declining mission system. In 1832, for example, thirty-six neophyte deaths and twenty baptisms were recorded, equaling a net loss of sixteen Indians for a total of 1057 Indians at Mission Rafael (Milliken 2009:39). However, Father Estenega only recorded 300 Indians living at the mission by the end of 1832. As Milliken (2009:39-40) questions, had missionaries failed to report the flight of 773 Indians, or were they too overwhelmed to account for the deaths of 773 Indians in a single year? In the absence of further evidence, native agency at Spanish missions appears to have remained a frequent phenomenon, even at their closure in the early 1830s.

Another common phenomenon—intermarriage—is also evident among mission Indians, including the Coast Miwok. For example, recalling her great grandparents Maria Copa said "the priests found them living together and made them marry. They named my [great] grandfather Otilio and his wife, Otilia. That was their custom" (Collier and Thalman 1996:26). While this example and the overall trend among mission Indians was for endogamous marriages (i.e., marriages of individuals from the same tribelet), numerous exogamous marriages (i.e., marriage of individuals from different tribelets) are documented (Milliken 2009, Table 6). For example, among the *Tamal Aguasto*, who occupied villages on or near Point San Pedro, forty-three endogamous marriages are recorded. Exogamous marriages include only one union with another bay shore tribelet; four instances of marriage between *Tamal Aguasto* and Ohlone-speakers from the San Francisco Peninsula; and thirteen examples of marriages to tribelets located along the Pacific Coast such as those from Tomales Bay and Bodega Bay (Milliken 2009). This pattern illuminates obsidian source data, which I believe reflect the reoccupation of MRN-114 and

MRN-328 by Coast Miwok from the west Marin Peninsula where Annadel obsidian dominates archaeological obsidian assemblages. Several examples of marriages between Coast Miwok men and Pomo women are documented at Mission San Rafael (Milliken 2009:41-42), but this would have also occurred prior to European contact.

That said the Franciscan missions of Alta California were "linguistic melting pots" where Indians and Europeans alike intermingled and reworked their social situations (Milliken 2009:45). As I mentioned earlier, mission Indians created marriage alliances with Indians in similar dire straits and also expanded their kin networks to include Spanish colonizers at nearby presidios and pueblos (Newell 2009:41-45). For Indians, the practice of godparenting was invested with multiple significances:

> Many Indians acted as godparents to other Indians at the mission, and in these cases, godparenting frequently created a relationship between godparent and godchild, between godparent and biological parents, or between godparent and the godchild's village or tribal community that created, repaired, or reinforced networks of relationships among Bay Area Indians (Newell 2009:18).

Viewed another way, Lightfoot (2005a) argues the combined effects of tribal amalgamation at missions in northern Alta California and the cultural implosion experienced by Indians torn from their home territories contributed to a highly malleable and more generalized "pan-mission" Indian identity. With time, Lightfoot argues, second and third generation neophytes raised at the missions would have lost touch with their homelands and "vested the broader landscapes of the missions with new meaning and symbolism" (Lightfoot 2005a:206).

Refuge communities like *Alisal rancheria* and Rancho Nicasio—safe-havens where Indians from similar and different tribal backgrounds lived and worked together—could be representative of the "pan-mission" phenomenon. These communities surfaced in the wake of the Spanish missions and the subsequent allotment of mission lands to Mexican families. *Alisal* was located on land ceded to the Ohlone by a *Californio* family, the Bernals, near the town of Pleasanton in the backcountry of Mission San Jose. It was a context for Ohlone, Northern Valley Yokuts, and Plains Miwok to marry; gather and consume wild foods; earn a living as laborers at local ranches; and practice dances related to the World Renewal Ceremony and other revitalization movements during the late nineteenth century (Leventhal et al. 1994). Some members of the Bernal family also intermarried with Ohlone, or served as godparents to Ohlone children (Leventhal et al. 1994:309). By 1925 however, the Ohlone appeared to have suffered a similar fate as the Coast Miwok described by Kelly (1978:414) above:

> The Costanoan [Ohlone] group is extinct so far as all practical purposes are concerned. A few scattered individuals survive, whose parents were attached to the missions of San Jose, San Juan Bautista, and San Carlos; but they are of mixed tribal ancestry and live almost lost among other Indians or obscure Mexicans (Kroeber 1925:464).

Nicasio—located northwest of Mission San Rafael about halfway between the mission and Tomales Bay—was originally the site of a prehistoric Coast Miwok village named *Echa-Tamal*, though this area took on renewed meaning as a refuge community in the middle and late nineteenth century. Charged with colonizing ex-mission lands within his district, Mariano Vallejo granted Nicasio to "Christianized Indians" of Mission San Rafael in 1835 at the petition of five Coast Miwoks: Teodorico Quilaquequi, Sebastian, Juan Evangelisto, Luis Gonzaga, and Luis Antolin (Dietz 1976:19). However, Vallejo neglected to file a formal petition for the Nicasio land grant with Mexican authorities in Monterey and, under a specious argument that the Indians were not making good use of their property, reclaimed the property two years later (Dietz 1976:21). The same Coast Miwok who had originally petitioned Vallejo for the property filed an appeal with the Mexican Government. "These lands," they stated "have pertained to our forefathers" (in Dietz 1976:22).

At Nicasio, Coast Miwok retained cultural traditions of pre-contact times; purposefully using the bow and arrow while also practicing more recent ranching and farming methods (see Dietz 1976:24). When Indians from Nicasio threatened to lay siege to the pueblo of San Rafael in protest for having their title rescinded, Vallejo caved to the request and granted them a small parcel of land and some cattle within the Nicasio Valley in 1840. Yet without formal ownership of this parcel, the land was officially granted to Pablo de la Guerra and John B.R. Copper in 1844.[1] However, Coast Miwok remained on the rancho during this time at the discretion of the administrator of Mission San Rafael and *Rancho San Pedro, Santa Margarita y las Gallinas*—Timoteo Murphy—who is said to have learned the "Indian tongue," purchased tools for the Indians, and invited them to his hacienda for barbeques and other celebrations (Donnelly 1966:M6).

In at least one instance, Charles Lauff (in Dietz 1976:35) recalled "after the feast everyone gathered around an immense fire that was burning where the corner of Fourth and C Street is today. The Indians were arriving from the outside settlements and in their paint and feathers presented a wonderful sight around the fire." Lauff also recalled his conversation with George Thomas Woods (also known as, "Thomas Woods" or "Tom Vaquero"), an entrepreneur living at Tomales Bay. The following excerpt provides a glimpse of the goings-on of Indians on the Marin Peninsula in the 1840s:

> [Woods'] home was the rendezvous of all the Indian tribes and it was not a difficult matter for him to keep them supplied with food, as deer, bear, and wild cattle were plentiful, and the bay was full of fish and clams. During the summers of 1844-45-46, it was not an uncommon sight to see 1000 Indians along the bayshore. They would come overland with their supply of hides, tallow and skins, and would wait weeks for the arrival of a vessel. In the summer evenings, in order to keep the Indians in good humor [Woods] would have a good old fashioned clambake in which the squaws and bucks would join in. Now and then a few deer would be thrown over the irons, and while the feast was being cooked the Indians would dance to their hearts content. Most of the Indians could talk English fairly well, thanks to the missionaries. Among them were cobblers, carpenters, cooks and black-smiths. Some of the younger Indians had fairly good voices and would sing the Latin hymns taught them by the padres while altar boys (in Dietz 1976:34-35).

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[1] The massive influx of settlers to the San Francisco Bay during the Gold Rush in 1849 and Chinese shrimp-fishing communities built along Point San Pedro after 1870 would further alter the cultural fabric of the Marin Peninsula. Additional petitions by Indians to gain title to Nicasio lands were denied by the United States Land Commission in 1855, although Jose Calistro (Coast Miwok) purchased a small parcel of land from William J. Miller in 1872 and was appointed caretaker of "certain old and infirm Indians at Nicasio" by the Marin County Board of Supervisors (Dietz 1976:56-58). In the 1920s, Maria Copa recalled Indians living at Nicasio including her relative "Yo Calistro" (Collier and Thalman 1996:63). Big Head dancers also performed at Nicasio as part of the Kuksu Cult (Collier and Thalman 1996:232). After Jose Calistro's death in 1875, the land was sold off piecemeal.

Camillo Ynitia (Coast Miwok) also acquired property in the post-mission era. With assistance from Mariano Vallejo, Ynitia was granted Rancho Olompali in 1843 and had his title later confirmed by the U.S. Land Commission (Carlson and Parkman 1986:244). The pattern of land purchases by California Indians is not purely a Bay Area phenomenon, but extends northward to Sonoma, Mendocino, and Lake Counties where Pomo bought land and actively shaped the discourse of American settlement (Schneider 2006).

Donnelly (1966:M7) also writes of Timoteo Murphy, who frequently "rode over his vast empire to the shores of San Pablo Bay. Often he returned with a deer slung over the back of his horse. Wild game abounded in the hills and flocks of ducks and geese darkened the skies in their flight." It is tempting to envision Timoteo Murphy—like Tom Vaquero, who enlisted Indian laborers to gather abalone and turned a profit selling the shells to French sailors (Munro-Fraser 1880:123)—in the company of Coast Miwok with knowledge of what and where to hunt on the San Pablo Bay shore.

Typically composites of two or more different tribelets or language groups, refuge communities like *Alisal* and Nicasio also provided displaced Indians around the bay opportunities to remake themselves *vis-à-vis* Mexican and American economies. Additionally, the placement of these communities within ancestral territories—at times where prehistoric sites are found—is more than coincidence. The caustic impact of colonialism and long-term reverberations of missionization for Indian communities cannot be underestimated. Some Indians did lose knowledge of specific skills while residing at missions, as evidenced by the example above describing the deaths of eight Indians at Mission Dolores from eating bad shellfish they had collected while on *paseo* (Newell 2009:57). Yet for others, identities were remade and connections to tribal communities and other places within the landscape endured.

Periodic approved departures from missions and illicit escape from missions to the mission hinterland, I argue, provided opportunities to reconnect with home territories and renewed meanings for particular places of refuge did not always necessitate losing touch with them over the long term. Parallel to the experiences of Indians at other points along the Pacific Coast, at places of refuge and even post-mission refuge communities Coast Miwoks tenaciously kept a foothold in their ancestral landscape "employing centuries-old subsistence practices, and, quietly and often primarily by example, reminding their children that… they were, in fact, Indians" (Tveskov 2007:438). As Theresa Harlan (2006), Coast Miwok, comments on her life and the lives of her parents and grandparents, their knowledge of Coast Miwok culture was enriched by a mixture of oral history and teaching through example carried out by previous generations into the past:

> What I know about my mom's life at Tomales Bay, I learned at the kitchen table playing card games or listening to her talk and laugh with relatives… [and one of her fondest memories was] following her dad… as they dug for clams. She loved to crack open a clam, wash the sand off in the bay, and eat it right there on the beach (Harlan 2006:10).

Oral Sources on Coast Miwok Cultural Persistence

In addition to ethnographic sources used throughout this dissertation, I collected oral traditions and oral histories from descendants of the Coast Miwok and Southern Pomo to further detail the resilience and experiences of Indians living on the Marin Peninsula following the mission era. Vansina (1985:13) distinguishes oral history—eyewitness accounts about events that occur within the lifetime of an informant—from oral tradition, or accounts of past events that occurred beyond the lifetime of an informant. Although some archaeologists have questioned the testability of oral sources to elucidate events in the deep past (Mason 2000), my research flows from scholarship which emphasizes oral traditions and oral histories as valid ways of knowing native North American pasts (e.g., Anyon et al. 1997; Echo-Hawk 2000).

As part of a holistic historical anthropological methodology, interviews with elders from the Federated Indians of Graton Rancheria were conducted during the summer of 2009. Through an open call for participants announced in the tribe's newsletter, tribal elders were invited to attend a three-hour interview session of their choice. Three self-selecting interview sessions were conducted in groups, which proved to be a cost-effective, relatively fast, and informal method of gathering a wide range of responses from a large group of informants. Furthermore, interviews were designed in such a way that responses given by some participants could trigger memories among other participants that might otherwise have been overlooked in formal one-on-one interviews. Participants in the study were asked questions, which were posed to guide an otherwise organic dialogue shaped by the knowledge and comfort levels of the informants. Three elders—George, Lynn, and Ted—were asked questions that primarily addressed connections between them and cultural landscapes. Specifically, where and how they (or their parents, grandparents, relatives, etc.) gathered or hunted particular plants and animals; if they observed cultural traditions when visiting certain places on the Marin County landscape; and when these places were visited and during which seasons certain plants and animals were harvested. All interviews were voluntary and followed research protocols (CPHS Protocol #2008-9-3) approved by the Committee for the Protection of Human Subjects at the University of California, Berkeley. The names of informants have been changed to ensure their anonymity.

George's father would often row Tom Smith over to Bodega Dunes to hunt rabbits with long sticks, which were used as clubs (personal communication, 23 May 2009). These boat trips also brought Tom Smith to Bodega Head, a spiritual place to this day and the location of caves that were sometimes used by Tom Smith when he fasted for particular ceremonies. George recalled his grandmother preparing acorn mush on the beach at Bodega; gathering clams in private beds (although George disliked getting stuck in the mud); going inland to collect acorns and deer; and setting aside fish and crab for relatives visiting from Santa Rosa. George also remembers his great aunt telling stories about trails used by Indians traveling between Bodega and Napa Valley, where Coast Miwok exchanged abalone and clamshell disk beads with the Wappo for obsidian (personal communication, 23 May 2009).

Born in Marshall on Tomales Bay, Lynn grew up in Oakland and she remembers spending summers with her grandmother in Marshall (personal communication, 25 August 2009). Now 73, Lynn commented that during the great depression her family lived at Tomales Bay and because of the bounty of wild foods available to them, they "didn't know what a depression was" (personal communication, 25 August 2009). She recalls childhood memories of picking blackberries for her grandmother's pies; gathering seaweed; dividing fresh catches of crab among Coast Miwok families; and clamming at Marshall near a Coast Miwok cemetery, where sixteen of her family members are interred. Lynn "can't remember a time when [she] didn't go to the cemetery" (personal communication, 25 August 2009). She and her family visit the cemetery every Memorial Day, clearing weeds and placing flowers on her relatives' graves. As a child and even to the present-day, Lynn happily remembers these visits, when after cleaning the cemetery her family would meet at Marshall beach to swim and barbeque.

Ted grew up at Bodega Bay (personal communication, 25 August, 2009). An avid fisherman and abalone diver, Ted recalls collecting salmon berries at the coast during the late spring and early summer; gathering abalone, clam, oyster, and sometimes mussel; and fishing salmon, trout, herring, lingcod, rock cod, jack smelt, and Cabazon. Ted declares he was "raised on venison" (personal communication, 25 August, 2009), and he also remembers eating rabbit, quail, and waterfowl such as ducks and geese. Waterfowl would be hunted in the late winter and early spring, and both Lynn and Ted vividly remember eating mudhens (American Coot) which were soaked in vinegar to make them more palatable, but still literally "tasted like mud" (personal communication, 25 August, 2009). Perhaps these and other waterfowl were gathered in the winter months with special nets, as Tom Smith had once remembered (Collier and Thalman 1996:129). Ted states, “everything was seasonal… seaweed would be collected during a minus tide, berries would be collected in the summer, deer in December and January, and perch could be caught when the pussy willows bloom” (personal communication, 25 August, 2009).

Notably, all three informants recall gathering and hunting wild foods at particular times of the year at Tomales Bay and Bodega Bay, just as their parents, grandparents, and previous generations had learned. Yet, while enduring culturally, socially, and linguistically, Coast Miwok also found ways to thrive in new economic atmospheres. Some labored at Mexican and, later, American ranches, potentially applying skills they had learned while residing at the missions and also incorporating these ranches into seasonal and social rounds (Silliman 2004:30). Some Coast Miwok worked for Tom Vaquerro and Timoteo Murphy herding cattle, gathering hides, and collecting abalone shell for a lucrative market in the 1840s. Beardsley (1954:19, emphasis added) refers to the region around Tomales Bay as a “refuge area for Indians unwilling to be converted... [and] survivors, or those who returned when the mission period ended, continued to live in *modified aboriginal fashion* until after 1855 or 1860, even while permanent white settlers were bringing dairy cattle and agriculture to the area.” Theresa Harlan’s grandmother remembered the move from Nicasio to Tomales as a child in the 1850s (Harlan 2006:11).

Some Coast Miwok even succeeded in obtaining parcels of land in Marin County following the closure of Spanish missions. At these places they ranched and farmed on their own but also purposefully maintained connections to the landscape as their relatives had done generations before. More recently, Ted remembers as a child travelling to Santa Rosa from Bodega Bay in the 1930s and 1940s with his family to pick hops, prunes, and apples later on. Coast Miwok also operated a successful fishing business at Bodega Bay into the mid-1900s (Collier and Thalman 1996:512). As Lynn made clear, her family has “always been together” (personal communication, 25 August 2009), whether or not some of them are buried within Marshall Cemetery. Annual gatherings here and subsequent celebrations at the beach involving food and drink are uncanny and mirror past gatherings at bay shell mounds where Coast Miwok would mourn lost loved ones, mingle, and make decisions. In another example gathered from a previous interview, George recalls collecting disinterred human bones from a vandalized shell mound one night at Bodega Bay and reburying them secretly so that they would not be disturbed again (see Schneider 2007a). In this fashion, many Coast Miwok retain connections to their ancestral landscape, continuing to visit culturally significant places to share meals and visit the graves of deceased family members—in some instances to shell mounds where ancestors several generations removed lay interred.

Additional examples of cultural continuity around the Bay Area lend further support to the probability that many prehistoric archaeological sites were utilized during and after the mission period as places of refuge and realms of on-going cultural practice. For example, Shoup and Milliken (1999) describe the life of Lope Inigo, an Ohlone man from the South San Francisco Bay area. Once a neophyte at Mission Santa Clara, Inigo was able to secure a parcel of land following the closure of the mission and throughout subsequent periods of Mexican and American settlement. Located in his tribal territory, Inigo’s parcel of land also contained several shell mounds that held the remains of his ancestors and would eventually be Inigo’s chosen resting place after his death in 1864.

Synthesis of Archaeological Data & Ethnographic, Historical, and Oral Sources

Patterns of refuge during the period of Spanish missionization have at once prehistoric antecedents as seen in seasonal visits to bay mounds by hunter-gatherers *and* ensuing currency as foundations for cultural continuity following the closure of the missions. Coast Miwok on the Marin Peninsula, through illicit and approved departure from missions, returned to familiar places like the shell mounds of MRN-114, MRN-115, and MRN-328 to continue familiar traditions and refashion themselves as productive citizens in consecutive colonial economies. Retaining connections to their ancestral landscape, in this fashion Coast Miwok identity was both enduring and mutable; carrying forward from previous generations cultural obligations, responsibilities, and knowledge of when and where to gather and hunt, as well as integrating European and other Indian practices to become socially, politically, and economically resolute throughout colonial times.

As demonstrated in this chapter by historical sources, the retention of native forms of subsistence, world views, and other daily practices were continuous among Indians living at Spanish missions. Mission Indians remained tuned to the seasonal nuances around them, including the periodic availability of certain plants and animals, where and how to procure these items, as well as how these extramural resources could benefit their lives within the missions. Typically understood as rigid colonial footholds, missions in fact show considerable fluidity in maintaining a steady populace of baptized Indians. Missions, as “transactional and transitional” social and political crossroads (Deeds 2003:8), provided opportunities for Indians to depart on occasion and to return to their home villages for relaxation or physical replenishment. While missionaries maintained their own spiritual justification for the *paseo* system and administration differed between each mission and missionary, new insights show some Indians may have timed their approved leaves of absence to coincide with births and deaths away from the mission.

At other times, Indians left missions without permission. In these instances, illicit departure offered a clear alternative to the hardships of mission life, including grueling manual labor, limited rations, punishment, and a steady death rate among baptized Indians sequestered into unfamiliar living conditions. More frequent than outright attacks on missionaries and mission property, running away is under-theorized at best, and addressed within scholarly dialogues as a kneejerk response to onerous conditions or as part of a more general discussion of native “resistance” to colonial settlement. Although tempting to consider all Spanish missions as porous institutions where Indians maintained considerable agency and departed on their own volition, it is also important to bear in mind that missions functioned to create a class of civilized Christians from indigenous groups and in doing so maintained firm policies designed to bring Indians to the missions, to keep them there, and, if they left, bring them back. The testimonies of recaptured runaways who fled Mission Dolores in 1795 are demonstrative of the hardships of mission life and the policies missionaries created to maintain a steady population of baptized Indians. As I discuss, the testimonies also offer an opportunity to explore the motivations for fleeing missions and the places to where mission Indians returned during their flight.

I argue periodic cycles of residence at MRN-114, MRN-115, and MRN-328 continued into colonial times, and archaeological deposits at these three shell mounds—places of on-going social significance—reflect periodic occupations by refugee Coast Miwok escaping Spanish missions in search of physical and spiritual nourishment. Going on *paseo* and illicit escape provided opportunities to reconnect with family and home villages, hunt and gather, refashion some traditions, and, in doing these things, remain Coast Miwok. Data collected from an AMS radiocarbon assay and specialized analyses of archaeological obsidian involving X-ray spectrometry and obsidian hydration dating include cycles of occupation during the Late Period Phase 2 (A.D. 1500 to 1800) and during historic times (post-1800). Temporally diagnostic artifacts include Late Period/Historic projectile points collected from MRN-328 and MRN-115; an abalone ornament similar to those found at other Late Period archaeological sites and on ethnographic regalia and baskets created by Indians in central California; and clam shell disk beads which are also prevalent in late prehistoric and ethnographic contexts. Specific faunal remains such as sea otter, harbor seal, and small terrestrial game are further telling of shell mound occupations that span prehistoric and historic times. Interestingly however, mixed deposits of native and colonial-era artifacts were not encountered despite their coexistence at refuge sites in other areas of California (see Bernard 2008).

Viewed another way, Indians fleeing from mission sites may have chosen to leave behind any material trappings acquired during their stay within these colonial settlements, and electing instead to gather wild plants and animals using tried and true methods involving stone and bone tools, nets, and baskets. In this sense, familiar hunting grounds and shell mounds themselves represented storehouses of useable raw materials, places to meet friends and family, and strategic points to keep a lookout for boat traffic and anyone attempting to bring them back to the missions. On this point, Brienes (1983:81) argues, the Chinese camps established between the 1870s and early twentieth century on Point San Pedro were "psychologically and culturally, and even physically, far removed… many camps were relatively inaccessible except by water, and the shallow depth of the bay at low tides made even that route into a sea of muck. For the camps near San Pedro Point, access to and from the outside world was almost completely dependent upon boats." The physical isolation of Point San Pedro may have also factored into the decisions of Coast Miwok departing Spanish missions.

Lithic reduction techniques—specifically, the production and high occurrence of expedient, unifacial chert tools—evidenced at MRN-114, MRN-115, and MRN-328 offer insight to the kinds of activities that took place at the three shell mounds over time. These include differences in flintknapping methods (core preparation and reduction techniques) through time and reduced encounters with obsidian as a resource for creating stone tools. This pattern is evidenced by a high occurrence of stepped terminations on obsidian flaked stone and by examples of bipolar reduction. With the growing shortage of obsidian from disrupted social and economic networks, locally procured cherts—possibly thermally altered—found increasing importance in daily life and was probably utilized for most processing tasks by men and women with a range of knapping experience. To further test this interpretation, future analysis of the lithic assemblage will more closely examine obsidian artifacts for signs of retouch to be able to gauge the possible reuse of older artifacts by mission runaways. Furthermore, future research into this ephemeral period of time may demand a retooled sampling strategy to be able to access scattered deposits of colonial-era artifacts.

Expanding outwards from California, examples of colonial encounter from other parts of the world give perspective on runaways and the seemingly ephemeral signs of refuge within archaeological deposits. Numerous shell middens found on the Gippsland Islands located of Southeast Australia's coast have been examined as places of refuge for native Australians responding to European pastoral practices during the 1850s (McNiven 2000). Containing a paucity of nineteenth century European and aboriginal artifacts, such as lithic tools and vertebrate remains, McNiven hypothesizes non-economic reasons for why these sites were occupied in colonial times. He argues offshore islands (and shell middens) were inhabited at certain times of the year by eloping couples as a strategy to increase social cohesiveness during a period of rapid demographic collapse (McNiven 2000:29).

Runaway slave narratives from the Americas and Caribbean lend further insight to the patterns and practices of runaway mission Indians in Alta California. The experience of William Grimes—who escaped from Savannah, Georgia in 1815 on a cargo ship to New York City and then walked to New Haven, Connecticut—speaks to the relentless abuse of enslaved Africans and their motivations for running away. "It indeed sometimes happened, that every morning I was taken and whipped severely" (William Grimes in Andrews and Mason 2008:35). The distance of Grimes' flight from Georgia and length of time away—nine years, during which he worked as a barber, grocer, and furniture salesman—further attest to the sheer scale of some trips, although at other times seeking refuge was much more local: "I escaped to a corn field in sight of my master's house, and secreted myself in an old log which I had picked out before" (Andrews and Mason 2008:38). Grimes remained in the log for three days until hunger drove him back to the plantation.

Archaeological research of self-emancipated communities in the Caribbean and Americas also offer comparative potential for examining the circumstances of refuge and associated material assemblages. For example, La Rosa Corzo's (2003) analysis of runaway settlements in Cuba offers important detail on their spatial organization, as well as the historical context for their occupation including sworn depositions from recaptured runaways who responded to questions about why they ran away, how long they stayed away, *where they went*, and *who lived at the havens*. Unlike the locations of shell mounds along the San Francisco Bay shoreline, Singleton and Souza's (2009:460-464) overview of maroon communities in Cuba, Brazil, and the United States suggests runaway communities were generally located in harsh physical environments with limited accessibility and varied in size from small cave hideouts to complex village networks. In at least one study examining the Black Seminole of central Florida, maroons reoccupied a place that had been previously inhabited by members of the same cultural group posing problems for archaeologists attempting to distinguish Seminole material culture from historic Black Seminole artifacts (Singleton and Souza 2009:464). Other research suggests maroon settlements provided seclusion for indigenous groups to persist well-after the start of colonial settlement (Agorsah 1994:182), as well as strategic points from which to periodically raid colonies for gathering food and European goods (Weik 1997:82). By comparison, the waters of the San Francisco Bay may have posed a significant barrier to periodic acquisitions of European goods, which might explain the relative scarcity of metal, glass, and ceramic artifacts compared to Coast Miwok material culture.

In addition to diminishing monetary and political support for the California missions, fugitivism, attacks, and persistent neophyte deaths hampered the efforts of Franciscan missionaries seeking to create a population of agrarian Christians from Bay Area Indians, even at their closure in the 1830s. While in operation, many Coast Miwoks managed to leave the missions with and without permissions, and in doing so assiduously remained connected to the landscape, sacred places, old village sites, and cultural observances including the collection of plants and animals. Still others, most often women, children, and the elderly, were less ambivalent and chose instead to remain at missions, in some instances fully participating in the church and in the relationships forged out of the conditions of living with Indians from other areas of central California. In this manner, those who departed and those who remained "used the resources of both traditional cultures and Hispanic Catholicism to make the new world the Spanish introduced into a livable one" (Newell 2009:189). Refuge communities that emerge following secularization mirror the multiculturalism of missions, and—like the shell mounds—served as arenas for rebuilding broken families and for navigating new governments and new economies. Vibrant research of maroon communities offers promising comparative insights to understanding the practices of Coast Miwok at places of refuge in the Spanish hinterland. As I discussed above, the locations of *Alisal*, Nicasio, and potentially other refuge communities indicate a longstanding connection to ancestral lands, the seasonal availability of plants and animals, and the traditions and prohibitions surrounding their collection; in short, connections deeply woven with Coast Miwok identity and connections still evident in ethnographic sources and in conversations with Coast Miwok elders.

CHAPTER EIGHT

CONCLUSION

In this chapter, I conclude my analysis of MRN-114, MRN-115, and MRN-328 and I provide closing thoughts on the long-term use of these sites before and after Spanish colonial settlement in the San Francisco Bay area. Addressing the practices of Indians seeking refuge away from Spanish missions, my dissertation draws from archaeological, ethnographic, and historical sources to argue persistent returns to old village sites reinforced Coast Miwok connections to their ancestral landscape and also provided opportunities for them to remake themselves with the coming of Mexican and American settlement. In my conclusions, I summarize core themes and key findings presented throughout my dissertation, and I discuss my interpretations relative to the broader field of mission studies, colonialism, and shell mound research. I close by presenting a brief outline of future research—to aid in refining my data and interpretive framework—as well as possibilities for conducting comparative study of refuge at other colonial and post-colonial contexts.

Summary

Historical and archaeological narratives of Spanish colonization in California have addressed the successes and failures of missions in terms of native accommodation or resistance to introduced modes of living. Between A.D. 1776 and the 1830s, 2,828 Coast Miwok from the Marin Peninsula were baptized at Spanish missions in the San Francisco Bay area. While some Coast Miwoks remained at missions and embraced the Catholic faith, some also avoided the missions at all costs and moved deeper into the colonial hinterland. Yet tribal views of native reaction to the missionaries involving their acceptance or rejection of the church has created an interpretation of Coast Miwok agency that is narrowly defined as a reaction to colonial prerogatives, rather than the motivations of thinking individuals. Even studies of resistance, one scholar notes, have been “defined more by the actions of the dominant than the positive and innovative reactions of the indigenous… [and] do not easily allow for those who preferred to play a different game or chose not to play at all” (Birmingham 2000:362).

Running away, in particular, is typically overlooked due to its apparent simplicity and ubiquity in many colonial contexts. Among the Coast Miwok residing at the missions for example “the growing response to corporal punishment was fugitivism” (Colley 1970:150). In dismissing native flight from California missions as an inevitable reaction to colonial encounter, the complex tangle of decision and utter emotion that culminated in a final act of flight is masked. My dissertation demonstrates that some Coast Miwok—exhibiting a mixture of interest and anxiety—ventured back and forth between missions and home villages, contrary to what has been previously supposed about missions as rigidly patrolled colonial institutions. By addressing the opportunities available for Indians to leave Spanish missions—either through illicit escape or by approved *paseos* for several weeks out of the year—my dissertation has attempted to examine distant places of refuge to which Coast Miwok returned to continue some social practices and retool others. In addition to expanding the spatial dimensions of colonial encounter to examine the complex patterns of cultural interaction and change in the Bay Area hinterlands, the goal of this dissertation has also been to reassess some shell mounds as places of on-going historical significance for Coast Miwok in addition to sites of prehistoric importance.

In Chapter One, I provided an overview of my dissertation research including the project background, conceptual issues, and the organization of the dissertation chapters. Flowing from my archaeological experience at Fort Ross, my interests in studying the practices of European and indigenous agents occupying colonial interspaces blossomed into the study of three prehistoric shell mounds—MRN-114, MRN-115, and MRN-328—that also show evidence of habitation at least 30 years after the founding of the first Spanish mission in the San Francisco Bay area. Although scarce archaeological and ethnohistoric evidence relate to the late occupation of bay shell mounds, radiocarbon dates and diagnostic artifacts from the three study sites suggest long-term occupation of shell mounds before and after colonial settlement. Although the goal of the Franciscan missions was nothing short of "a complete overhaul of all conscious and unconscious behavior" for Indian neophytes (Wade 2008:19), in reality missions demonstrate considerable fluidity in tethering Indians to the missions. Shortages of food rations sometimes compelled missionaries to allow Indians to leave missions to hunt and gather wild plants, game, fish, and shellfish, and the practice of loaning neophytes to outlying presidios and pueblos for manual labor and other chores suggest a colony in constant movement. The flux of people leaving and entering the missions reinforced links between Spanish and Coast Miwok worlds, but also for the Coast Miwok reaffirmed links between the living and ancestral world, between natural and spiritual realms. My research examines the machinations of mission life that generated opportunities for Indians to return to home villages and continue the very practices in danger of being erased.

In Chapter Two, I outlined the theoretical underpinning of my argument and I presented a model for studying *places of refuge*. Scholarly dialogues pertaining to colonialism and culture contact, landscape, theories of resistance and practice, as well as materiality, memory, and identity inspire the framework I use to explore processes of native refugeeism on the Marin Peninsula. My focus on studies of resistance, in particular, integrates a temporal dimension for understanding the historical circumstances of resistance over the long-term as a means to address the changing motivations and multiplicity of agents and agendas engaged in colonial contexts. While I recognize the universality of flight in other time periods and venues around the world, my model for studying places of refuge in California details the parameters of flight by mission Indians inhabiting the northern frontier of colonial New Spain. As frontier institutions, missions were porous institutions representing both colonial footholds and dynamic locations continually shaped by the motivations and contingencies of colonial and native agents. Expanding outwards from these small colonial points along coastal California, the broad hinterlands of missions represented frontiers within broader borderlands and further opportunity for Indians to vacillate between two worlds. Orbiting the missions in the hinterlands, individual places of refuge were venues for mission runaways to affirm continuity with the past and remake themselves within present social orders.

In keeping with the past, mission runaways and those departing on *paseo*, took on the practices of their former hunting and gathering existence. In fact, others have suggested that missions fit within a seasonal cycle whereby hunting and gathering groups congregated at missions during times of drought to take advantage of available resources, and then dispersed at other times in accordance with the availability of particular seasonally available foods (R. Jackson 1984:228; see also Birmingham 2000). Through their collection of wild plants and shellfish and by hunting terrestrial game, neophytes also retained knowledge of *when* and *where* to hunt and gather. In Chapter Three, I discuss the settlement and subsistence patterns of Coast Miwok hunter-gatherers as has been reconstructed through archaeological and ethnographic sources. In doing so, I argue that hunter-gatherer pursuits did not cease with colonial settlement in the San Francisco Bay area and that a period of adjustment existed in many native communities. During this time, persistent movements by Coast Miwok across the Marin landscape reinforced attachment to place in a recursive act of "reviving and revising" old times (Basso 1996a:6). Although cultural and natural disturbances to the tops of many bay shell mounds skew archaeological interpretations of how these sites were used in colonial times, I stress continuities between prehistoric and historic times—not disjuncture—and I believe, as Tringham (1994:169) succinctly noted in her analysis of the long-term intertwined biography of engendered places, "history includes the many thousands of years of prehistory."

In Chapter Four, I outlined my research questions and expectations, and the bulk of the chapter included a summary of my archaeological field investigations at MRN-114, MRN-115, and MRN-328. Archaeological field methods included: systematic mapping of surface topographic relief, salient surface features, and the study area using a total station; systematic surface collection at all three sites; geophysical survey involving the use of a magnetometer and electrical resistivity/conductivity instrument at MRN-114; auger testing at MRN-114 and MRN-328; and targeted excavations of subsurface features at MRN-114 identified during geophysical survey. An array of spatial and diachronic data was captured in employing each field method. For instance, surface artifact density maps created from data collected during systematic surface collection at each shell mound indicate distinct areas of human activity ringing each mound. Further detailing of this pattern drew from auger data collected in 20 centimeter increments. The data indicate areas of persistent activity at different locations around each shell mound through time, as well as possible differentiation in daily activities conducted at each site. Lithic artifacts and shellfish remains collected in auger units were also calculated and demonstrate changes in raw materials used to create stone tools, as well as potential changes in shellfish consumption over time. I argue that an increase in the relative quantity of mussel shell remains at 20 to 40 centimeters within auger units at MRN-114 reflect a period of resource intensification documented at other Late Period shell mounds in the Bay Area. During this time, environmental changes and growing human populations challenged local hunter-gatherers to look elsewhere for foods, and in doing so I surmise Coast Miwok refined the requisite knowledge needed to make do with changing—and even trying—circumstances.

Materials collected during archaeological field operations at MRN-114, MRN-115, and MRN-328 include lithic artifacts (flaked stone, groundstone, and fire-cracked rock), faunal remains, plant remains, as well as glass, metal, and ceramic artifacts. I also examined the assemblage of artifacts collected from MRN-115 in 1949 by Clement Meighan (1953) and housed at the Phoebe A. Hearst Museum of Anthropology. Presented in Chapter Five, this diverse material assemblage lends insight to an array of activities that took place at the three shell mounds and in the lives of its inhabitants, and also demonstrates changes and continuities in Coast Miwok social practices over the long term. Plant remains from two features at MRN-114 and animal remains—terrestrial and sea mammals, birds, fishes, sharks and rays, reptiles and amphibians, and shellfish (bivalves, gastropods, and crustaceans)—speak to the immense diversity of animal species gathered by Coast Miwok and the timing of animal harvests on a seasonal basis and over a longer term. Regarding the timing of occupations at Marin shell mounds, it appears that many of the dietary remains collected from MRN-114, MRN-115, and MRN-328 demonstrate residence during the Middle Period (500 B.C. to A.D. 900) and Late Period (A.D. 900-1800). The presence of sea otter, harbor seal, and the remains of other small terrestrial mammals—Cottontail rabbit, raccoon, and coyote—are especially reflective of Late

Period sites, but also a broad subsistence base that enabled Coast Miwok to account for periodic changes in animal populations through coharvesting practices using an widely adapted tool kit.

Lithic artifacts—groundstone, flaked stone, and bifacial tools—were also examined in Chapter Five to further evaluate the timing of shell mound occupations, as well as change and continuity in Coast Miwok material culture, especially in the dimensions of raw material choice and stone tool manufacturing techniques. Concerning the timing of shell mound occupations, some lithic artifact types—steatite charmstones, a steatite pipe bowl, and two projectile points—are characteristic of the Late Period, while the two projectile point types have also been recorded within ethnographic contexts and produced from historic glass. Similarly, many of the shell artifacts recovered from the three study sites are temporally diagnostic of many Late Period Phase 2 (A.D. 1500 to 1800) sites and are also recorded in ethnographic sources from other tribes in central California. Examining lithic tool production, chert artifacts compose 59 percent of the total flaked stone assemblage, followed by smaller amounts of obsidian (15%) and other raw material suitable for flaking (26%). Calculated percentages of each artifact type created from either chert, obsidian, or another raw material reveal a preference for obsidian to create bifacial tools and chert for the production of expedient tools for processing tasks. This could be an affirmation of the kinds of activities that took place at the shell mounds over time, as much as an indication of the workability of particular kinds of raw materials for certain tool types. That is, angular shatter and flake tools are manufactured predominately from chert and appear in large numbers at the surfaces and upper 20 centimeters of each shell mound suggesting more recent emphasis on processing tasks using tools manufactured from local chert. Furthermore, obsidian bifacial tools appear in greater frequency at MRN-115.

My analysis of flake attributes focused on tool morphology, specifically flake termination and striking platform type, width, and thickness. Lithic reduction techniques—specifically, the production and high occurrence of expedient, unifacial chert tools—offer insight to the kinds of activities that took place at the three shell mounds; changes in flintknapping methods (core preparation and reduction techniques); and possibly reduced encounters with obsidian as a resource for creating stone tools. The high occurrence of stepped terminations on obsidian flaked stone and evidence of bipolar reduction suggest obsidian became increasingly scarce during the Late Period, while locally procured cherts—possibly thermally altered to improve the knapping qualities of chert—found growing importance in daily life and, as evidenced by increased platform width and thickness through time, was probably utilized for most processing tasks by individuals with a range of knapping experience. Additionally, dorsal cortex scores and dorsal scar scores increase through time at all three sites, with an average of approximately one to two dorsal flake removals. Considering these scores, finished bifacial tools were probably less prevalent in the lives of later shell mound dwellers compared to unifacial, expedient tools.

Several of the glass, ceramic, and metal artifacts collected from each site are further diagnostic of specific time periods. For example, salt-glazed ceramics and a fragment from a blue-on-white porcelain rice bowl are closely associated with the Chinese shrimp fishing camps that dotted the shores of San Pablo Bay between the 1870s and early 1900s. A milk glass Mason jar lid and fragment from an Irish soda bottle from the 1920s to 1950s were most likely deposited by ranchers who owned the land prior to the creation of the park. Thirty-one spent cartridge casings also reflect ranching activities and possible illicit park activity, and some date to the middle to late nineteenth century. Unexpectedly, artifacts typically recovered from other colonial contexts in California—glass beads, flaked glass artifacts, ferrous metal objects, and mission ceramics—were not present in the assemblage from the three shell mounds.

Rather than rely on specific classes of artifacts as hallmarks of colonial encounter, my focus on the full assemblage of material collected during archaeological investigations at MRN-114, MRN-115, and MRN-328 expands the spatial and material dimensions of culture contact beyond what is typically assumed. Furthermore, specialized analyses described in Chapter Six offer informative temporal data related to the occupation of shell mounds during and after missionization had already commenced. Source provenance of archaeological obsidian reflects lithic procurement during the Late Period, but my analysis demonstrates a shift in the acquisition of obsidian from northern California sources. Despite a small sample size, the apparent shift from the acquisition of both Napa and Annadel obsidians to primarily Annadel obsidian mirror changes in social networks in the north San Francisco Bay. Specifically, it appears that over time occupants of MRN-114, MRN-115, and MRN-328 procured obsidian either directly or indirectly through social networks associated with the Annadel source possibly due to increasingly circumscribed territories and decreased access to Napa Valley during the Late Period. Data collected from an assay of eight AMS radiocarbon determinations and two three obsidian hydration dates indicate all three sites were also inhabited contemporaneously through time, and supports differentiation in site use within the shell mound cluster over the long-term. The chronological sequence from all three shell mounds indicates occupations during the Middle Period and Late Period, as well as during historic times—while Spanish missions were in operation and afterward.

In Chapter Seven, historical sources and oral information collected during my interviews with Coast Miwok and Southern Pomo elders are presented to contextualize archaeological and ethnographic data discussed in the previous four chapters and to examine the long-term implications of apostasy and permitted leaves of absence from missions for Indians inhabiting the Marin Peninsula after the closure of the missions. Specifically, survey responses collected from missionaries living at Alta California missions between 1813 and 1815 and transcribed testimonies from recaptured runaways who fled Mission Dolores in 1795 give insight to the *paseo* system and the motivation behind Indians' illicit flight from missions. While it is important to bear in mind possible biases or purposeful omissions and/or inclusions to documentary sources, as part of a holistic data set combined with material evidence from the Alta California missions, textual data indicate neophytes retained many cultural practices while living at the missions and showcased these practices in public and private spaces. It appears Indians residing at California missions remained tuned to seasonal and ceremonial rhythms, gaining permission to hunt waterfowl and game, gather acorns and seeds, and collect shellfish from local shorelines. With or without permission from padres, neophytes orchestrated dances within the mission quadrangle, are recorded as cremating the bodies of important tribal members in later accounts, and practiced traditional curing rites to heal the bodies of other mission Indians. In addition to these outward expressions of native culture, neophyte quarters were havens to meet friends and family in similar straits afterhours. Still others—an estimated ten percent of the neophyte population at any given time—departed the missions without permission. Just as some Indians are thought to have timed particular life events (e.g., births and deaths) with their permitted departures, I argue refugee Coast Miwok would have also returned to familiar places to dance, bury the dead, and make decisions.

After the closure of missions in the San Francisco Bay area, Coast Miwok continued to assert themselves in Mexican and American worlds. At Rancho Nicasio—and for the Ohlone, at *Alisal*—Indians retained connections to ancestral lands; continuing rituals and subsistence practices in accordance with particular seasonal and social parameters while also learning to conduct themselves as productive citizens in new economic contexts. Among the Coast Miwok, cultural persistence can be viewed in terms long-term connections to native places, as demonstrated during interviews with elder members of the Federated Indians of Graton Rancheria (Coast Miwok and Southern Pomo). While examples of native fugitivism and permitted leaves of absence from missions compel researchers to reconsider mission sites as accommodating to the needs of neophyte inhabitants and as catalysts for native agency, it is also important to remember missions were created first and foremost to aggregate, confine, and convert native populations and they had serious negative impacts on California Indian communities. As spaces of cultural exchange and colonial encounter, as well as shrines of "complex and contested memories" (Wade 2008:259), the ways in which scholars and the public alike imagine missions and the Indians who resided at them continue to inform our understanding of contemporary Indian communities. The extent to which Coast Miwok and other Bay Area hunter-gatherers engaged with or resisted Spanish missions has had enduring anthropological, economic, and political implications for how these communities are presently imagined as either perishing or surviving colonial encounters.

Placing Refuge

Revisiting my research expectations described in Chapter Four, I expected that MRN-114, MRN-115, and MRN-328 would have been inhabited in the Late Period and in historical times. AMS radiocarbon determinations, obsidian hydration dates, and temporally diagnostic artifacts support Meighan's (1953:6) inference that the occupants of MRN-115 were "taken to one of the Spanish missions." These data indicate Middle Period, Late Period, and historic residence at MRN-114, MRN-115, and MRN-328, although it is unclear if the later residents of the three shell mounds were "taken" to missions or if they visited missions on their own accord. Second, I expected that only Coast Miwok would have inhabited the three sites before, during, and after Spanish missionization. As porous zones of encounter where some social practices were maintained and others were remade, still other facets of the colonial world are not entirely knowable. The model I propose allows some flexibility in who occupied places of refuge on the Marin Peninsula, but I also present some evidence that the three shell mounds were inhabited solely by Coast Miwok. Source provenance data collected from obsidian artifacts indicate a reoccupation of the shell mounds by Coast Miwoks with access to a different obsidian source (Annadel), and my research of Coast Miwok recruitment suggests Coast Miwok-speakers from Tomales Bay and Bodega Bay—located further afield—entered missions much later than those inhabiting the bay shore. Tribal intermingling within Spanish missions may have resulted in new economic links outside of them. *Paseos* and running away to places of refuge with family and friends invigorated kin networks and revised cultural practices among Indians in similar conditions, possibly indicated by Coast Miwok stone tool forms manufactured from Southern Pomo obsidians.

Third, I expected that missions located in the San Francisco Bay area would have demonstrated flexibility in permitting neophytes to leave missions and to obtain resources outside the mission walls. This pattern is recorded at other missions located on the frontier of New Spain, including Alta California and, as I argue, missions located in the San Francisco Bay area. While varying by mission, and probably administered at the discretion of missionaries, my study of the *paseo* system suggests opportunities for baptized Coast Miwoks to leave missions, return to home villages, and revert to hunting, gathering, and collecting several times during the year. Fourth, I would have expected Coast Miwok to return to familiar villages during approved leaves of absence or during illicit escape from missions. Historical accounts of mission life indicate that Indians on *paseo* were specifically permitted to return to their homes (see Chapter Seven), while high rates of fugitivism recorded at Bay Area missions and chronometric data provide contextual support for examining long-term residence of MRN-114, MRN-115, and MRN-328. However, these lines of evidence are insufficient for addressing *where exactly* Coast Miwok returned while away from Spanish missions. Although, as I argue in this dissertation, Coast Miwok connections to the Marin landscape where not as easily dismantled with missionization as previously supposed, historical sources are silent on the places visited by runaways or neophytes on *paseo*. Equally perplexing, concerning my final research expectation, mixtures of colonial and native artifacts—emblematic of “resistive adaptation” (Bernard 2008:348)—were not encountered at the three study sites. Viewed differently, Indians fleeing missions left behind the material trappings of this new way of living, and used instead the stone and bone tools, nets, and baskets of their pre-contact existence. Just as local knowledge of chert quarries, fishing spots, and gathering areas would have come into play during trips away from missions, shell mounds also represented opportune locales to hideout and reuse tools deposited by previous generations.

My dissertation is significant to the field of archaeology in three ways. First, my research addresses chronological sequences and cultural overlap between prehistoric and historic time periods. Taphonomic issues stemming from cultural and natural disturbances have impacted the study of shell mound sites, such that damaged (or entirely missing) late archaeological deposits complicate interpretations of shell mound reuse by hunter-gatherers over the long term. My analysis of intact cultural deposits at MRN-114, MRN-115, and MRN-328 compels archaeologists to examine shell mounds and other archaeological sites in terms of long-term cultural sequences that span arbitrary junctures between prehistory and historic times. Second, my dissertation contributes to vibrant studies of culture contact and colonialism, and expands the purview of these fields of study to include sites of refuge located in the hinterland of colonial settlements. I also reinterpret Spanish missions as more than bounded colonial institutions, but sites of considerable fluidity in providing neophytes opportunities—both permitted and unforeseen—to return to hunting and gathering practices. In doing so, mission Indians maintained connections to ancestral homelands and upheld cultural traditions at places of refuge while retooling other cultural practices. Third, my dissertation provides theoretical contributions to the field of archaeology and, especially, theoretical conversations that address landscape, resistance, social identity, and memory.

My research also makes theoretical and methodological contributions to the study of colonial encounters and places of refuge. Yet, further study of the practice and processes of refugeeism is recommended. Explored briefly in Chapter Seven, comparative research of runaways and maroon societies in other areas of the world hold promise for detailing the lives of mission runaways. In at least one case study from Cuba (La Rosa Corzo 2003), sworn testimonies from captured runaways describe motivations for flight, as well as *where* they fled, *who* lived at refugee areas, and *what* they did there. Similar research holds comparative potential for understanding the spatial dimensions, material remains, and social fabric of sites of refuge. It would also be lucrative to examine refuge in other areas of California, perhaps even associated with other mission sites. The San Joaquin Valley in California could be one area of further research. Once a vast tule marsh, the *Tulares* region is described as an ideal hideout and convenient location from which to raid Spanish and Mexican settlements (Phillips 1993).

Attention may also be given to other shell mounds in the San Francisco Bay area. For example, careful study of the house pits on top of MRN-115, and at other sites located along Point San Pedro, could offer important information for understanding colonial encounters and refuge at a household scale of analysis. A systematic radiocarbon assay of these pit features, and other shell mounds located in west Marin County, could provided needed temporal data for interpreting continuity in site use before and after colonial settlement, and for determining the spatial patterning of refuge across the Marin landscape.

In addition to a refined radiocarbon study, seasonality data can further elucidate the timing of shell mound occupations. Already underway, elemental and isotopic analysis of mussel shell carbonate collected from MRN-114 will be used as a proxy for determining shellfish harvesting (and site use). When compared to mission records chronicling the movements of Indians in and out of missions, seasonal data will offer important information for understanding hunting and gathering practices in colonial contexts and can also contribute to current dialogues exploring mission sites as native places and components of seasonal routines (e.g., R. Jackson 1984; Lydon 2009; Panich 2009). Future analysis will also focus on the remaining flotation units and plant identifications. Macroscopic identifications of paleoethnobotanical and faunal remains offer a direct method for inferring seasonality based on the presence and absence of seasonally available species.

The growing body of scholarship dealing with place, memory, and landscape lends further credence to persistent use of shell mounds long after the "end" of Bay Area prehistory. That mounded sites across North America often functioned as village sites *and* cemeteries; they are visceral examples of the profound symbolic importance of these culturally meaningful places. Interment of the dead at distinct locations indicates a claim to these places; commemoration of place and social continuity; and affirmations of kinship ties between generations. These "material reiterations," as Ashmore (2002:1178) calls them, are also useful to explain the long-term use of shell mounds in the San Francisco Bay. Spanning prehistoric and historic times, Indians would congregate periodically around larger shell mounds to feast, dance, mingle, intermarry, and make decisions. In this fashion, for Coast Miwok the symbolic importance of shell mounds as territorial landmarks and places to honor the dead buried within them would have also reinforced their dealings and decisions, and those of subsequent visitors. Shell mounds offered refugee Coast Miwok opportunity for social continuity and reinvention, providing spiritual support in trying times and anchoring contingent social identities.

These were also places of physical sustenance, well-known spots to supplement sparse mission diets with seasonally available and nutritive indigenous foods. This pattern is documented at other mission contexts in North America, where despite rigid social arrangements, food shortages forced mission administrators to provide opportunities for Indians to gather wild plants, shellfish, and game; in short, opportunities to re-immerse in a hunting and gathering existence. Knowing when and where to procure these items would not have been totally abandoned with European settlement, but periodically recalled on trips away from the mission. The testimonies of recaptured runaways are especially telling in this case. Archaeologically, this could be seen in the heightened prevalence of expedient stone tools manufactured from chert collected locally, and the decreased prevalence of obsidians coming from further away and beyond multiple tribelet territories.

As Rubertone (2000:435) and others have argued, archaeological approaches to the study of culture contact and colonialism have traditionally emphasized places of contact or sites of colonial settlement, often to the detriment of long-term understandings of cultural persistence among native populations who often still identify with culturally meaningful places. My research addresses the continuum of living conditions located away from colonial centers and the sophisticated processes of native social reinvention and assertion during the colonial period.

Expanding outward from the shell mounds of China Camp, it may be beneficial to envision a much larger region of refuge with which the Coast Miwok persistently engaged and remade themselves during consecutive waves of European settlement and Indian displacement. At places like Nicasio in the wake of Spanish California, Coast Miwok vied for the purchase of lands in their ancestral territory. Indians found other ways to retain ties to the landscape: dividing time between seasonal rounds and laboring at Petaluma Adobe; picking hops and apples; and operating a successful fishing business at Bodega Bay. In addition to becoming economically resolute, Coast Miwok also retained connections to the old ways. As described by Graton Rancheria elders, one fondly recalled winter mud hen hunts while others passionately recall tending the graves of family members at disturbed cemeteries, shell mounds, and other sacred sites where they continue to confront colonialism in its various forms. In this sense, shell mounds were never truly "abandoned," but remain part of the Coast Miwok world today.

One hundred years ago, Max Uhle (1907:36) warned the great depth of time visible in some shell mounds should not overshadow the upper most layers, which may demonstrate occupation up to the "threshold of modern times." Sometimes natural and cultural disturbances are to blame for this shadowing effect. At other times, scholarly research is just as destructive. In exploring the abutment of prehistoric and historical times at bay shell mounds, archaeologists would do well to keep in mind long-term processes of cultural adjustment and persistence that span arbitrary divides between history and prehistory. To shell mounds and other places of refuge Coast Miwok quietly returned to meet the demands of tradition and to chart a course for navigating a rapidly changing world.

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Appendix A

Catalog Key

As part of the China Camp Archaeological Project, faunal remains and lithic artifacts were collected from CA-MRN-114, CA-MRN-115, and MRN-328 and these data are presented in Appendix B and Appendix C, respectively. Catalogs for ethnobotanical remains, shell artifacts, and glass, metal, and ceramic artifacts are provided in Chapter Five. Additional data included in a complete artifact catalog can be obtained by the author by request. All artifacts are cataloged using a four-part numbering system, which includes the project name (CCAP), site (MRN-114, MRN-115, or MRN-328), catalog number/date of excavation (e.g., 7/17/07), and the artifact number. For example:

Example: CCAP-MRN114-7/17/07-5
CCAP: China Camp Archaeological Project
MRN114: CA-MRN-114
7/17/07: Date excavated
5: Artifact 5

For brevity, only the site, date excavated, and artifact number are indicated. Unit, depth, and screen fraction are also indicated when possible. Artifacts from the Phoebe A. Hearst Museum of Anthropology (PAHMA) are indicated by a catalog number with a 1- prefix (e.g., 1-127855). A "P number" has also been assigned to each site excavated during my dissertation field work at China Camp State Park by the California Department of Parks and Recreation for eventual curation at the State Archaeological Collections Research Facility in Sacramento, California. Accordingly, P-1541 = CA-MRN-114, P-1542 = CA-MRN-115, and P-1543 = CA-MRN-328. However, this system is not used in the present catalog.

Additionally, artifact codes are used as abbreviations for faunal and lithic data presented in the following appendices. These codes are:

FA: Faunal
MA: Mammal
BI: Bird
FI: Fish
HE: Herp (Reptile or Amphibian)
LI: Lithic
LG: Lithic groundstone
LF: Lithic flaked stone
LO: Lithic other
CH: Charmstone
FG: Fire-cracked groundstone
MH: Milling handstone
MHF: Milling handstone fragment
MOF: Mortar fragment
PE: Pestle
PEF: Pestle fragment
AS: Angular shatter
BI: Biface tool
BTF: Bifacial thinning flake
CORE: Core
CT: Core tool
FT: Flake tool
OT: Other

Appendix B

Faunal Data

Site	Unit	Depth (cm.)	CAT #	Count	Fraction (in.)	Basic Group	Taxon	Element	Part	B[1]	C[1]	G[1]	W[1]
114	1070N/1057E	0-20	11/2/07-5	1	1/8	FA-MA			Fragment				
114	1070N/1057E	20-40	11/2/07-5	1	1/8	FA-MA		Rib	Fragment				
114	1074N/1048E	20-40	9/29/07-1	1	1/8	FA-MA		L bone	Fragment				
114	1074N/1048E	20-40	9/29/07-1	1	1/8	FA-MA	Thomomys bottae	Ulna	Proximal				
114	1074N/1048E	40-60	9/29/07-1	1	1/8	FA-MA	Thomomys bottae	Femur	Most				
114	1074N/1060E	0-20	9/29/07-3	1	1/4	FA-BI	Anatidae	Furculum	Fragment				
114	1074N/1060E	20-40	9/29/07-3	1	1/8	FA-BI	Aves	Ulna	Shaft				
114	1074N/1060E	60-80	9/29/07-3	1	1/8	FA-MA	Thomomys bottae	Ilium	Complete				
114	1074N/1060E	60-80	9/29/07-3	1	1/4	FA-MA	Sylvilagus spp.	Mandible	Mid				
114	1077N/1064E	0-20	9/28/07-2	1	1/4	FA-FI	Myliobatis californica	Tooth	Fragment				
114	1077N/1064E	0-20	9/28/07-2	2	1/4	FA-MA		L bone	Fragment				
114	1077N/1064E	0-20	9/28/07-2	2	1/4	Unid							
114	1077N/1064E	20-40	9/28/07-2	1	1/4	FA-MA		Cranium	Fragment				
114	1077N/1064E	40-60	9/28/07-2	1	1/8	FA-MA			Fragment				
114	1077N/1064E	60-80	9/28/07-2	3	1/8	FA-FI	Oncorhynchus spp.		Fragment				
114	1078N/1049E	20-40	9/28/07-5	1	1/4	FA-MA	Microtus californicus	Mandible	Most				
114	1078N/1049E	60-80	9/28/07-5	1	1/4	FA-FI	Oncorhynchus tshawytscha	Vertebra	Centrum				

[1]B = burned; C = cut; G = gnawed; and W = worked

Site	Unit	Depth (cm.)	CAT #	Count	Fraction (in.)	Basic Group	Taxon	Element	Part	B	C	G	W
114	1078N/1056E	0-20	7/18/08-1	2	1/4	FA-MA	Microtus californicus	Mandible	Complete				
114	1078N/1056E	0-20	7/23/08-1	1	1/4	FA-MA	Odocoileus hemionus	Naviculo-cuboid	Complete				
114	1078N/1056E	20-30	7/18/08-2	1	1/4	FA-BI	Aythya spp.	Coracoid	Proximal				
114	1078N/1056E	20-30	7/18/08-2	1	1/4	FA-BI	Anas spp.	Scapula	Proximal				
114	1078N/1056E	20-30	7/18/08-2	1	1/4	FA-BI	Anatidae	Humerus	Shaft				
114	1078N/1056E	20-30	7/18/08-2	5	1/4	FA-BI	Aves		Fragment				
114	1078N/1056E	20-30	7/18/08-2	1	1/4	FA-FI	Acipenser spp.	Scute	Most				
114	1078N/1056E	20-30	7/18/08-2	1	1/4	FA-MA	Thomomys bottae	Innominate	Most				
114	1078N/1056E	20-30	7/18/08-2	1	1/4	FA-MA	Thomomys bottae	Maxilla	Most				
114	1078N/1056E	20-30	7/18/08-2	1	1/4	FA-MA	Thomomys bottae	Mandible	Complete				
114	1078N/1056E	20-30	7/18/08-2	1	1/4	FA-MA	Odocoileus hemionus	Metacarpal	Proximal				
114	1078N/1056E	20-30	7/18/08-2	1	1/4	FA-MA	Microtus californicus	Mandible	Most				
114	1078N/1056E	30-40	7/19/08-1	1	1/4	FA-BI	Anatidae	Tarso-metatarsus	Distal				
114	1078N/1056E	30-40	7/19/08-1	1	1/4	FA-BI	Anseriformes	Sternum					
114	1078N/1056E	30-40	7/19/08-1	1	1/4	FA-BI	Scolopacidae	Ulna	Shaft				
114	1078N/1056E	30-40	7/19/08-1	1	1/4	FA-MA	Odocoileus hemionus	Tibia	Proximal, S2	Y			

Site	Unit	Depth (cm.)	CAT #	Count	Fraction (in.)	Basic Group	Taxon	Element	Part	B	C	G	W
114	1078N/1056E	30-40	7/19/08-1	1	1/4	FA-MA		L bone	Shaft Frag				
114	1078N/1056E	30-40	7/19/08-1	1	1/4	FA-MA		Cranium	Fragment				
114	1078N/1056E	40-50	7/19/08-2	1	1/4	FA-MA	Odocoileus hemionus	Petrosal	Fragment				
114	1078N/1056E	40-50	7/19/08-2	1	1/4	FA-MA	Odocoileus hemionus	Metapodial	Shaft Frag				
114	1078N/1056E	40-50	7/19/08-2	1	1/4	FA-MA	Thomomys bottae	Femur	Most				
114	1078N/1056E	50-60	7/21/08-1	1	1/4	FA-BI	Anas spp.	Radius	Proximal				
114	1078N/1056E	50-60	7/21/08-1	1	1/4	FA-BI	Aythya spp.	Vertebra, thoracic	Centrum				
114	1078N/1056E	50-60	7/21/08-1	1	1/4	FA-FI	Acipenser spp.	Scute, cranial	Fragment				
114	1078N/1056E	50-60	7/21/08-1	4	1/4	FA-FI	Acipenser spp.		Fragment				
114	1078N/1056E	50-60	7/21/08-1	3	1/4	FA-FI	Oncorhynchus spp.	Vertebra	Fragment				
114	1078N/1056E	50-60	7/21/08-1	2	1/4	FA-FI	Oncorhynchus spp.	Cranial	Fragment				
114	1078N/1056E	50-60	7/21/08-1	1	1/4	FA-FI	Salmonidae	Fin ray	Proximal				
114	1078N/1056E	50-60	7/21/08-1	1	1/4	FA-MA		Libone	Fragment				
114	1078N/1056E	50-60	7/21/08-1	1	1/4	FA-MA	Thomomys bottae	Petrosal bulla	Complete				
114	1078N/1056E	50-60	7/21/08-1	1	1/4	FA-MA	Thomomys bottae	Tibia	Most				
114	1078N/1056E	50-60	7/21/08-1	1	1/4	FA-MA	Thomomys bottae	Scapula	Proximal				

Site	Unit	Depth (cm.)	CAT #	Count	Fraction (in.)	Basic Group	Taxon	Element	Part	B	C	G	W
114	1078N/1056E	50-60	7/21/08-1	1	1/4	FA-MA	Thomomys bottae	Humerus	Most				
114	1078N/1056E	50-60	7/21/08-1	2	1/4	FA-MA	Microtus californicus	Mandible	Complete				
114	1078N/1056E	50-60	7/22/08-1	1	>1/8	FA-BI	Aves	Humerus	Proximal Frag	Y			
114	1078N/1056E	50-60	7/22/08-1	1	>1/8	FA-FI	Clupeidae	Vertebra	Centrum				
114	1078N/1056E	50-60	7/22/08-1	1	>1/8	FA-FI	Acipenser spp.	Scute	Most	Y			
114	1078N/1056E	50-60	7/22/08-1	1	>1/8	FA-FI	Teleosti						
114	1078N/1056E	50-60	7/22/08-1	7	1/16-1/8	FA-FI	Teleosti		Fragment				
114	1078N/1056E	50-60	7/22/08-1	1	1/16-1/8	FA-FI	Clupeiformes	Vertebra	Fragment				
114	1078N/1056E	50-60	7/22/08-1	2	1/16-1/8	FA-FI	Salmonidae		Fragment				
114	1078N/1056E	50-60	7/22/08-1	12	>1/8	FA-FI	Salmonidae		Fragment				
114	1078N/1056E	50-60	7/22/08-1	1	>1/8	FA-FI	Myliobatis californica	Tooth	Fragment	Y			
114	1078N/1056E	50-60	7/22/08-1	1	>1/8	FA-FI	Gillichthys mirabilis	Vertebra	Complete				
114	1078N/1056E	50-60	7/22/08-1	1	>1/8	FA-FI	Atheriniformes	Vertebra	Fragment				
114	1078N/1056E	50-60	7/22/08-1	6	1/16-1/8	FA-FI	Salmonidae		Fragment				
114	1078N/1056E	50-60	7/22/08-1	1	>1/8	FA-HE	Pituophis melanoleucus	Vertebra, cervical	Centrum				
114	1078N/1056E	50-60	7/22/08-1	1	1/16-1/8	FA-HE	Aneides lugubris	Vertebra, caudal	Centrum				

Site	Unit	Depth (cm.)	CAT #	Count	Fraction (in.)	Basic Group	Taxon	Element	Part	B	C	G	W
114	1078N/1056E	50-60	7/22/08-1	1	1/16-1/8	FA-HE	Colubridae	Vertebra	Fragment				
114	1078N/1056E	50-60	7/22/08-1	1	>1/8	FA-MA	Microtus californicus	Calcaneus	Complete				
114	1078N/1056E	50-60	7/22/08-1	2	>1/8	FA-MA	Rodentia		Fragment				
114	1078N/1056E	50-60	7/22/08-1	2	>1/8	FA-MA	Mammalia		Fragment				
114	1078N/1056E	50-60	7/22/08-1	1	1/16-1/8	FA-MA	Peromyscus spp.	Ulna	Complete				
114	1078N/1056E	50-60	7/22/08-1	3	>1/8	FA-MA	Rodentia		Fragment				
114	1078N/1056E	50-60	7/22/08-1	3	>1/8	FA-MA	Mammalia		Fragment				
114	1078N/1056E	50-60	7/22/08-1	19	>1/8	FA-MA	Mammalia		Fragment	Y			
114	1078N/1056E	50-60	7/22/08-1	1	>1/8	FA-MA	Microtus californicus	Ilium	Most				
114	1078N/1056E	50-60	7/28/08-1	3	1/4	FA-FI	Myliobatis californica	Tooth	Most				
114	1078N/1066E	40-60	9/28/07-1	1	1/4	FA-MA		L bone	Fragment	Y			
114	1078N/1066E	80-100	9/28/07-1	6	1/4	FA-FI	Acipenser spp.	Scute	Fragment				
114	1079N/1059E	20-40	9/28/07-3	1	1/8	FA-FI	Oncorhynchus spp.	Vertebra	Fragment				
114	1079N/1059E	20-40	9/28/07-3	1	1/8	FA-MA		Rib	Fragment				
114	1079N/1059E	60-80	9/28/07-3	1	1/8	FA-FI	Oncorhynchus spp.	Vertebra	Centrum Frag				
114	1079N/1059E	60-80	9/28/07-3	1	1/4	FA-MA		L bone	Fragment				

Site	Unit	Depth (cm.)	CAT #	Count	Fraction (in.)	Basic Group	Taxon	Element	Part	B	C	G	W
114	1079N/1059E	80-100	9/28/07-3	1	1/8	FA-FI	Teleosti	Ray, spine	Fragment				
114	1080N/1051E	20-40	9/28/07-4	1	1/8	FA-MA	Peromyscus spp.	Humerus	Complete				
114	1080N/1051E	20-40	9/28/07-4	2	1/8	FA-MA		L bone	Fragment				
114	1080N/1051E	20-40	9/28/07-4	1	1/8	FA-MA	Rodentia	Ilium	Fragment				
114	1080N/1052E	0-20	11/2/07-7	1	1/8	FA-MA	Microtus californicus	Femur	Most				
114	1080N/1052E	20-40	11/2/07-7	1	1/8	FA-MA	Thomomys bottae	Mandible	Proximal				
114	1080N/1052E	40-60	11/2/07-7	1	1/8	FA-FI	Oncorhynchus spp.	Vertebra	Fragment				
114	1080N/1052E	40-60	11/2/07-7	1	1/4	FA-MA	Thomomys bottae	Mandible	Most				
114	1080N/1056E	0-10	7/31/07-1	1		FA-MA	Large mammal		Fragment				
114	1080N/1056E	10 to 20	8/1/07-1	1		FA-MA	Med mammal		Fragment				
114	1080N/1056E	20-30	8/2/07-1	1		FA-BI	Anatidae	Fibula	Shaft Frag	Y			
114	1080N/1056E	20-30	8/2/07-1	2		FA-FI	Myliobatis californica	Vertebrae	Centrum				
114	1080N/1056E	20-30	8/2/07-1	1		FA-MA	Odocoileus hemionus	Radius	Shaft Frag				
114	1080N/1056E	20-30	8/2/07-1	2		FA-MA	Odocoileus hemionus	Metapodial	Fragment				
114	1080N/1056E	20-30	8/2/07-1	2		FA-MA	Odocoileus hemionus	L bone	Shaft Frag				
114	1080N/1056E	20-30	8/2/07-1	1		FA-MA	Microtus californicus	Mandible	Most				

Site	Unit	Depth (cm.)	CAT #	Count	Fraction (in.)	Basic Group	Taxon	Element	Part	B	C	G	W
114	1080N/1056E	20-30	8/2/07-1	2		FA-MA	Thomomys bottae	Teeth	Distal				
114	1082N/1066E	0-20	9/27/07-2	1	1/4	FA-BI	Branta canadensis	Radius					
114	1082N/1066E	20-40	9/27/07-2	1	1/4	FA-MA	Odocoileus hemionus	Metatarsal	Shaft	Y			
114	1083N/1049E	0-20	9/21/07-4	1	1/8	FA-MA		L bone	Fragment				
114	1083N/1049E	20-40	9/21/07-4	1	1/4	FA-FI	Acipenser spp.	Basibranchial					
114	1083N/1049E	40-60	9/21/07-4	1	1/4	FA-BI	Aves	L bone	Shaft Frag				
114	1083N/1049E	40-60	9/21/07-4	2	1/4	FA-FI	Acipenser spp.	Scute	Most				
114	1083N/1049E	60-80	9/21/07-4	3	1/8	FA-FI	Oncorhynchus spp.		Fragment				
114	1083N/1055E	20-40	9/23/07-1	1	1/4	FA-MA		L bone	Fragment				
114	1083N/1064E	0-20	9/27/07-1	2	1/8	FA-BI	Aves	Mandible	Fragment				
114	1083N/1064E	0-20	9/27/07-1	1	1/4	FA-BI	Aves	L bone	Fragment				
114	1083N/1064E	20-40	9/27/07-1	1	1/8	FA-MA		L bone	Fragment				
114	1083N/1064E	80-100	9/27/07-1	1	1/8	FA-MA		L bone	Fragment				
114	1083N/1064E	80-100	9/27/07-1	2	1/4	FA-MA	Odocoileus hemionus	Calcaneus	Distal				
114	1084N/1057E	40-60	9/23/07-2	1	1/4	FA-MA		L bone	Shaft				
114	1084N/1057E	60-80	9/23/07-2	1	1/4	FA-MA		Ichas?	Shaft Frag				

Site	Unit	Depth (cm.)	CAT #	Count	Fraction (in.)	Basic Group	Taxon	Element	Part	B	C	G	W
114	1084N/1057E	60-80	9/23/07-2	1	1/4	Unid							
114	1086N/1048E	0-20	9/21/07-3	1	1/8	FA-MA	Thomomys bottae	Humerus	Distal				
114	1086N/1051E	0-20	9/21/07-2	1	1/8	FA-BI	Aves	L bone	Shaft				
114	1086N/1051E	0-20	9/21/07-2	1	1/8	FA-MA	Thomomys bottae	Vertebra, thoracic	Complete				
114	1086N/1051E	40-60	9/21/07-2	1	1/8	FA-FI	Teleosti	Fin ray	Proximal				
114	1086N/1051E	40-60	9/21/07-2	1	1/8	FA-MA	Thomomys bottae	Mandible	Proximal				
114	1086N/1051E	60-80	9/21/07-2	1	1/4	FA-MA	Odocoileus hemionus	Phalanx 2	Proximal				
114	1086N/1051E	80-100	9/21/07-2	1	1/8	FA-FI	Acipenser spp.	Ray	Fragment				
114	1086N/1061E	60-80	8/1/07-2	1	1/4	FA-MA	Carnivora	Vertebra, cervical	Fragment	Y			
114	1086N/1061E	80-100	8/1/07-2	1	1/4	FA-MA	Artiodactyla	Vertebra	Neural arch	Y			
114	1086N/1068E	20-40	7/31/07-3	1	1/2	FA-BI	Aves	Scapula	Distal				
115			1-127803	9		FA-FI	Triakis semifasciata	Vertebrae	Centrum				
115			1-127803	1		FA-FI	Acipenser spp.	Scute	Fragment				
115			1-127803	1		FA-FI	Acipenser spp.	Post-temporal	Complete				
115			1-127803	1		FA-FI	Oncorhynchus spp.	Cranium	Fragment				
115			1-127825	1		FA-FI	Triakis semifasciata	Vertebra	Centrum				

Site	Unit	Depth (cm.)	CAT #	Count	Fraction (in.)	Basic Group	Taxon	Element	Part	B	C	G	W
115			1-127829	4		FA-FI	Acipenser spp.	Opercal	Fragment				
115			1-127834	1		FA-FI	Acipenser spp.	Cranial scute	Fragment				
115			1-127834	1		FA-FI	Acipenser spp.	Dentary	Mid				
115			1-127841	1		FA-FI	Triakis semifasciata	Vertebra	Centrum				
115			1-127904	1		FA-FI	Oncorhynchus tshawytscha	Vertebral collumn	Centrum				
115			1-127919	1		FA-FI	Acipenser spp.	Maxilla	Mast				
115			1-127931	1		FA-FI	Triakis semifasciata	Vertebra	Centrum				
115			1-127940	1		FA-FI	Triakis semifasciata	Vertebra	Centrum				
115			1-127968	1		FA-FI	Acipenser spp.	Craical scute	Fragment				
115			1-127974	2		FA-FI	Acipenser spp.	Cleithrum	Mid				
115			1-127978	2		FA-FI	Squatina californica	Vertebra	Fragment				
115			1-127984	2		FA-FI	Acipenser spp.	Cranium	Fragment				
328	958N/979E	0-20	7/17/08-4	1	1/8	FA-MA	Thomomys bottae	Radius	Proximal				
328	958N/979E	20-40	7/17/08-4	1	1/8	FA-MA		L bone	Shaft Frag				
328	958N/979E	40-60	7/17/08-4	1	1/8	FA-MA		L bone	Shaft Frag				
328	959N/983E	0-20	7/17/08-5	1	1/8	FA-FI	Teleosti		Fragment				

Site	Unit	Depth (cm.)	CAT #	Count	Fraction (in.)	Basic Group	Taxon	Element	Part	B	C	G	W
328	959N/983E	0-20	7/17/08-5	1	1/8	FA-FI	Clupeidae	Vertebra	Centrum				
328	959N/983E	0-20	7/17/08-5	1	1/8	FA-MA		Rib	Fragment				
328	959N/983E	20-40	7/17/08-5	1	1/8	FA-FI	Oncorhynchus spp.	Vertebra	Fragment				
328	959N/983E	20-40	7/17/08-5	1	1/8	FA-MA	Thomomys bottae	Mandible	Mid				
328	959N/983E	40-60	7/17/08-5	1	1/8	FA-FI	Teleosti		Fragment				
328	959N/997E	0-20	7/14/08-4	1	1/8	FA-BI	Aves	Humerus	Proximal				
328	959N/997E	0-20	7/14/08-4	2	1/8	FA-BI	Aves		Fragment				
328	962N/980E	0-20	7/17/08-3	1	1/8	FA-MA			Fragment				
328	962N/980E	20-40	7/17/08-3	1	1/8	FA-FI	Oncorhynchus spp.	Vertebra	Fragment				
328	963N/993E	20-40	7/15/08-1	1	1/8	FA-FI	Teleosti	Fin ray	Fragment				
328	963N/993E	40-60	7/15/08-1	1	1/8	FA-FI	Myliobatis californica	Vertebra	Centrum				
328	963N/993E	60-80	7/15/08-1	1	1/8	FA-FI	Myliobatis californica	Tooth, lateral	Complete				
328	963N/993E	60-80	7/15/08-1	1	1/4	FA-MA	Odocoileus hemionus	L pm 3	Most				
328	963N/993E	60-80	7/15/08-1	1	1/8	FA-MA	Sylvilagus spp.	Tibia	Proximal				
328	963N/993E	60-80	7/15/08-1	1	1/8	FA-MA	Thomomys bottae	Femur	Proximal				
328	964N/997E	20-40	7/14/08-2	3	1/4	FA-FI	Oncorhynchus spp.	Cranial	Fragment				

Site	Unit	Depth (cm.)	CAT #	Count	Fraction (in.)	Basic Group	Taxon	Element	Part	B	C	G	W
328	964N/997E	40-60	7/14/08-2	1	1/4	FA-FI	Acipenser spp.	Scute	Fragment				
328	967N/981E	0-20	7/16/08-4	1	1/8	FA-FI	Sebastes spp.	Vertebra	Centrum				
328	967N/981E	0-20	7/16/08-4	1	1/8	FA-MA	Microtus californicus	Maxilla	Most				
328	967N/981E	0-20	7/16/08-4	2	1/8	FA-MA	Rodentia		Fragment				
328	967N/981E	0-20	7/16/08-4	1	1/8	FA-MA			Fragment				
328	967N/981E	20-40	7/16/08-4	1	1/8	FA-MA	Sylvilagus spp.	Phalanx 2	Complete				
328	967N/981E	60-80	7/16/08-4	1	1/8	FA-MA	Rodentia		Fragment				
328	967N/981E	80-100	7/16/08-4	1	1/8	FA-FI	Teleosti		Fragment				
328	967N/981E	80-100	7/16/08-4	2	1/8	FA-MA		L bone	Shaft Frag				
328	968N/1001E	0-20	7/14/08-1	1	1/4	FA-MA		L bone	Shaft Frag				
328	968N/1001E	0-20	7/14/08-1	1	1/4	FA-MA	Scapanus latimanus	Mandible	Most				
328	968N/1001E	0-20	7/14/08-1	1	1/8	FA-MA			Fragment				
328	968N/1001E	0-20	7/14/08-1	1	1/8	FA-MA	Microtus californicus	Femur	Most				
328	968N/1001E	20-40	7/14/08-1	1	1/8	FA-MA	Thomomys bottae	Scapula	Proximal				
328	968N/978E	0-20	7/17/08-1	1	1/8	FA-FI	Teleosti	Hypural	Proximal				
328	968N/997E	0-20	7/11/08-3	1	1/8	FA-FI	Myliobatis californica	Tooth, medial	Most				

Site	Unit	Depth (cm.)	CAT #	Count	Fraction (in.)	Basic Group	Taxon	Element	Part	B	C	G	W
328	968N/997E	20-40	7/11/08-3	1	1/8	FA-MA	Rodentia	Rib	Proximal				
328	968N/997E	20-40	7/11/08-3	1	1/8	FA-MA			Fragment				
328	968N/997E	40-60	7/11/08-3	1	1/8	FA-FI	Porichthys notatus	Opercal	Proximal				
328	968N/997E	40-60	7/11/08-3	3	1/8	FA-FI	Teleosti		Fragment				
328	968N/997E	60-80	7/11/08-3	1	1/8	FA-FI	Teleosti		Fragment				
328	968N/997E	80-100	7/11/08-3	4	1/8	FA-FI	Teleosti		Fragment				
328	968N/997E	80-100	7/11/08-3	1	1/8	FA-FI	Myliobatis californica	Tooth, lateral	Complete				
328	968N/997E	80-100	7/11/08-3	4	1/8	FA-FI	Porichthys notatus	Vertebra	Centrum				
328	968N/997E	80-100	7/11/08-3	2	1/8	FA-FI	Oncorhynchus spp.	Cranial	Fragment				
328	968N/997E	80-100	7/11/08-3	1	1/8	FA-FI	Oncorhynchus spp.	Vertebra	Fragment				
328	968N/997E	80-100	7/11/08-3	1	1/8	FA-MA			Fragment				
328	969N/989E	0-20	7/15/08-2	2	1/8	FA-BI	Aves		Fragment				
328	969N/989E	0-20	7/15/08-2	1	1/4	Unid							
328	969N/989E	100-120	7/15/08-2	1	1/8	FA-MA		L bone	Shaft Frag				
328	969N/989E	120-140	7/15/08-2	1	1/4	FA-FI	Myliobatis californica	Tooth, medial	Most				
328	969N/989E	40-60	7/15/08-2	1	1/4	FA-MA	Odocoileus hemionus	Naviculo-cuboid	Fragment				

Site	Unit	Depth (cm.)	CAT #	Count	Fraction (in.)	Basic Group	Taxon	Element	Part	B	C	G	W
328	969N/989E	40-60	7/15/08-2	1	1/8	FA-MA	Microtus californicus	Mandible	Complete				
328	969N/989E	40-60	7/15/08-2	2	1/8	FA-MA		L bone	Shaft Frag				
328	969N/989E	80-100	7/15/08-2	1	1/4	FA-BI	Anseriformes	Bill	Fragment				
328	969N/989E	80-100	7/15/08-2	1	1/4	FA-FI	Myliobatis californica	Vertebra	Complete				
328	969N/989E	80-100	7/15/08-2	1	1/8	FA-FI	Teleosti	Fin ray	Fragment				
328	969N/989E	80-100	7/15/08-2	1	1/8	FA-FI	Notorynchus cepedianus	Tooth	Most	Y			
328	969N/994E	20-40	7/14/08-3	1	1/8	Unid							
328	969N/994E	60-80	7/14/08-3	1	1/8	FA-MA		L bone	Shaft Frag	Y			Y
328	969N/994E	60-80	7/14/08-3	1	1/8	FA-MA		L bone	Shaft Frag				
328	969N/994E	80-100	7/14/08-3	1	1/8	FA-HE	Pituophis catenifer	Vertebra, thoracic	Complete				
328	971N/985E	0-20	7/16/08-3	1	1/8	FA-BI	Anatidae	Radius	Proximal	Y			
328	971N/985E	0-20	7/16/08-3	1	1/8	FA-BI	Aves	L bone	Shaft				
328	971N/985E	0-20	7/16/08-3	2	1/8	FA-MA	Rodentia	Vertebrae	Centrum				
328	971N/985E	20-40	7/16/08-3	3	1/8	FA-FI	Teleosti		Fragment				
328	971N/985E	20-40	7/16/08-3	1	1/8	FA-FI	Clupeidae	Vertebra	Centrum				
328	971N/985E	20-40	7/16/08-3	1	1/4	FA-MA	Microtus californicus	Mandible	Most				

Site	Unit	Depth (cm.)	CAT #	Count	Fraction (in.)	Basic Group	Taxon	Element	Part	B	C	G	W
328	971N/985E	20-40	7/16/08-3	2	1/4	FA-MA		L bone	Shaft Frag				
328	971N/985E	20-40	7/16/08-3	1	1/8	FA-MA	Microtus californicus	Femur	Most				
328	971N/985E	20-40	7/16/08-3	2	1/8	FA-MA	Rodentia	Vertebra	Centrum				
328	971N/985E	40-45	7/16/08-3	1	1/4	FA-BI	Anatidae	Sternum	Anterior				
328	971N/985E	40-45	7/16/08-3	1	1/4	FA-FI	Oncorhynchus spp.	Vertebra	Fragment				
328	971N/985E	40-45	7/16/08-3	3	1/8	FA-FI	Teleosti		Fragment				
328	971N/985E	40-45	7/16/08-3	1	1/4	FA-MA			Fragment				
328	971N/985E	40-45	7/16/08-3	1	1/8	FA-MA	Microtus californicus	Femur	Proximal	Y			
328	971N/985E	40-45	7/16/08-3	1	1/8	FA-MA	Sciuridae	Tibia	Distal				
328	971N/992E	20-40	7/11/08-1	1	1/4	FA-BI	Anatidae	Articulum	Fragment				
328	971N/992E	20-40	7/11/08-1	1	1/4	FA-BI	Anatidae	Ulna	Shaft				
328	971N/992E	20-40	7/11/08-1	1	1/8	FA-BI	Aves	Humerus	Prox Shft Frag				
328	971N/992E	20-40	7/11/08-1	1	1/8	FA-MA		L bone	Shaft Frag				
328	971N/992E	20-40	7/11/08-1	1	1/8	FA-MA	Rodentia	Rib	Proximal				
328	971N/992E	60-80	7/11/08-1	1	1/8	FA-FI	Teleosti		Fragment				
328	972N/979E	0-20	7/16/08-2	1	1/8	FA-MA	Rodentia		Fragment				

Site	Unit	Depth (cm.)	CAT #	Count	Fraction (in.)	Basic Group	Taxon	Element	Part	B	C	G	W
328	972N/979E	0-20	7/16/08-2	2	1/8	FA-MA	Microtus californicus	Femur	Complete				
328	978N/983E	0-20	7/16/08-1	1	1/4	FA-MA	Microtus californicus	Maxilla	Most				
328	978N/996E	0-20	7/9/08-5	1	1/4	FA-MA	Sciurus griseus	Radius	Proximal				
328	978N/996E	0-20	7/9/08-5	2	1/8	FA-MA			Fragment				
328	978N/996E	20-40	7/9/08-5	1	1/8	FA-FI	Teleosti		Fragment				
328	978N/996E	20-40	7/9/08-5	1	1/4	FA-MA		L bone	Shaft Frag				
328	978N/996E	20-40	7/9/08-5	1	1/8	FA-MA		L bone	Shaft Frag				
328	978N/996E	20-40	7/9/08-5	1	1/8	FA-MA	Thomomys bottae	Humerus	Distal				
328	978N/996E	60-80	7/9/08-5	1	1/8	FA-MA	Sciuridae	Clavicle	Fragment				
328	978N/996E	80-100	7/9/08-5	1	1/8	FA-MA			Fragment				
328	982N/991E	0-20	7/9/08-4	1	1/4	FA-MA		L bone	Fragment				
328	982N/991E	20-40	7/9/08-4	1	1/4	FA-MA		L bone	Shaft Frag				
328	982N/991E	40-60	7/9/08-4	1	1/8	FA-MA	Thomomys bottae	Humerus	Proximal	Y			
328	982N/996E	0-20	7/9/08-3	1	1/8	FA-MA			Fragment				
328	982N/996E	20-40	7/9/08-3	1	1/8	FA-FI	Acipenser spp.	Scute	Fragment				
328	982N/996E	40-60	7/9/08-3	1	1/4	FA-BI	Aves	Vertebra	Centrum				

Site	Unit	Depth (cm.)	CAT #	Count	Fraction (in.)	Basic Group	Taxon	Element	Part	B	C	G	W
328	982N/996E	40-60	7/9/08-3	1	1/4	FA-FI	Acipenser spp.	Scute	Complete				
328	982N/996E	60-80	7/9/08-3	1	1/4	FA-MA			Fragment				
328	982N/996E	80-100	7/9/08-3	1	1/8	FA-FI	Teleosti	Fin ray	Fragment				
328	982N/996E	80-100	7/9/08-3	1	1/4	FA-MA		L bone	Fragment				
328	985N/993E	0-20	7/9/08-1	1	1/8	FA-MA		L bone	Shaft Frag	Y			Y

Additional CA-MRN-115 faunal data from PAHMA collection:

Site	Unit	Depth (cm.)	CAT #	Basic Group	Taxon	Element	Part	B	C	G	W
115			1-127803	FA-BI	Aves	Furculum					
115			1-127803	FA-BI	Aves	Furculum					
115			1-127803	FA-BI	Aves	Tibiotarsus					
115			1-127803	FA-BI	Aves	Radius					
115			1-127803	FA-BI	Aves	Femur					
115			1-127805	FA-BI	Aves	Humerus			Y		
115			1-127805	FA-BI	Aves	Humerus		Y			
115			1-127805	FA-BI	Aves	Coracoid					
115			1-127821	FA-BI	Aves	Long Bone	Fragment	Y			
115			1-127821	FA-BI	Aves	Humerus					
115			1-127821	FA-BI	Aves	Humerus			Y		
115			1-127821	FA-BI	Aves	Coracoid					
115			1-127821	FA-BI	Aves	Tarsometatarsus					
115			1-127821	FA-BI	Aves	Tarsometatarsus					
115			1-127823	FA-BI	Aves	Tibiotarsus					

Site	Unit	Depth (cm.)	CAT #	Basic Group	Taxon	Element	Part	B	C	G	W
115			1-127824	FA-BI	Aves	Scapula					
115			1-127824	FA-BI	Aves	Humerus					
115			1-127824	FA-BI	Aves	Rib					
115			1-127825	FA-BI	Aves	Humerus		Y	Y		
115			1-127825	FA-BI	Aves	Tibiotarsus					
115			1-127825	FA-BI	Aves	Tibiotarsus					
115			1-127829	FA-BI	Aves	Coracoid					
115			1-127829	FA-BI	Aves	Coracoid					
115			1-127829	FA-BI	Aves	Humerus					
115			1-127833	FA-BI	Aves	Tarsometatarsus					
115			1-127837	FA-BI	Aves	Femur					
115			1-127841	FA-BI	Aves	Carpometacarpus					
115			1-127887	FA-BI	Aves	Tarsometatarsus					
115			1-127889	FA-BI	Aves	Long Bone	Fragment		Y		
115			1-127889	FA-BI	Aves	Long Bone	Fragment				
115			1-127905	FA-BI	Aves	Furculum					
115			1-127908	FA-BI	Aves	Coracoid					
115			1-127911	FA-BI	Aves	Humerus			Y		
115			1-127919	FA-BI	Aves	Tarsometatarsus					
115			1-127919	FA-BI	Aves	Humerus					
115			1-127920	FA-BI	Aves	Humerus					
115			1-127920	FA-BI	Aves	Humerus					
115			1-127920	FA-BI	Aves	Tarsometatarsus					
115			1-127920	FA-BI	Aves	Tibiotarsus					
115			1-127920	FA-BI	Aves	Scapula					
115			1-127921	FA-BI	Aves	Ulna					
115			1-127921	FA-BI	Aves	Tibiotarsus					
115			1-127921	FA-BI	Aves	Ulna					
115			1-127921	FA-BI	Aves	Ulna					

Site	Unit	Depth (cm.)	CAT #	Basic Group	Taxon	Element	Part	B	C	G	W
115			1-127921	FA-BI	Aves	Coracoid					
115			1-127921	FA-BI	Aves	Sternum					
115			1-127921	FA-BI	Aves	Carpometacarpus					
115			1-127921	FA-BI	Aves	Carpometacarpus		Y			
115			1-127922	FA-BI	Aves	Ulna			Y		
115			1-127922	FA-BI	Aves	Ulna					
115			1-127922	FA-BI	Aves	Ulna					
115			1-127922	FA-BI	Aves	Ulna					
115			1-127922	FA-BI	Aves	Ulna					
115			1-127922	FA-BI	Aves	Carpometacarpus					
115			1-127922	FA-BI	Aves	Humerus					
115			1-127922	FA-BI	Aves	Sternum					
115			1-127923	FA-BI	Aves	Ulna					
115			1-127923	FA-BI	Aves	Ulna					
115			1-127923	FA-BI	Aves	Humerus					
115			1-127927	FA-BI	Aves	Carpometacarpus					
115			1-127927	FA-BI	Aves	Coracoid					
115			1-127927	FA-BI	Aves	Ulna					
115			1-127928	FA-BI	Aves	Femur					
115			1-127928	FA-BI	Aves	Tibiotarsus					
115			1-127928	FA-BI	Aves	Humerus					
115			1-127928	FA-BI	Aves	Humerus					
115			1-127928	FA-BI	Aves	Humerus					
115			1-127928	FA-BI	Aves	Humerus					
115			1-127928	FA-BI	Aves	Long Bone	Fragment				
115			1-127929	FA-BI	Aves	Femur					
115			1-127929	FA-BI	Aves	Tibiotarsus					
115			1-127929	FA-BI	Aves	Femur					
115			1-127929	FA-BI	Aves	Ulna					

Site	Unit	Depth (cm.)	CAT #	Basic Group	Taxon	Element	Part	B	C	G	W
115			1-127930	FA-BI	Aves	Scapula					
115			1-127930	FA-BI	Aves	Long Bone	Fragment				
115			1-127930	FA-BI	Aves	Humerus					
115			1-127930	FA-BI	Aves	Humerus					
115			1-127930	FA-BI	Aves	Ulna					
115			1-127930	FA-BI	Aves	Carpometacarpus					
115			1-127930	FA-BI	Aves	Coracoid					
115			1-127930	FA-BI	Aves	Coracoid					
115			1-127930	FA-BI	Aves	Furculum					
115			1-127930	FA-BI	Aves	Femur					
115			1-127930	FA-BI	Aves	Femur					
115			1-127931	FA-BI	Aves	Humerus		Y			
115			1-127931	FA-BI	Aves	Coracoid			Y		
115			1-127931	FA-BI	Aves	Coracoid					
115			1-127931	FA-BI	Aves	Coracoid		Y			
115			1-127931	FA-BI	Aves	Coracoid		Y			
115			1-127931	FA-BI	Aves	Carpometacarpus					
115			1-127931	FA-BI	Aves	Tibiotarsus			Y		
115			1-127933	FA-BI	Aves	Coracoid		Y			
115			1-127933	FA-BI	Aves	Coracoid					
115			1-127933	FA-BI	Aves	Coracoid					
115			1-127933	FA-BI	Aves	Tibiotarsus					
115			1-127936	FA-BI	Aves	Radius					
115			1-127936	FA-BI	Aves	Sternum					
115			1-127936	FA-BI	Aves	Ulna					
115			1-127936	FA-BI	Aves	Ulna					
115			1-127936	FA-BI	Aves	Ulna					
115			1-127936	FA-BI	Aves	Coracoid					
115			1-127936	FA-BI	Aves	Coracoid					

Site	Unit	Depth (cm.)	CAT #	Basic Group	Taxon	Element	Part	B	C	G	W
115			1-127937	FA-BI	Aves	Coracoid					
115			1-127937	FA-BI	Aves	Coracoid					
115			1-127937	FA-BI	Aves	Ulna					
115			1-127937	FA-BI	Aves	Humerus					
115			1-127939	FA-BI	Aves	Non-ID	Fragment				
115			1-127939	FA-BI	Aves	Non-ID	Fragment				
115			1-127940	FA-BI	Aves	Scapula					
115			1-127940	FA-BI	Aves	Humerus					
115			1-127940	FA-BI	Aves	Humerus		Y			
115			1-127943	FA-BI	Aves	Coracoid					
115			1-127943	FA-BI	Aves	Tarsometatarsus					
115			1-127947	FA-BI	Aves	Femur					
115			1-127962	FA-BI	Aves	Coracoid			Y		
115			1-127962	FA-BI	Aves	Coracoid					
115			1-127962	FA-BI	Aves	Rib					
115			1-127962	FA-BI	Aves	Tibiotarsus					
115			1-127962	FA-BI	Aves	Tibiotarsus					
115			1-127962	FA-BI	Aves	Long Bone	Fragment				
115			1-127967	FA-BI	Aves	Ulna					
115			1-127967	FA-BI	Aves	Long Bone	Fragment				
115			1-127967	FA-BI	Aves	Ulna					
115			1-127967	FA-BI	Aves	Scapula					
115			1-127970	FA-BI	Aves	Furculum					
115			1-127970	FA-BI	Aves	Coracoid					
115			1-127970	FA-BI	Aves	Humerus					
115			1-127970	FA-BI	Aves	Ulna					
115			1-127970	FA-BI	Aves	Furculum					
115			1-127977	FA-BI	Aves	Coracoid					
115			1-127978	FA-BI	Aves	Coracoid					

Site	Unit	Depth (cm.)	CAT #	Basic Group	Taxon	Element	Part	B	C	G	W
115			1-127978	FA-BI	Aves	Humerus		Y			
115			1-127981	FA-BI	Aves	Scapula					
115			1-127981	FA-BI	Aves	Long Bone	Fragment				
115			1-127984	FA-BI	Aves	Coracoid					
115			1-127984	FA-BI	Aves	Tibiotarsus					
115	1S	17	1-98008	FA-BI	Aves	Long Bone	Fragment				Y
115			1-127931	FA-HE	Turtle	Innominate					
115			1-119565	FA-MA	Bovid	Cranial			Y		
115			1-127805	FA-MA	Bovid/Cervid	Metapodial					
115			1-127805	FA-MA	Bovid/Cervid	Metatarsal			Y		
115			1-127805	FA-MA	Bovid/Cervid	Metapodial					
115			1-127805	FA-MA	Bovid/Cervid	Metapodial			Y		
115			1-127805	FA-MA	Bovid/Cervid	Tooth					
115			1-127825	FA-MA	Bovid/Cervid	Cervical		Y			
115			1-127825	FA-MA	Bovid/Cervid	Scaphoid					
115			1-127828	FA-MA	Bovid/Cervid	Humerus					
115			1-127829	FA-MA	Bovid/Cervid	Tibia					
115			1-127832	FA-MA	Bovid/Cervid	Radius			Y		
115			1-127839	FA-MA	Bovid/Cervid	Femur					
115	C-3	80	1-127849	FA-MA	Bovid/Cervid	Metapodial			Y		Y
115			1-127851	FA-MA	Bovid/Cervid	Ulna			Y		Y
115	C-2	54	1-127862	FA-MA	Bovid/Cervid	Scapula			Y		Y
115	C-2	86	1-127871	FA-MA	Bovid/Cervid	Long Bone	Fragment				Y
115			1-127873	FA-MA	Bovid/Cervid	Ulna			Y		
115			1-127883	FA-MA	Bovid/Cervid	Phalanx, Intermediate					
115			1-127885	FA-MA	Bovid/Cervid	Mandible			Y		
115			1-127888	FA-MA	Bovid/Cervid	Tibia			Y		
115			1-127893	FA-MA	Bovid/Cervid	Astragalus		Y	Y		
115	D-3	32	1-127894	FA-MA	Bovid/Cervid	Metatarsal					Y

Site	Unit	Depth (cm.)	CAT #	Basic Group	Taxon	Element	Part	B	C	G	W
115			1-127897	FA-MA	Bovid/Cervid	Metacarpal					
115			1-127904	FA-MA	Bovid/Cervid	Astragalus					
115			1-127905	FA-MA	Bovid/Cervid	Humerus					
115	D-2	21	1-127906	FA-MA	Bovid/Cervid	Scapula			Y	Y	Y
115			1-127911	FA-MA	Bovid/Cervid	Atlas					
115			1-127911	FA-MA	Bovid/Cervid	Innominate		Y			
115			1-127911	FA-MA	Bovid/Cervid	Innominate		Y			
115			1-127919	FA-MA	Bovid/Cervid	Metacarpal					
115			1-127920	FA-MA	Bovid/Cervid	Metapodial		Y			
115			1-127923	FA-MA	Bovid/Cervid	Radius			Y		
115			1-127924	FA-MA	Bovid/Cervid	Femur		Y	Y		
115			1-127924	FA-MA	Bovid/Cervid	Femur					
115			1-127924	FA-MA	Bovid/Cervid	Femur				Y	
115			1-127924	FA-MA	Bovid/Cervid	Metacarpal					
115			1-127926	FA-MA	Bovid/Cervid	Calcaneus		Y	Y		
115			1-127928	FA-MA	Bovid/Cervid	Humerus					
115			1-127928	FA-MA	Bovid/Cervid	Humerus					
115			1-127929	FA-MA	Bovid/Cervid	Astragalus		Y			
115			1-127930	FA-MA	Bovid/Cervid	Metacarpal					
115			1-127933	FA-MA	Bovid/Cervid	Mandible			Y		
115			1-127936	FA-MA	Bovid/Cervid	Tibia			Y		
115			1-127939	FA-MA	Bovid/Cervid	Radius			Y		
115			1-127939	FA-MA	Bovid/Cervid	Tibia					
115			1-127939	FA-MA	Bovid/Cervid	Tibia					
115			1-127940	FA-MA	Bovid/Cervid	Cervical					
115			1-127940	FA-MA	Bovid/Cervid	Femur			Y		
115			1-127944	FA-MA	Bovid/Cervid	Lumbar					
115			1-127962	FA-MA	Bovid/Cervid	Metapodial			Y		
115			1-127967	FA-MA	Bovid/Cervid	Phalanx, Distal					

Site	Unit	Depth (cm.)	CAT #	Basic Group	Taxon	Element	Part	B	C	G	W
115			1-127968	FA-MA	Bovid/Cervid	Astragalus					
115			1-127968	FA-MA	Bovid/Cervid	Lumbar					
115			1-127968	FA-MA	Bovid/Cervid	Metapodial					
115			1-127970	FA-MA	Bovid/Cervid	Humerus		Y	Y	Y	
115			1-127970	FA-MA	Bovid/Cervid	Cervical					
115			1-127973	FA-MA	Bovid/Cervid	1st Phalange					
115			1-127975	FA-MA	Bovid/Cervid	Humerus					
115			1-127981	FA-MA	Bovid/Cervid	Tooth					
115			1-127803	FA-MA	Carnivore	Mandible					
115		surface	1-127856	FA-MA	Carnivore	Femur			Y		
115			1-127911	FA-MA	Carnivore	Humerus		Y	Y		
115			1-127931	FA-MA	Carnivore	Mandible					
115			1-127967	FA-MA	Carnivore	Ulna					
115			1-127974	FA-MA	Carnivore	Radius					
115			1-127810	FA-MA	Cervid	Metacarpal			Y		
115			1-127834	FA-MA	Cervid	Antler					
115			1-127834	FA-MA	Cervid	Antler					
115			1-127834	FA-MA	Cervid	Cranial			Y		
115			1-127837	FA-MA	Cervid	Ulna					
115	1S	54	1-127855	FA-MA	Cervid	Antler			Y		
115			1-127885	FA-MA	Cervid	Cranial					
115			1-127887	FA-MA	Cervid	Mandible			Y		
115			1-127901	FA-MA	Cervid	Cranial		Y			
115			1-127901	FA-MA	Cervid	Cranial		Y			
115			1-127911	FA-MA	Cervid	External cuneiform					
115			1-127911	FA-MA	Cervid	Navicular-cuboid			Y		
115			1-127915	FA-MA	Cervid	Ulna			Y		
115	D-1	73	1-127916	FA-MA	Cervid	Accessory metapodial					Y
115			1-127939	FA-MA	Cervid	Tibia			Y		Y

Site	Unit	Depth (cm.)	CAT #	Basic Group	Taxon	Element	Part	B	C	G	W
115			1-127940	FA-MA	Cervid	Mandible			Y		
115			1-127970	FA-MA	Cervid	Metacarpal					
115			1-127803	FA-MA	Mammal	Long Bone	Fragment		Y		
115			1-127803	FA-MA	Mammal	Femur					
115			1-127803	FA-MA	Mammal	Long Bone	Fragment				
115			1-127805	FA-MA	Mammal	Non-ID	Fragment				
115			1-127805	FA-MA	Mammal	Rib					
115			1-127805	FA-MA	Mammal	Long Bone	Fragment				
115			1-127805	FA-MA	Mammal	Long Bone	Fragment				
115			1-127810	FA-MA	Mammal	Rib		Y			
115			1-127821	FA-MA	Mammal	Long Bone	Fragment				
115			1-127824	FA-MA	Mammal	Rib					
115			1-127829	FA-MA	Mammal	Long Bone	Fragment		Y		
115			1-127834	FA-MA	Mammal	Long Bone	Fragment				
115			1-127839	FA-MA	Mammal	Femur					
115			1-127854	FA-MA	Mammal	Long Bone	Fragment		Y		Y
115	C-1	67	1-127868	FA-MA	Mammal	Long Bone	Fragment				Y
115			1-127870	FA-MA	Mammal	Long Bone	Fragment				Y
115	D-2	41	1-127881	FA-MA	Mammal	Long Bone	Fragment				Y
115	D-2	24-36	1-127883	FA-MA	Mammal	Scapula		Y	Y		
115			1-127883	FA-MA	Mammal	Metapodial					
115			1-127884	FA-MA	Mammal	Long Bone	Fragment				Y
115			1-127885	FA-MA	Mammal	Scapula		Y	Y		
115			1-127889	FA-MA	Mammal	Long Bone	Fragment				
115			1-127889	FA-MA	Mammal	Long Bone	Fragment				
115		backdirt	1-127890	FA-MA	Mammal	Long Bone	Fragment				Y
115	Test Hole 2	24	1-127900	FA-MA	Mammal	Long Bone	Fragment				Y
115			1-127901	FA-MA	Mammal	Cranial					

Site	Unit	Depth (cm.)	CAT #	Basic Group	Taxon	Element	Part	B	C	G	W
115			1-127901	FA-MA	Mammal	Cranial					
115			1-127901	FA-MA	Mammal	Cranial					
115			1-127905	FA-MA	Mammal	Long Bone	Fragment				
115			1-127907	FA-MA	Mammal	Rib			Y		Y
115	D-1	112	1-127912	FA-MA	Mammal	Rib		Y			Y
115	D-2	72	1-127913	FA-MA	Mammal	Long Bone	Fragment				Y
115	D-1		1-127914	FA-MA	Mammal	Long Bone	Fragment				Y
115			1-127917	FA-MA	Mammal	Long Bone	Fragment				Y
115			1-127919	FA-MA	Mammal	Non-ID	Fragment				
115			1-127920	FA-MA	Mammal	Rib					
115			1-127922	FA-MA	Mammal	Rib					
115			1-127922	FA-MA	Mammal	Metacarpal					
115			1-127928	FA-MA	Mammal	Rib					
115			1-127928	FA-MA	Mammal	Rib					
115			1-127930	FA-MA	Mammal	Scapula					
115			1-127931	FA-MA	Mammal	Tibia					
115			1-127933	FA-MA	Mammal	Long Bone	Fragment				
115			1-127936	FA-MA	Mammal	Rib		Y			
115			1-127936	FA-MA	Mammal	Femur					
115			1-127936	FA-MA	Mammal	Femur				Y	
115			1-127937	FA-MA	Mammal	Long Bone	Fragment				
115			1-127939	FA-MA	Mammal	Innominate		Y			
115			1-127939	FA-MA	Mammal	Innominate		Y			
115			1-127939	FA-MA	Mammal	Mandible					
115			1-127940	FA-MA	Mammal	Calcaneus					
115			1-127940	FA-MA	Mammal	Rib					
115			1-127940	FA-MA	Mammal	Rib			Y		
115			1-127940	FA-MA	Mammal	Rib					
115			1-127940	FA-MA	Mammal	Rib					

Site	Unit	Depth (cm.)	CAT #	Basic Group	Taxon	Element	Part	B	C	G	W
115			1-127940	FA-MA	Mammal	Rib			Y		
115			1-127940	FA-MA	Mammal	Rib			Y		
115			1-127940	FA-MA	Mammal	Rib			Y		
115			1-127943	FA-MA	Mammal	Metapodial					
115			1-127945	FA-MA	Mammal	Tibia					Y
115	C-1	67	1-127948	FA-MA	Mammal	Non-ID	Fragment				Y
115	C-3	88	1-127949	FA-MA	Mammal	Long Bone	Fragment				Y
115	C-2	20	1-127952	FA-MA	Mammal	Rib					Y
115	C-2	47	1-127953	FA-MA	Mammal	Long Bone	Fragment				Y
115	C-1	49	1-127957	FA-MA	Mammal	Long Bone	Fragment		Y		Y
115			1-127962	FA-MA	Mammal	Long Bone	Fragment				
115			1-127962	FA-MA	Mammal	Humerus			Y		
115			1-127962	FA-MA	Mammal	Femur				Y	
115			1-127968	FA-MA	Mammal	Rib					
115			1-127968	FA-MA	Mammal	Rib					
115			1-127968	FA-MA	Mammal	Rib					
115			1-127968	FA-MA	Mammal	Long Bone	Fragment				
115			1-127968	FA-MA	Mammal	Long Bone	Fragment				
115			1-127968	FA-MA	Mammal	Long Bone	Fragment				
115			1-127970	FA-MA	Mammal	Rib					
115			1-127970	FA-MA	Mammal	Non-ID	Fragment				
115			1-127970	FA-MA	Mammal	Long Bone	Fragment				
115			1-127971	FA-MA	Mammal	Tibia					
115			1-127973	FA-MA	Mammal	Compact Bone					
115			1-127978	FA-MA	Mammal	Long Bone	Fragment				
115			1-127978	FA-MA	Mammal	Tibia		Y			
115			1-127984	FA-MA	Mammal	Femur					
115			1-127984	FA-MA	Mammal	Femur					
115			1-127984	FA-MA	Mammal	Long Bone	Fragment				

Site	Unit	Depth (cm.)	CAT #	Basic Group	Taxon	Element	Part	B	C	G	W
115			1-127984	FA-MA	Mammal	Long Bone	Fragment				
115			1-127984	FA-MA	Mammal	Long Bone	Fragment				
115			1-127984	FA-MA	Mammal	Long Bone	Fragment				
115			1-127984	FA-MA	Mammal	Long Bone	Fragment				
115			1-127984	FA-MA	Mammal	Non-ID	Fragment				
115			1-127984	FA-MA	Mammal	Long Bone	Fragment				
115			1-98004	FA-MA	Mammal	Long Bone	Fragment			Y	Y
115			1-127927	FA-MA	Rodent	Innominate					
115			1-127810	FA-MA	Sea Mammal	Tibia		Y	Y		Y
115			1-127807	FA-MA	Sea Mammal	Rib					

Appendix C

Lithic Data

Site (MRN-)	Unit	Depth (cm)	Fraction	CAT#	Basic Group	Artifact	Raw Material	Max Length (cm)	Max Width (cm)	Weight (g)	Description
114	1080N/1056E	0-10		7/31/07-1F	LI-LG	FG	basalt	4.12	3.20	19.38	fragment
114	1086N/1068E	0-20		7/31/07-3	LI-LG	OT	basalt	2.46	1.94	6.69	unidentified frag
114	1078N/1056E	20-30	1/4	7/18/08-2i	LI-LG	PE	basalt	6.98	3.15	92.05	
114	1080N/1056E	0-10		7/31/07-1E	LI-LF	AS	chert	2.18	0.88	1.84	
114	1083N/1055E	0-20	1/4	9/23/07-1	LI-LF	AS	chert	3.11	2.08	16.24	
114	1069N/1070E	0-20	1/4	11/2/07-6B	LI-LF	AS	chert	1.24	0.92	0.63	
114	1078N/1056E	0-20	1/4	7/18/08-1B	LI-LF	AS	chert	2.47	1.91	6.18	
114	1078N/1056E	0-20	1/4	7/18/08-1C	LI-LF	AS	chert	2.50	1.73	7.99	
114	1078N/1056E	0-20	1/4	7/18/08-1D	LI-LF	AS	chert	2.07	1.74	3.81	
114	1078N/1056E	0-20	1/4	7/18/08-1E	LI-LF	AS	chert	1.64	1.36	2.86	
114	1080N/1056E	20-30		8/2/07-1B	LI-LF	AS	chert	5.71	3.67	30.96	
114	1078N/1056E	20-30	1/4	7/18/08-2C	LI-LF	AS	chert	1.51	0.90	0.48	
114	1078N/1056E	20-30	1/4	7/18/08-2D	LI-LF	AS	chert	2.82	2.50	9.52	
114	1070N/1057E	20-40	1/4	11/2/07-5B	LI-LF	AS	chert	1.18	1.08	0.49	
114	1078N/1056E	30-40	1/4	7/19/08-1B	LI-LF	AS	chert	1.73	1.14	2.72	
114	1078N/1056E	40-50	1/4	7/19/08-2C	LI-LF	AS	chert	2.23	2.75	12.63	
114	1086N/1051E	40-60	1/4	9/21/07-2	LI-LF	AS	chert	3.85	2.09	17.47	
114	1083N/1049E	40-60	1/4	9/21/07-4B	LI-LF	AS	chert	2.00	1.00	0.43	
114	1078N/1056E	50-60	1/4	7/21/08-1A	LI-LF	AS	chert	1.64	0.83	0.99	
114	1078N/1056E	50-60	1/4	7/21/08-1B	LI-LF	AS	chert	1.23	0.78	0.19	
114	1078N/1066E	60-80	1/4	9/28/07-1	LI-LF	AS	chert	2.66	1.36	4.34	
114	1086N/1051E	80-100	1/8	9/21/07-2	LI-LF	AS	chert	1.18	0.42	0.16	
114	1078N/1066E	80-100	1/8	9/28/07-1	LI-LF	AS	chert	1.40	0.36	0.16	
114	1083N/1060E	surface		7/26/07-15	LI-LF	AS	chert	1.98	1.45	3.23	
114	1076N/1050E	surface		7/26/07-19B	LI-LF	AS	chert	3.52	2.25	4.65	
114	1076N/1050E	surface		7/26/07-19C	LI-LF	AS	chert	2.34	1.70	2.65	
114	1076N/1050E	surface		7/26/07-19D	LI-LF	AS	chert	1.57	1.39	2.58	
114	1076N/1050E	surface		7/26/07-19E	LI-LF	AS	chert	1.76	1.65	1.73	
114	1073N/1049E	surface		7/27/07-1A	LI-LF	AS	chert	1.70	1.44	2.19	
114	1071N/1057E	surface		7/27/07-3	LI-LF	AS	chert	3.50	1.84	13.02	
114	1075N/1063E	surface		7/27/07-4B	LI-LF	AS	chert	1.65	1.09	2.85	
114	1086N/1048E	0-20	1/4	9/21/07-3	LI-LF	BTF	chert	1.36	1.44	0.26	

Site (MRN-)	Unit	Depth (cm)	Fraction	CAT#	Basic Group	Artifact	Raw Material	Max Length (cm)	Max Width (cm)	Weight (g)	Description
114	1078N/1056E	50-60	>1/8	7/21/08-2B	LI-LF	BTF	chert	0.31	0.53	0.00	
114	1073N/1049E	surface		7/27/07-1B	LI-LF	BTF	chert	0.85	0.84	0.11	
114	1075N/1063E	surface		7/27/07-4C	LI-LF	BTF	chert	0.80	1.20	0.13	
114	1080N/1056E	20-30		8/2/07-1A	LI-LF	CORE	chert	3.18	2.19	33.81	multidirectional
114	1074N/1048E	80-100	1/4	9/29/07-1	LI-LF	CORE	chert	3.52	2.08	12.92	multidirectional
114	1085N/1047E	surface		7/26/07-13B	LI-LF	CORE	chert	3.07	2.62	22.74	multidirectional
114	1078N/1056E	40-50	1/4	7/19/08-2A	LI-LF	CT	chert	2.71	2.31	5.42	unimarginal reduction with additional flake removal
114	1085N/1047E	surface		7/26/07-13A	LI-LF	CT	chert	3.74	3.12	16.98	multidirectional reduction; unimarginal retouch
114	1080N/1056E	0-10		7/31/07-1D	LI-LF	FT	chert	1.81	2.55	2.42	two platforms (second platform 1.08 x 0.38 cm; midline = 0.57 cm)
114	1083N/1049E	0-20	1/4	9/21/07-4	LI-LF	FT	chert	1.82	1.75	1.75	
114	1069N/1070E	0-20	1/4	11/2/07-6A	LI-LF	FT	chert	3.79	4.51	20.68	
114	1078N/1056E	0-20	1/4	7/18/08-1A	LI-LF	FT	chert	2.35	2.77	2.90	
114	1080N/1056E	20-30		8/2/07-1C	LI-LF	FT	chert	1.03	0.89	0.41	
114	1078N/1056E	20-30	1/4	7/18/08-2A	LI-LF	FT	chert	3.37	3.20	15.51	
114	1078N/1056E	20-30	1/4	7/18/08-2B	LI-LF	FT	chert	1.34	2.40	1.25	
114	1083N/1055E	20-40	1/4	9/23/07-1	LI-LF	FT	chert	1.35	1.48	0.72	dorsal channel down midline
114	1078N/1056E	30-40	1/4	7/19/08-1A	LI-LF	FT	chert	4.41	3.50	22.09	
114	1078N/1056E	40-50	1/4	7/19/08-2B	LI-LF	FT	chert	2.09	1.33	1.35	
114	1083N/1049E	40-60	1/4	9/21/07-4A	LI-LF	FT	chert	2.97	1.92	6.55	unimarginal edge modification
114	1083N/1057E	40-60	1/4	9/23/07-2	LI-LF	FT	chert	3.81	3.49	10.98	
114	1086N/1061E	60-80	1/2	8/1/07-2	LI-LF	FT	chert	2.47	2.12	2.74	
114	1086N/1051E	60-80	1/4	9/21/07-2	LI-LF	FT	chert	2.33	1.39	1.33	
114	1082N/1066E	80-100	1/4	9/27/07-2	LI-LF	FT	chert	1.60	2.07	1.11	

Site (MRN-)	Unit	Depth (cm)	Fraction	CAT#	Basic Group	Artifact	Raw Material	Max Length (cm)	Max Width (cm)	Weight (g)	Description
114	1079.812N/1060.556E/996.567Z	surface		2/2/07-1	LI-LF	FT	chert	5.32	4.99	33.47	
114	1067N/1054E	surface		7/27/07-7	LI-LF	FT	chert	4.90	3.36	21.16	bimarginal edge modification
114	1069N/1064E	surface		7/27/07-9	LI-LF	FT	chert	2.74	1.54	1.79	
114	1082N/1066E	20-40	1/4	9/27/07-2	LI-LO		chert	1.22	0.72	1.22	chert nodule; no evidence of fracture
114	1080N/1056E	0-10		7/31/07-1B	LI-LF	AS	obsidian	0.73	0.32	0.04	
114	1078N/1049E	0-20	1/8	9/28/07-5A	LI-LF	AS	obsidian	0.64	0.50	0.16	
114	1078N/1049E	0-20	1/8	9/28/07-5B	LI-LF	AS	obsidian	0.82	0.49	0.15	
114	1078N/1049E	0-20	1/8	9/28/07-5C	LI-LF	AS	obsidian	0.56	0.47	0.09	
114	1078N/1056E	50-60	>1/8	7/21/08-2A	LI-LF	AS	obsidian	0.70	0.47	0.09	
114	1070N/1057E	20-40	1/8	11/2/07-5A	LI-LF	BTF	obsidian	0.67	0.41	0.00	
114	1078N/1056E	50-60	1/16-1/8	7/21/08-2C	LI-LF	BTF	obsidian	0.25	0.06	0.00	
114	1076N/1050E	surface		7/26/07-19A	LI-LF	BTF	obsidian	0.72	0.99	0.12	
114	1080N/1056E	0-10		7/31/07-1A	LI-LF	FT	obsidian	2.76	3.18	3.12	
114	1088N/1064E	0-20	1/2	7/31/07-4	LI-LF	FT	obsidian	3.33	3.98	5.31	
114	1078N/1056E	30-40	1/4	7/19/08-1	LI-LF	FT	obsidian	3.91	2.00	6.81	possible projectile point preform
114	1075N/1063E	surface		7/27/07-4A	LI-LF	FT	obsidian	1.16	0.63	0.13	
114	1078N/1056E	20-30	1/4	7/18/08-2F	LI-LF	AS	other	3.22	0.48	1.16	
114	1078N/1056E	20-30	1/4	7/18/08-2G	LI-LF	AS	other	1.48	0.91	0.34	
114	1078N/1056E	20-30	1/4	7/18/08-2H	LI-LF	AS	other	2.21	1.15	2.16	
114	1069N/1070E	20-40	1/4	11/2/07-6	LI-LF	AS	other	1.40	1.12	0.54	
114	1078N/1056E	40-50	1/4	7/19/08-2D	LI-LF	AS	other	3.81	2.00	3.21	
114	1078N/1056E	50-60	1/4	7/21/08-1D	LI-LF	AS	other	2.06	1.65	0.77	
114	1078N/1056E	50-60	1/4	7/21/08-1E	LI-LF	AS	other	1.64	1.42	0.80	
114	1078N/1056E	20-30	1/4	7/18/08-2E	LI-LF	BI	other	5.98	6.32	131.99	
114	1080N/1056E	0-10		7/31/07-1C	LI-LF	FT	other	1.88	1.65	1.25	
114	1078N/1056E	30-40	1/4	7/19/08-1C	LI-LF	FT	other	2.19	2.17	2.70	axe head shape
114	1086N/1048E	40-60	1/4	9/21/07-3	LI-LF	FT	other	1.54	2.27	1.10	
114	1078N/1056E	50-60	1/4	7/21/08-1C	LI-LF	FT	other	3.72	3.47	8.71	thermally altered

Site (MRN-)	Unit	Depth (cm)	Fraction	CAT#	Basic Group	Artifact	Raw Material	Max Length (cm)	Max Width (cm)	Weight (g)	Description
114	1078N/1063E	surface		7/26/07-22	LI-LF	FT	other	2.94	2.22	4.61	
114	1080N/1056E	20-30		8/2/07-1D	LI-LG	OT	sandstone	2.85	1.95	7.79	unidentified object
114	1078N/1056E	20-30	1/4	7/18/08-2J	LI-LG	OT	steatite	2.13	2.03	7.37	one polished U-shaped end and one broken end
114	1078N/1056E	30-40	1/4	7/19/08-1D	LI-LG	OT	steatite	2.57	1.77	6.32	nodule
115	1006N/1040E	surface		7/17/07-9C	LI-LG	FG	basalt	5.51	4.62	122.23	fragment
115	1013N/1044E	surface		7/18/07-2	LI-LG	FG	basalt	3.27	3.24	6.46	fragment
115	1032N/1041E	surface		7/19/07-3A	LI-LG	FG	basalt	7.32	5.26	84.42	fragment
115	1034N/1052E	surface		7/19/07-1	LI-LG	FG	basalt	8.04	4.55	88.48	fragment
115	Pit 1S	20 in		1-127950	LI-LG	MH	basalt	9.74	7.84	539.70	bifacially ground surface; or, hammerstone/ pestle w/ chipping on proximal and distal ends
115	Pit A-1	6 in		1-127858	LI-LG	MH	basalt	9.10	6.41	348.72	rough surface w/ chipping at distal portion and rough break at base
115	1032N/1041E	surface		7/19/07-3B	LI-LG	MH	basalt	6.72	4.88	154.71	
115	1032N/1041E	surface		7/19/07-3C	LI-LG	MH	basalt	8.30	7.98	312.37	soot present
115				1-127875	LI-LG	MOF	basalt	14.28	13.65	581.80	vesicular basalt; ca. triangular w/out points, curved, and possibly fire-affected
115	1033N/1039E	surface		7/19/07-4A	LI-LG	OT	basalt	8.32	5.55	283.59	unidentifiable frag
115	1033N/1039E	surface		7/19/07-4B	LI-LG	OT	basalt	4.91	3.51	50.60	unidentifiable frag
115	Pit C-3	41 in		1-127896	LI-LG	PEF	basalt	12.24	6.31	752.90	minimal chipping
115	Trench C	95 in		1-127879	LI-LG	PEF	basalt	6.12	5.67	259.41	fire-affected; one side worn flat; 2 perpendicular grooves of 1.5 cm
115	1008N/1027E	surface		7/17/07-12	LI-LF	AS	chert	2.65	1.95	7.03	

Site (MRN-)	Unit	Depth (cm)	Fraction	CAT#	Basic Group	Artifact	Raw Material	Max Length (cm)	Max Width (cm)	Weight (g)	Description
115	1008N/1032E	surface		7/17/07-11	LI-LF	AS	chert	1.94	1.78	3.40	
115	1006N/1040E	surface		7/17/07-9B	LI-LF	AS	chert	1.63	0.80	0.33	
115	1007N/1046E	surface		7/17/07-8	LI-LF	AS	chert	2.03	1.38	2.27	
115	1003N/1028E	surface		7/17/07-6	LI-LF	AS	chert	2.95	2.25	13.96	
115	1004N/1033E	surface		7/17/07-5A	LI-LF	AS	chert	4.16	2.00	18.81	
115	1004N/1033E	surface		7/17/07-5B	LI-LF	AS	chert	2.96	2.21	14.60	
115	1004N/1033E	surface		7/17/07-5C	LI-LF	AS	chert	2.50	2.41	10.05	
115	1004N/1033E	surface		7/17/07-5D	LI-LF	AS	chert	1.91	1.60	2.60	
115	1001N/1048E	surface		7/17/07-4B	LI-LF	AS	chert	2.77	2.23	8.31	
115	1001N/1048E	surface		7/17/07-4C	LI-LF	AS	chert	3.48	1.53	5.63	
115	1001N/1048E	surface		7/17/07-4D	LI-LF	AS	chert	1.46	1.00	1.38	
115	1027N/1026E	surface		7/18/07-23	LI-LF	AS	chert	0.77	0.70	0.33	
115	1020N/1025E	surface		7/18/07-17	LI-LF	AS	chert	2.72	1.29	6.19	
115	1036N/1026E	surface		7/19/07-14B	LI-LF	AS	chert	2.65	2.05	4.64	
115	1037N/1030E	surface		7/19/07-13A	LI-LF	AS	chert	1.69	0.86	0.99	
115	1037N/1030E	surface		7/19/07-13B	LI-LF	AS	chert	1.41	0.84	0.95	
115	1036N/1037E	surface		7/19/07-11	LI-LF	AS	chert	1.42	0.66	0.42	
115	1038N/1043E	surface		7/19/07-9B	LI-LF	AS	chert	3.76	3.06	51.54	
115	1038N/1043E	surface		7/19/07-9C	LI-LF	AS	chert	5.38	4.10	137.34	
115	1040N/1030E	surface		7/20/07-3	LI-LF	AS	chert	3.65	1.96	5.67	
115				1-127925	LI-LF	AS	chert	2.50	3.58	6.75	
115	Pit C-2	67 in		1-127955	LI-LF	CORE	chert	5.35	3.89	98.76	multidirectional
115	Pit C-3	90 in		1-127954	LI-LF	CORE	chert	5.42	4.97	46.15	multidirectional
115	1012N/1028E	surface		7/18/07-5C	LI-LF	CORE	chert	3.47	3.64	30.89	multidirectional
115	1036N/1026E	surface		7/19/07-14D	LI-LF	CORE	chert	4.36	3.08	24.23	multidirectional
115	1036N/1051E	surface		7/19/07-7	LI-LF	CORE	chert	4.40	5.34	121.08	multidirectional
115	1042N/1038E	surface		7/20/07-2	LI-LF	CORE	chert	3.47	2.91	18.82	multidirectional
115	Pit C-2	41 in		1-127951	LI-LF	CT	chert	2.70	2.18	5.42	unimarginal edge modification
115				1-127934	LI-LF	CT	chert	3.87	2.84	17.81	unimarginal retouch
115				1-127947	LI-LF	CT	chert	5.17	4.39	82.26	unimarginal edge modification

Site (MRN-)	Unit	Depth (cm)	Fraction	CAT#	Basic Group	Artifact	Raw Material	Max Length (cm)	Max Width (cm)	Weight (g)	Description
115		surface		1-127848	LI-LF	FT	chert	3.02	2.13	3.77	bimarginal edge modification
115	1006N/1040E	surface		7/17/07-9A	LI-LF	FT	chert	2.80	4.37	10.79	
115	1003N/1039E	surface		7/17/07-1A	LI-LF	FT	chert	2.93	2.91	6.80	
115	1036N/1026E	surface		7/19/07-14A	LI-LF	FT	chert	3.24	2.05	4.51	
115	1036N/1026E	surface		7/19/07-14C	LI-LF	FT	chert	3.15	2.94	11.95	
115				1-127838	LI-LF	FT	chert	3.87	3.48	13.52	edge modification
115				1-127859	LI-LF	FT	chert	3.95	3.38	24.38	bimarginal edge modification
115				1-127865	LI-LF	FT	chert	3.63	3.08	20.32	
115				1-127866	LI-LF	FT	chert	2.55	3.84	8.13	unimarginal edge modification
115				1-127877	LI-LF	FT	chert	4.57	2.90	10.15	unimarginal edge modification; thermal alteration
115				1-127895	LI-LF	FT	chert	3.82	3.73	32.17	
115				1-127899	LI-LF	FT	chert	3.79	4.10	14.65	unimarginal edge modification
115				1-127958	LI-LF	FT	chert	2.59	4.13	8.36	unimarginal edge modification
115				1-127959A	LI-LF	FT	chert	3.05	2.88	8.57	unimarginal edge modification
115				1-127959B	LI-LF	FT	chert	4.78	3.67	29.53	unimarginal edge modification
115				1-127964	LI-LF	FT	chert	5.47	4.77	24.73	
115				1-127965	LI-LF	FT	chert	4.08	4.32	23.48	
115				1-98005	LI-LF	FT	chert	4.31	3.75	12.32	
115				1-98006	LI-LF	FT	chert	3.00	2.55	5.11	
115	Pit C-1	96 in		1-127869	LI-LG	CH	granite	6.20		78.97	
115				1-127850	LI-LO		mica			4.58 w/ bag	Mica frags
115	Pit C-3	41 in		1-127872	LI-LF	BI	obsidian	7.20	2.60	20.93	serrated "saw or blade" (Meighan 1953:12)

Site (MRN-)	Unit	Depth (cm)	Fraction	CAT#	Basic Group	Artifact	Raw Material	Max Length (cm)	Max Width (cm)	Weight (g)	Description
115	Pit C-3	72 in		1-127860	LI-LF	BI	obsidian	6.32	1.61	8.72	cortex at proximal end
115	Pit C-3	82 in		1-127861	LI-LF	BI	obsidian	8.13	2.19	14.16	serrated
115	Pit A-3	9 in		1-127864	LI-LF	BI	obsidian	3.41	1.41	1.23	missing barb; possible retouch w/ unfinished corner notched; hafted
115	Pit D-1	90 in		1-127918	LI-LF	BI	obsidian	7.89	2.16	16.19	incomplete
115		backdirt		1-127852	LI-LF	BI	obsidian	1.08	1.50	0.59	"drill" (Meighan 1953); basal notched; ventral side worked, dorsal side polished; hafted
115	1038N/1043E	surface		7/19/07-9A	LI-LF	BI	obsidian	4.51	2.39	7.10	
115				1-127863	LI-LF	BI	obsidian	2.22	1.53	1.45	corner notched; serrated and missing distal end; appears unfinished; hafted
115				1-98007	LI-LF	BI	obsidian	6.79	2.25	11.72	
115	Pit 1S	3 in		1-127857	LI-LF	CORE	obsidian	3.58	2.71	25.35	bipolar reduction (multidirectional);
115	Pit C-2	81 in		1-127867	LI-LF	FT	obsidian	4.05	2.63	6.68	bimarginal edge modification on two sides
115				1-127876	LI-LF	FT	obsidian	3.54	2.90	12.48	possible projectile point preform with some bimarginal edge modification
115	1012N/1028E	surface		7/18/07-5B	LI-LF	AS	other	2.83	1.72	1.93	
115	1001N/1048E	surface		7/17/07-4A	LI-LF	FT	other	4.65	2.75	12.57	
115	1012N/1028E	surface		7/18/07-5A	LI-LF	FT	other	3.32	2.44	5.57	
115				1-127853	LI-LO		red ochre	2.51	1.90	4.07	nodule
115	Pit 1N	21 in		1-98010	LI-LG	OT	sandstone	7.05	5.11	31.28	

Site (MRN-)	Unit	Depth (cm)	Fraction	CAT#	Basic Group	Artifact	Raw Material	Max Length (cm)	Max Width (cm)	Weight (g)	Description
115	1003N/1039E	surface		7/17/07-1B	LI-LG	OT	sandstone	2.26	1.61	8.26	unidentified frag
115	Pit C-3	80 in		1-127880	LI-LG	CH	steatite	9.17		102.58	asphaltum present
115		backdirt		1-127891	LI-LG	OT	steatite	2.92	2.12	5.81	Steatite "labret" (Meighan 1953)
328	972N/986E	surface		7/25/07-3	LI-LG	FG	basalt	5.22	4.86	79.05	
328	962N/990E	surface		7/24/07-9B	LI-LG	MHF	basalt	7.12	5.86	245.65	
328	970N/979E	surface		7/25/07-1B	LI-LG	OT	basalt	2.36	1.94	7.11	unidentified frag
328	975N/995E	surface		7/25/07-10	LI-LG	OT	basalt	2.89	2.35	8.85	unidentified frag
328	979N/1002E	surface		7/26/07-1	LI-LG	OT	basalt	3.72	2.27	22.71	unidentified frag
328	983.3N/995.6E	20-40	1/4	6/22/07-1A	LI-LF	AS	chert	2.00	1.62	2.31	
328	959N/983E	20-40	1/4	7/17/08-5A	LI-LF	AS	chert	1.83	1.41	3.50	
328	959N/983E	20-40	1/4	7/17/08-5B	LI-LF	AS	chert	1.81	1.53	2.25	
328	982N/996E	60-80	1/4	7/9/08-3	LI-LF	AS	chert	1.67	1.58	1.94	
328	985N/993E	80-100	1/4	7/9/08-1	LI-LF	AS	chert	2.03	1.67	1.63	
328	957N/977E	surface		7/24/07-1B	LI-LF	AS	chert	2.48	2.44	10.70	
328	958N/989E	surface		7/24/07-3B	LI-LF	AS	chert	1.59	1.06	2.19	
328	958N/989E	surface		7/24/07-3C	LI-LF	AS	chert	2.00	1.21	1.76	
328	963N/978E	surface		7/24/07-6	LI-LF	AS	chert	1.63	0.62	0.83	
328	965N/997E	surface		7/24/07-15A	LI-LF	AS	chert	2.48	1.83	9.96	
328	965N/997E	surface		7/24/07-15B	LI-LF	AS	chert	2.37	1.61	3.32	
328	970N/979E	surface		7/25/07-1A	LI-LF	AS	chert	3.92	2.26	12.14	
328	974N/994E	surface		7/25/07-4A	LI-LF	AS	chert	2.59	1.43	4.35	
328	989N/1004E	surface		7/26/07-5	LI-LF	AS	chert	3.35	1.93	6.05	
328	985N/998E	surface		7/26/07-6	LI-LF	AS	chert	3.37	1.88	3.88	
328	985N/984E	surface		7/26/07-7A	LI-LF	AS	chert	3.94	1.94	26.13	
328	985N/984E	surface		7/26/07-7B	LI-LF	AS	chert	2.37	1.65	4.19	
328	985N/984E	surface		7/26/07-7C	LI-LF	AS	chert	2.15	1.18	1.55	
328		surface		7/7/08-1	LI-LF	AS	chert	2.97	2.27	18.16	
328		surface		7/7/08-6	LI-LF	AS	chert	2.78	1.96	6.25	
328	972N/1001E	surface		7/25/07-6B	LI-LF	BTF	chert	0.95	1.07	0.32	
328	969N/977E	surface		7/24/07-11	LI-LF	CORE	chert	2.39	2.07	8.67	multidirectional
328	957N/977E	surface		7/24/07-1A	LI-LF	CT	chert	5.88	4.10	30.72	unimarginal retouch

Site (MRN-)	Unit	Depth (cm)	Fraction	CAT#	Basic Group	Artifact	Raw Material	Max Length (cm)	Max Width (cm)	Weight (g)	Description
328	971N/985E	0-20	1/4	7/16/08-3	LI-LF	FT	chert	1.17	1.45	0.89	
328	959N/997E	20-40	1/4	7/14/08-4	LI-LF	FT	chert	2.15	1.85	1.70	
328	963N/993E	40-60	1/4	7/15/08-1B	LI-LF	FT	chert	2.14	1.81	2.70	unimarginal retouch
328	961.264N/981.954E/1005.002Z	surface		1/29/07-1	LI-LF	FT	chert	6.62	4.59	46.10	unimarginal retouch
328	958N/989E	surface		7/24/07-3A	LI-LF	FT	chert	2.60	1.81	1.98	
328	962N/990E	surface		7/24/07-9A	LI-LF	FT	chert	1.90	1.93	3.35	unimarginal retouch
328	972N/999E	surface		7/25/07-5	LI-LF	FT	chert	3.82	5.03	13.40	bimarginal reduction
328	972N/1001E	surface		7/25/07-6A	LI-LF	FT	chert	3.12	4.05	16.96	multiple dorsal flake scars and dorsal cortex
328	957N/977E	surface		7/24/07-1C	LI-LO		chert	2.30	1.81	3.97	nodule
328	968N/978E	0-20	1/4	7/17/08-1	LI-LF	BI	obsidian	3.27	1.29	2.10	serrated and side-notched (hafted); Stockton Notched Leaf Type
328	959N/998E	surface		7/24/07-5	LI-LF	BI	obsidian	3.88	1.68	3.23	side-notched (hafted); convex base; cortex on ventral and dorsal side
328	982N/996E	0-20	1/8	7/9/08-3	LI-LF	BTF	obsidian	0.51	0.66	0.05	
328	972N/979E	0-20	1/8	7/16/08-2	LI-LF	BTF	obsidian	0.43	0.38	0.01	
328	982N/991E	40-60	1/8	7/9/08-4	LI-LF	BTF	obsidian	0.80	0.51	0.04	
328	978N/996E	60-80	1/8	7/9/08-5	LI-LF	BTF	obsidian	0.52	0.45	0.03	
328	971N/992E	60-80	1/8	7/11/08-1	LI-LF	BTF	obsidian	0.43	0.41	0.01	
328	969N/989E	60-80	1/8	7/15/08-2	LI-LF	BTF	obsidian	0.51	0.51	0.04	
328	969N/994E	20-40	1/4	7/14/08-3	LI-LF	CORE	obsidian	2.37	2.09	8.31	multidirectional
328	963N/993E	40-60	1/4	7/15/08-1A	LI-LF	FT	obsidian	1.68	0.83	0.31	platform modified to serrated edge; bimarginal edge modification
328	972N/979E	40-60	1/4	7/16/08-2A	LI-LF	FT	obsidian	1.23	1.11	0.20	

Site (MRN-)	Unit	Depth (cm)	Fraction	CAT#	Basic Group	Artifact	Raw Material	Max Length (cm)	Max Width (cm)	Weight (g)	Description
328	982N/996E	0-20	1/4	7/9/08-3	LI-LF	AS	other	2.48	1.32	1.42	
328	958N/979E	0-20	1/4	7/17/08-4	LI-LF	AS	other	1.11	1.12	0.22	
328	983.3N/995.6E	20-40	1/4	6/22/07-1C	LI-LF	AS	other	2.60	2.62	12.99	
328	978N/996E	20-40	1/4	7/9/08-5	LI-LF	AS	other	1.34	0.84	0.52	
328	969N/989E	20-40	1/4	7/15/08-2	LI-LF	AS	other	1.16	1.05	0.30	
328	972N/979E	20-40	1/4	7/16/08-2	LI-LF	AS	other	3.10	2.80	8.20	
328	967N/981E	20-40	1/4	7/16/08-4	LI-LF	AS	other	2.30	1.38	1.20	
328	964N/976E	20-40	1/4	7/17/08-2A	LI-LF	AS	other	2.28	1.68	1.25	
328	964N/976E	20-40	1/4	7/17/08-2B	LI-LF	AS	other	1.71	0.75	0.61	
328	978N/996E	40-60	1/4	7/9/08-5A	LI-LF	AS	other	3.45	2.53	4.93	
328	978N/996E	40-60	1/4	7/9/08-5B	LI-LF	AS	other	1.64	1.52	0.91	
328	963N/993E	40-60	1/4	7/15/08-1C	LI-LF	AS	other	2.06	1.54	0.94	
328	963N/993E	40-60	1/4	7/15/08-1D	LI-LF	AS	other	1.51	1.09	0.26	
328	985N/993E	60-80	1/8	7/9/08-1	LI-LF	AS	other	0.92	0.54	0.14	
328	982N/996E	60-80	1/4	7/9/08-3A	LI-LF	AS	other	1.94	2.14	1.45	
328	982N/996E	60-80	1/4	7/9/08-3B	LI-LF	AS	other	2.50	2.00	2.68	
328	968N/1001E	60-80	1/4	7/14/08-1A	LI-LF	AS	other	2.18	1.38	1.31	
328	968N/1001E	60-80	1/8	7/14/08-1B	LI-LF	AS	other	1.20	0.71	0.17	
328	972N/979E	60-80	1/4	7/16/08-2A	LI-LF	AS	other	4.41	2.62	14.43	
328	972N/979E	60-80	1/4	7/16/08-2B	LI-LF	AS	other	3.67	2.37	7.89	
328	972N/979E	60-80	1/4	7/16/08-2C	LI-LF	AS	other	3.92	2.23	5.09	
328	972N/979E	60-80	1/4	7/16/08-2D	LI-LF	AS	other	1.50	1.02	0.29	
328	957N/977E	surface		7/24/07-1E	LI-LF	AS	other	3.48	2.22	8.77	
328	957N/977E	surface		7/24/07-1F	LI-LF	AS	other	2.91	1.56	5.13	
328	957N/977E	surface		7/24/07-1G	LI-LF	AS	other	1.70	1.27	0.87	
328	955N/983E	surface		7/24/07-2	LI-LF	AS	other	2.61	1.92	4.78	
328	974N/994E	surface		7/25/07-4C	LI-LF	AS	other	3.85	3.79	22.75	
328	974N/994E	surface		7/25/07-4D	LI-LF	AS	other	2.83	2.49	14.12	
328		surface		7/7/08-4	LI-LF	AS	other	4.04	3.21	14.74	
328		surface		7/7/08-5	LI-LF	AS	other	3.78	2.68	11.79	
328		surface		7/7/08-11	LI-LF	AS	other	3.76	2.36	3.96	

Site (MRN-)	Unit	Depth (cm)	Fraction	CAT#	Basic Group	Artifact	Raw Material	Max Length (cm)	Max Width (cm)	Weight (g)	Description
328		surface		7/7/08-12	LI-LF	AS	other	2.35	2.50	3.96	
328		surface		7/7/08-13	LI-LF	AS	other	4.28	1.63	4.11	
328		surface		7/7/08-15	LI-LF	AS	other	3.20	2.32	21.72	
328	979.494N/985.196E/1002.060Z	surface		7/8/08-2	LI-LF	AS	other	5.61	3.74	14.80	
328	983.3N/995.6E	20-40	1/4	6/22/07-1B	LI-LF	FT	other	2.34	3.00	3.89	
328	968N/978E	40-60	1/8	7/17/08-1	LI-LF	FT	other	1.74	0.71	0.41	
328	957N/977E	surface		7/24/07-1D	LI-LF	FT	other	1.83	1.51	0.64	
328	969N/990E	surface		7/24/07-14	LI-LF	FT	other	1.92	2.81	3.92	
328	974N/994E	surface		7/25/07-4B	LI-LF	FT	other	6.86	3.57	58.16	
328		surface		7/7/08-10	LI-LF	FT	other	3.02	3.40	5.05	
328		surface		7/7/08-14	LI-LF	FT	other	1.92	1.55	1.26	
328		surface		7/7/08-16	LI-LF	FT	other	3.70	4.15	13.46	
328		surface		7/7/08-17	LI-LF	FT	other	2.33	3.05	4.43	
328	968N/978E	60-80	1/4	7/17/08-1	LI-LG	OT	other	1.98	0.73	0.44	unidentified frag
328	969N/987E	surface		7/24/07-13A	LI-LG	OT	other	5.47	4.39	77.58	unidentified frag
328	969N/987E	surface		7/24/07-13B	LI-LG	OT	other	3.18	3.02	32.71	unidentified frag
328	969N/987E	surface		7/24/07-13C	LI-LG	OT	other	2.80	2.13	11.32	unidentified frag
328	969N/987E	surface		7/24/07-13D	LI-LG	OT	other	3.18	1.61	10.18	unidentified frag
328	969N/987E	surface		7/24/07-13E	LI-LG	OT	other	2.87	1.61	6.97	unidentified frag
328	972N/1001E	surface		7/25/07-6C	LI-LG	OT	sandstone	3.15	2.01	12.68	unidentified object
328	972N/979E	40-60	1/4	7/16/08-2B	LI-LG	OT	steatite	3.40	2.14	13.87	pipe frag; bowl and drill start present

Appendix D

Obsidian Hydration Report

ORIGER'S OBSIDIAN LABORATORY
P.O. BOX 1531
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ORIGER@ORIGER.COM

October 3, 2009

Tsim Schneider
1520A Bancroft Way
Berkeley, California 94703

Dear Tsim:

I write to report the results of obsidian hydration band analysis of eight specimens from sites CA-MRN-114 (n=4), CA-MRN-115 (n=1), and CA-MRN-328 (n=3) within China Camp State Park, Marin County, California. No attempt was made on two other specimens because their surfaces were weathered, and highly unlikely to yield hydration band measurements. This work was completed as requested in your letter dated September 11, 2009.

Procedures typically used by our lab for preparation of thin sections and measurement of hydration bands are described here. Specimens are examined to find two or more surfaces that will yield edges that will be perpendicular to the microslides when preparation of each thin section is done. Generally, two parallel cuts are made at an appropriate location along the edge of each specimen with a four-inch diameter circular saw blade mounted on a lapidary trimsaw. The cuts result in the isolation of small samples with a thickness of about one millimeter. The samples are removed from the specimens and mounted with Lakeside Cement onto etched glass micro-slides.

The thickness of each sample was reduced by manual grinding with a slurry of #600 silicon carbide abrasive on plate glass. Grinding was completed in two steps. The first grinding is stopped when each sample's thickness is reduced by approximately one-half. This eliminates micro-flake scars created by the saw blade during the cutting process. Each slide is then reheated, which liquefies the Lakeside Cement, and the samples are inverted. The newly exposed surfaces are then ground until proper thickness is attained.

Correct thin section thickness is determined by the "touch" technique. A finger is rubbed across the slide, onto the sample, and the difference (sample thickness) is "felt." The second technique used to arrive at proper thin section thickness is the "transparency" test where the micro-slide is held up to a strong source of light and the translucency of each sample is observed. The samples are reduced enough when it readily allows the passage of light. A cover glass is affixed over each sample when grinding is completed. The slides and paperwork are on file under File No. OOL-463.

The hydration bands are measured with a strainfree 60-power objective and a Bausch and Lomb 12.5-power filar micrometer eyepiece mounted on a Nikon Labophot-Pol polarizing microscope. Hydration band measurements have a range of +/- 0.2 microns due to normal equipment limitations.

Six measurements are taken at several locations along the edge of each thin section, and the mean of the measurements is calculated and listed on the enclosed data page. Only three of the eight specimens were marked by hydration bands. The following table provides information about the analyzed specimens.

Table 1. China Camp State Park hydration results

Slide No.	Specimen No.	Hydration Mean	Source	Date (years before present)
1	1076N 1050E	No visible band	Annadel	
2	1075N 1063E	1.2 microns	Napa Valley	ca. 221
3	1088N 1064E	1.4 microns	Annadel	ca. 503
4	1078N 1056E	No visible band	Annadel	
5	1038N 1043E	No visible band	Napa Valley	
6	968N 978E	No visible band	Annadel	
7	~~969N~~ 998E /959N	No visible band	Annadel	
8	969N 994E	0.9 microns	Napa Valley	ca. 124

Unfortunately, most specimens failed to be marked by hydration bands. It appears that some may have been exposed to fire, and the heat caused the loss of measureable hydration bands.

Please don't hesitate to contact me if you have questions regarding this hydration work.

Sincerely,

Thomas M. Origer
Director

Appendix E

AMS Radiocarbon Dating Report

BETA
BETA ANALYTIC INC.
DR. M.A. TAMERS and MR. D.G. HOOD
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MIAMI, FLORIDA, USA 33155
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beta@radiocarbon.com

REPORT OF RADIOCARBON DATING ANALYSES

Mr. Tsim D. Schneider — Report Date: 11/7/2008

University of California, Berkeley — Material Received: 10/17/2008

Sample Data	Measured Radiocarbon Age	13C/12C Ratio	Conventional Radiocarbon Age(*)
Beta - 250547	280 +/- 40 BP	-25.3 o/oo	280 +/- 40 BP

SAMPLE : CCAPMRN11501
ANALYSIS : AMS-Standard delivery
MATERIAL/PRETREATMENT : (charred material): solvent extraction
2 SIGMA CALIBRATION : Cal AD 1490 to 1670 (Cal BP 460 to 280) AND Cal AD 1780 to 1790 (Cal BP 160 to 160)

Sample Data	Measured Radiocarbon Age	13C/12C Ratio	Conventional Radiocarbon Age(*)
Beta - 250548	210 +/- 40 BP	-22.2 o/oo	260 +/- 40 BP

SAMPLE : CCAPMRN11502
ANALYSIS : AMS-Standard delivery
MATERIAL/PRETREATMENT : (wood): solvent extraction
2 SIGMA CALIBRATION : Cal AD 1520 to 1590 (Cal BP 430 to 360) AND Cal AD 1620 to 1670 (Cal BP 330 to 280)
Cal AD 1770 to 1800 (Cal BP 180 to 150) AND Cal AD 1940 to 1950 (Cal BP 10 to 0)

Dates are reported as RCYBP (radiocarbon years before present, "present" = AD 1950). By international convention, the modern reference standard was 95% the 14C activity of the National Institute of Standards and Technology (NIST) Oxalic Acid (SRM 4990C) and calculated using the Libby 14C half-life (5568 years). Quoted errors represent 1 relative standard deviation statistics (68% probability) counting errors based on the combined measurements of the sample, background, and modern reference standards. Measured 13C/12C ratios (delta 13C) were calculated relative to the PDB-1 standard.

The Conventional Radiocarbon Age represents the Measured Radiocarbon Age corrected for isotopic fractionation, calculated using the delta 13C. On rare occasion where the Conventional Radiocarbon Age was calculated using an assumed delta 13C, the ratio and the Conventional Radiocarbon Age will be followed by "*". The Conventional Radiocarbon Age is not calendar calibrated. When available, the Calendar Calibrated result is calculated from the Conventional Radiocarbon Age and is listed as the "Two Sigma Calibrated Result" for each sample.

BETA

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REPORT OF RADIOCARBON DATING ANALYSES

Mr. Tsim D. Schneider — Report Date: 1/27/2009

University of California, Berkeley — Material Received: 1/6/2009

Sample Data	Measured Radiocarbon Age	13C/12C Ratio	Conventional Radiocarbon Age(*)
Beta - 254226	380 +/- 40 BP	-24.7 o/oo	380 +/- 40 BP

SAMPLE : CCAPMRN11401
ANALYSIS : AMS-Standard delivery
MATERIAL/PRETREATMENT : (charred material): acid/alkali/acid
2 SIGMA CALIBRATION : Cal AD 1440 to 1640 (Cal BP 510 to 310)

Sample Data	Measured Radiocarbon Age	13C/12C Ratio	Conventional Radiocarbon Age(*)
Beta - 254227	640 +/- 40 BP	-1.7 o/oo	1020 +/- 40 BP

SAMPLE : CCAPMRN11402
ANALYSIS : AMS-Standard delivery
MATERIAL/PRETREATMENT : (shell): acid etch
2 SIGMA CALIBRATION : Cal AD 1480 to 1680 (Cal BP 470 to 270)

Sample Data	Measured Radiocarbon Age	13C/12C Ratio	Conventional Radiocarbon Age(*)
Beta - 254228	510 +/- 40 BP	-3.1 o/oo	870 +/- 40 BP

SAMPLE : CCAPMRN11403
ANALYSIS : AMS-Standard delivery
MATERIAL/PRETREATMENT : (shell): acid etch
2 SIGMA CALIBRATION : Cal AD 1650 to 1880 (Cal BP 300 to 70)

Sample Data	Measured Radiocarbon Age	13C/12C Ratio	Conventional Radiocarbon Age(*)
Beta - 254229	1520 +/- 40 BP	-3.5 o/oo	1870 +/- 40 BP

SAMPLE : CCAPMRN11404
ANALYSIS : AMS-Standard delivery
MATERIAL/PRETREATMENT : (shell): acid etch
2 SIGMA CALIBRATION : Cal AD 700 to 940 (Cal BP 1240 to 1010)

Sample Data	Measured Radiocarbon Age	13C/12C Ratio	Conventional Radiocarbon Age(*)
Beta - 254230	580 +/- 40 BP	-2.8 o/oo	940 +/- 40 BP

SAMPLE : CCAPMRN32801
ANALYSIS : AMS-Standard delivery
MATERIAL/PRETREATMENT : (shell): acid etch
2 SIGMA CALIBRATION : Cal AD 1540 to 1720 (Cal BP 410 to 220) AND Cal AD 1740 to 1750 (Cal BP 210 to 200)
Cal AD 1790 to 1800 (Cal BP 160 to 150)

Dates are reported as RCYBP (radiocarbon years before present, "present" = AD 1950). By international convention, the modern reference standard was 95% the 14C activity of the National Institute of Standards and Technology (NIST) Oxalic Acid (SRM 4990C) and calculated using the Libby 14C half-life (5568 years). Quoted errors represent 1 relative standard deviation statistics (68% probability) counting errors based on the combined measurements of the sample, background, and modern reference standards. Measured 13C/12C ratios (delta 13C) were calculated relative to the PDB-1 standard.

The Conventional Radiocarbon Age represents the Measured Radiocarbon Age corrected for isotopic fractionation, calculated using the delta 13C. On rare occasion where the Conventional Radiocarbon Age was calculated using an assumed delta 13C, the ratio and the Conventional Radiocarbon Age will be followed by "*". The Conventional Radiocarbon Age is not calendar calibrated. When available, the Calendar Calibrated result is calculated from the Conventional Radiocarbon Age and is listed as the "Two Sigma Calibrated Result" for each sample.

BETA

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REPORT OF RADIOCARBON DATING ANALYSES

Mr. Tsim D. Schneider

Report Date: 1/27/2009

Sample Data	Measured Radiocarbon Age	13C/12C Ratio	Conventional Radiocarbon Age(*)
Beta - 254231	460 +/- 40 BP	0.0 o/oo	870 +/- 40 BP

SAMPLE : CCAPMRN32802
ANALYSIS : AMS-Standard delivery
MATERIAL/PRETREATMENT : (shell): acid etch
2 SIGMA CALIBRATION : Cal AD 1650 to 1880 (Cal BP 300 to 70)

Dates are reported as RCYBP (radiocarbon years before present, "present" = AD 1950). By international convention, the modern reference standard was 95% the 14C activity of the National Institute of Standards and Technology (NIST) Oxalic Acid (SRM 4990C) and calculated using the Libby 14C half-life (5568 years). Quoted errors represent 1 relative standard deviation statistics (68% probability) counting errors based on the combined measurements of the sample, background, and modern reference standards. Measured 13C/12C ratios (delta 13C) were calculated relative to the PDB-1 standard.

The Conventional Radiocarbon Age represents the Measured Radiocarbon Age corrected for isotopic fractionation, calculated using the delta 13C. On rare occasion where the Conventional Radiocarbon Age was calculated using an assumed delta 13C, the ratio and the Conventional Radiocarbon Age will be followed by "*". The Conventional Radiocarbon Age is not calendar calibrated. When available, the Calendar Calibrated result is calculated from the Conventional Radiocarbon Age and is listed as the "Two Sigma Calibrated Result" for each sample.