ARCHAEOLOGY OF THE DIABLO RANGE: INVESTIGATIONS AT THE ARROYO BLANCO RANCHERIA (CA-FRE-1331) FRESNO COUNTY, CALIFORNIA

by

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A thesis submitted to the Master of Arts Graduate Program in Anthropology at California State University, Bakersfield, in partial fulfillment of the requirements for the degree of

MASTER OF ARTS
in
ANTHROPOLOGY

Bakersfield, California
2006

TO THE OFFICE OF MASTER OF ARTS GRADUATE PROGRAM IN ANTHROPOLOGY:

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Frontispiece: Overview of Arroyo Blanco Rancheria (CA-FRE-1331), looking southeast. The flat, oak-studded area in the approximate center of the photograph is interpreted as the primary occupation area of the site (see Chapter 5).

ACKNOWLEDGEMENTS

Thank you to everyone at California State University, Bakersfield, the Bureau of Land Management, Santa Rosa Rancheria, and my family and friends who supported me though this process.

This thesis has been an effort that spans centuries, nay millennia. Without the support of lots of people this research in Fresno County, California would not have transpired. I will do my best to recognize all of you that have helped me but if I forget a name or individual effort, please forgive me and know that you can take some credit in this archaeological endeavor.

First a big thank you to the California State University, Bakersfield, archaeological field schools of Spring Quarter 2001 and Spring Quarter 2002 who did the lion's share of initial excavation and mapping. The field school role call from 2001 is the following: Bruno Huerta, Derek Hurt, Blendan Walker, Dr. Mark Q. Sutton, Amy Girado, Dr. Jill K. Gardner, Jeremy Kroger, Fran Rogers, Ryan Stahl, Becky Orfila, Amanda DesLauriers, Sandy Rogers, Citla Vazquez, Susan Lewis, and Julie Minor. Bruno, Derek, and Citla were nice enough to come back later that spring, too. In spring 2002, the list of participants was: Tim Kelly, Bruno Huerta, Derek Hurt, Blendan Walker, Justin Gamble, Dr. Mark Q. Sutton, Darron Nilsson, Shannon Hurst, Rebecca Ragsdale, Juan Pinzón, Audrey Williams, and Dr. Jill K. Gardner.

A very special thank you goes to Alex DeGeorgey and Joann Mellon from northern California who volunteered their time, expertise, and good character to come down and assist with the documentation of the housepit and burial features…sometimes things happen to work out perfectly.

Without the contributions of the following individuals and companies, the special studies section would be lacking: Erin Dwyer of Paradise who completed the floral analysis; Robert Parr of the Center for Archaeological Research in Bakersfield who did the protein residue tests; Darden Hood, Lethia Cerda, and David Miller from BetaAnalytic, Inc., in Miami, Florida, who completed the radiocarbon testing; and finally Craig E. Skinner and Jennifer Thatcher of the Northwest Obsidian Research Laboratory in Corvallis, Oregon, who did all the obsidian hydration and sourcing studies. Thank you to Julie Anne Hamon (Delgado) from the Bureau of Land Management for providing a plant list of the White Creek study area. Also, thank you to Dr. Roger LaJeunesse on behalf of the Fresno County Coroner's Office and Dr. Robert M. Yohe II of California State University, Bakersfield, for their analyses and impressions on the recovered human remains.

Gary Breschini of Archaeological Consulting, Inc., in Salinas was very helpful in getting reference material and allowing me to pick his brain about local excavations. California archaeologists Bob Gibson and Bill Olsen were both helpful to me early on during my research, especially in formulating questions about the Salinan, Yokuts, and Costanoan/Ohlone ethnic boundaries. Thanks to fellow graduate student Hubie Switalski in developing a set of maps that are coherent and do everything a set of maps should do. Jim Snyder, librarian at Yosemite National Park, also deserves a big thank you for allowing me to get into Frank F. Latta's notes and manuscripts, and for sending me a copy of the document which helped to give a real place name to archaeological site CA-FRE-1331.

A special thank you goes to Marilyn Hilton, the University's Department of Sociology/Anthropology Secretary and so much more. She was instrumental in helping me achieve thesis completion and navigating those eternal administrative procedures. Another thank you goes to Marisa Marquez, my graduate student evaluator at Admissions and Records. Although I didn't get to bother him as much as I should have, thanks to Dr. Robert Negrini of the University's Geology Department for the identification of some lithic mysteries and answers to general geomorphological questions. One person that definitely deserves a special thank you is Dr. Jill K. Gardner. Jill is a friend and colleague who introduced me to Cal. State Bakersfield, supported me during my time there, and was the one who helped me to truly realize what the editing process is all about.

Thank you to Tim Moore, Bureau of Land Management geologist from the Hollister Field Office, who answered my numerous questions on lithic material identification, formation, and structure. He was also able to provide the Niton portable x-ray fluorescence (XRF) machine to examine the iron oxide content of a sandstone sample from CA-FRE-1331. Other people to thank from the Bureau of Land Management are: Russ Kaldenberg for offering some suggestions to the original research design; Bob Beehler, George Hill, and Rick Cooper for being very understanding and supportive bosses while I was working on my field work, lab work, and writing; archaeologists Ken Wilson, Kirk Halford, and Duane Christian for their program support; engineer technician John Wrobel; administrative help from Sandy Borges, Carol Bustos, Lenore Avila-Pino and Teresa Alberts; technical support and land use history from Bruce Cotterill, Dan Byrne, and Sam Fitton; and moral support came from anthropologist Yolanda Chavez and archaeologists Cheryl Foster-Curley, Jack Scott, and Margaret Hangan. The Bureau of Land Management archaeologists who got their hands dirty at CA-FRE-1331 were: my program and life mentor and Rick Hanks (thanks for the great frontispiece photo); the esteemed Dr. Eric Ritter from the Redding Field Office; Julie Burcell from the Ukiah Field Office; James Barnes from the Folsom Field Office; and

Kim Cuevas from the Bakersfield Field Office. Their combined expertise in and out of the field is without equal. My peers Julie, James, and Kim worked at the site repeatedly and Julie was extra helpful with profile illustrations. I will always appreciate their efforts and their different perspectives on cultural resources management, and I will always treasure their friendship. Finally, a special thanks to John Skibinski – because of "Ski's" personal and professional commitment, I began my journey as an archaeologist with the Bureau of Land Management in California.

Thank you to all of the other students and colleagues who helped me during my tenure at California State University, Bakersfield, including Audrey Williams, Vickie Harvey, Deanna Heikken, Gale Grasse-Sprague, Robin Tidmore, Susan Wolfe, Matt DesLauriers, Jay Hinshaw, Nelson Siefken, Dr. Gerrit L. Fenenga, and Dr. Jean Hudson. Two special people on the campus made life bearable during the work grind: Bob Parr of the Center for Archaeological Research made the hours spent in the laboratory seem less tedious and much more humane, and Adele Baldwin of the Southern San Joaquin Archaeological Information Center who showed me that life can be complicated but is too short to lose your perspective (or your mind over) the little things. Another thank you at Cal. State is deserved to Becky Orfila, M. A., for illustrating some of the groundstone artifacts and providing moral support with a dose of friendship.

A quick thank you goes to the Kern County Archaeological Society for allowing me to present some of the preliminary data and findings to a riveted audience several years ago.

Needless to say this research would not have succeeded without the participation and consultation of Native Californian people. Early in the research design, consultation with Ann Marie Sayers from Indian Canyon in Hollister provided some good input. A special thanks to Lalo Franco of the Santa Rosa Rancheria of Tachi Yokuts from Lemoore for his personal and professional insights, as well as his assistance in the legal handling and proper disposition of the human burial discovery.

Thanks to Ray Iddings, Jr., for his continual support and willingness to help backfill some test units at CA-FRE-1331. Also thanks to: archaeologist Gabriel Roark of Jones & Stokes, Inc., in Sacramento; archaeologist Linda Hylkema of Santa Clara University; soil scientist Kerry Arroues of the Natural Resource Conservation Service in Fresno; geologist Fred Fisher of the United States Geological Survey at the University of Arizona; archaeologists Dan Foster and Linda Sandelin of the California Department of Forestry and Fire Protection; archaeologist Rob Edwards, Director of the Archaeological Technology Program at Cabrillo College in Aptos, who gave me a solid foundation in California archaeology I will always draw upon – thanks Rob; artist Joseph Demaree of San Jose; Joe Deford of Bakersfield; archaeologist Mary Barger of the Western Area Power Administration in Denver; archaeologist Mark Hylkema of California Department of Parks and Recreation in Santa Cruz; and paleontologist Dr. J. D. Stewart of PCR Services Corporation in Pasadena, California. Thank you Jack Johnson and Bush.

A very special thank you to Danny Means and his dog Caden, without whom I would have been sleeping in the lab, my truck, or the streets of Bakersfield while I was working on my thesis over the years – it's not easy trying to finish a thesis when you're 200 miles away from the archaeology lab much less your thesis committee (apologies to Buck Owens).

Speaking of thesis committees, California State University, Bakersfield, Professors Dr. Mark Q. Sutton and Dr. Robert M. Yohe II, and Bureau of Land Management archaeologist Rick E. Hanks should be given much of the credit for the existence of this thesis. Without their continued support, dedication, enthusiasm, encouragement, consultation, experience, and faith (whew!), the work completed at site CA-FRE-1331 would not have been brought to life. Mark was there with me at the beginning of my scholastic endeavors at Cal. State, and his persistence and belief in my abilities helped me to realize my goal of receiving a Master's Degree in Anthropology – thanks Mark. When my original thesis committee dissolved itself Robert became a new committee member, and I was very lucky in having his experience, knowledge, and personable demeanor as assets towards completing my education at Cal. State – thanks Robert. My lucky streak continued when Rick Hanks came to be my program mentor at the Hollister Field Office of the Bureau of Land Management; I thank him for his personal and professional support, advice, and friendship.

Lastly, personal thank you's go to my immediate family: pets IshPuk, Momma, and Kitzmüeller; moms Marcia and Patty; sisters Claudia and Julie; brothers Joe and Dan; and dad Fred. All my love and appreciation goes to my wonderful wife Jennifer – thanks to you I can get things like this done. Finally, this thesis is dedicated to my dad Oskar Rudolf who passed away this fall – thank you Dad for everything.

ABSTRACT

In an effort to better understand the prehistoric settlement and subsistence patterns in central California's Diablo Mountain Range, this thesis represents an attempt to examine the relationship between cultural adaptation to the environment and the physical expression of those adaptations. More specifically, this research was intended to examine the regional models for prehistoric occupation (Olsen and Payen 1968, 1969) and to compare their reconstruction of past human and environmental systems to other models (Moratto 1984; Jones et al. 1999). Much of the literature postulated that this region was sparsely settled, largely attributable to environmental factors (Latta 1949, 1977; Hewes 1941). As a result, it was thought that little valuable archaeological information existed for the Diablo Range and the west side of the San Joaquin Valley in particular. Site CA-FRE-1331 was selected to test these concepts and expectations. Located in the foothills of western Fresno County, the site is a good example of a probable Yokuts Late period seasonal habitation. Data also indicated a possible Early or Middle period inhumation. As a result of research and investigations at the site, it is concluded that the notion of scarce archaeological and cultural data for this region is incorrect; moreover a regional occupational model is supported with respect to the San Luis-Little Panoche chronology.

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CHAPTER 1

INTRODUCTION

Archaeological research in the Central California Diablo Range has been sporadic, resulting in the perception that little economic or ethnic interaction in precontact California ever occurred in this area. This perception is inaccurate if one looks at the literature available about the subject. In fact, there is healthy debate about the prehistoric ethnic attributes that may have existed along the foothills and pocket valleys in the Coast Range that extend into the San Joaquin Valley. Ethnic boundaries along the west side of the San Joaquin Valley have best been described as "hazy," and this lack of clearly definable boundaries "may be a factor of loss of territorial information over the past 210 years, rather than a reflection of past reality" (Breschini et al. 1983:469). More than likely, these boundaries were "not hard and fast entities," but rather fluctuated through time due to "climatic changes, population pressures, and other factors" related to socioeconomic or cultural issues (Breschini et al. 1983:469).

The western hills between the towns of Los Baños and Coalinga in the Central Valley have traditionally been considered an ethnographic "blank." None of the literature ascribes a single Yokuts group to this area, though most literature shows the Costanoan-Yokuts interface as following ridges which separate the coast watershed from the San Joaquin River watershed; the southern extent of the Costanoan boundary placed somewhere near the upper headwaters of the San Benito River (Breschini et al. 1983:479). The possibility of "bilingual and bicultural areas" may also fit into an ethnic boundary reconstruction of the valley's west side (Breschini et al. 1983:469). The mountain passes between the Coast Ranges were conduits for an exchange of people and goods that probably fluctuated over time. Occasionally, these pathways between the coast and valley were busy trade zones, heavily populated during California's prehistoric Late Period. Exactly who was living in these territories or "hinterlands" between the core ethnic populations remains undetermined. In this setting, opportunities for archaeological research exist, such as those involving ethnic distribution, an examination of socio-economic modes of exchange, and a review of regional chronologies.

Olsen and Payen (1983) cited Kroeber (1925:484) as describing the west side of the San Joaquin Valley as being without human habitation. They believed, however, that Kroeber was in error and that, in fact, the Little Panoche-Los Banos region between the San Joaquin River and the crest of the Diablo Range may have formed a block of an ethnic group comparable to groups such as the Tachi (Olsen and Payen 1983:3). Results from California Department of Parks and Recreation archaeological projects indicated a long series of archeological phases "broken by a hiatus between circa A.D. 1000 and 1500," possibly relating to a dry climatic interval (Moratto 1984:215). After circa A.D. 1500, populations expanded and settlements increased in the western San Joaquin Valley. This general sequence parallels Delta chronologies but includes elements and patterns from the South Coast Ranges. In order to investigate these phenomena and test the chronological model created by Olden and Payen (1968, 1969) a suitable prehistoric archaeological site, CA-FRE-1331, needed to be selected for test excavations.

SITE CA-FRE-1331

Presently, only a small portion of the western San Joaquin Valley/eastern Diablo Range area has been inventoried for cultural resources and "virtually no excavation has been undertaken in the region" (United States Department of the Interior 1985:37; Breschini et al. 1983, 1986). Archaeological site CA-FRE-1331 is located in White Creek Canyon, up in the foothills of western Fresno County (Fig. 1) on public lands administered by the Bureau of Land Management (BLM), which is part of the United States Department of the Interior (USDI). This site has the potential to improve our understanding of prehistoric cultural dynamics in California which are not clearly defined and are "poorly documented" within this part of the inner Coast Ranges (Latta 1949, 1977; Olsen and Payen 1968, 1983; Breschini et al. 1983, 1986; United States Department of the Interior 1985:37). Research at CA-FRE-1331 was intended to investigate the temporal and functional nature of the site, and attempt to identify the ethnic and economic interrelationships that existed within the region prior to European contact. The BLM originally planned to excavate CA-FRE-1331 in 1987, but this was never completed. The BLM primary research goal for the site was to determine site depth and extent incorporating at least five 1 m. x 1 m. test excavation units (United States Department of the Interior 1986:22). The site also exhibited damage as a result of vandalism and pothunting (United States Department of the Interior 1986:23). Citing the lack of knowledge regarding the regional prehistory and physical impacts occurring to the site, test excavations were recommended (United States Department of the Interior 1986:23).

Initial studies suggest that CA-FRE-1331 is probably a prehistoric contact village site (or *rancheria*) inhabited by the Yokuts, Costanoan, or Salinan. In fact, it is possible that White Creek Canyon itself was considered the village area, with CA-FRE-1331 and/or other nearby sites (e.g., CA-FRE-1333, CA-FRE-1345) as the main loci of activity. CA-FRE-1331 might have been a stop on a seasonal round of foodstuff gathering. If it had

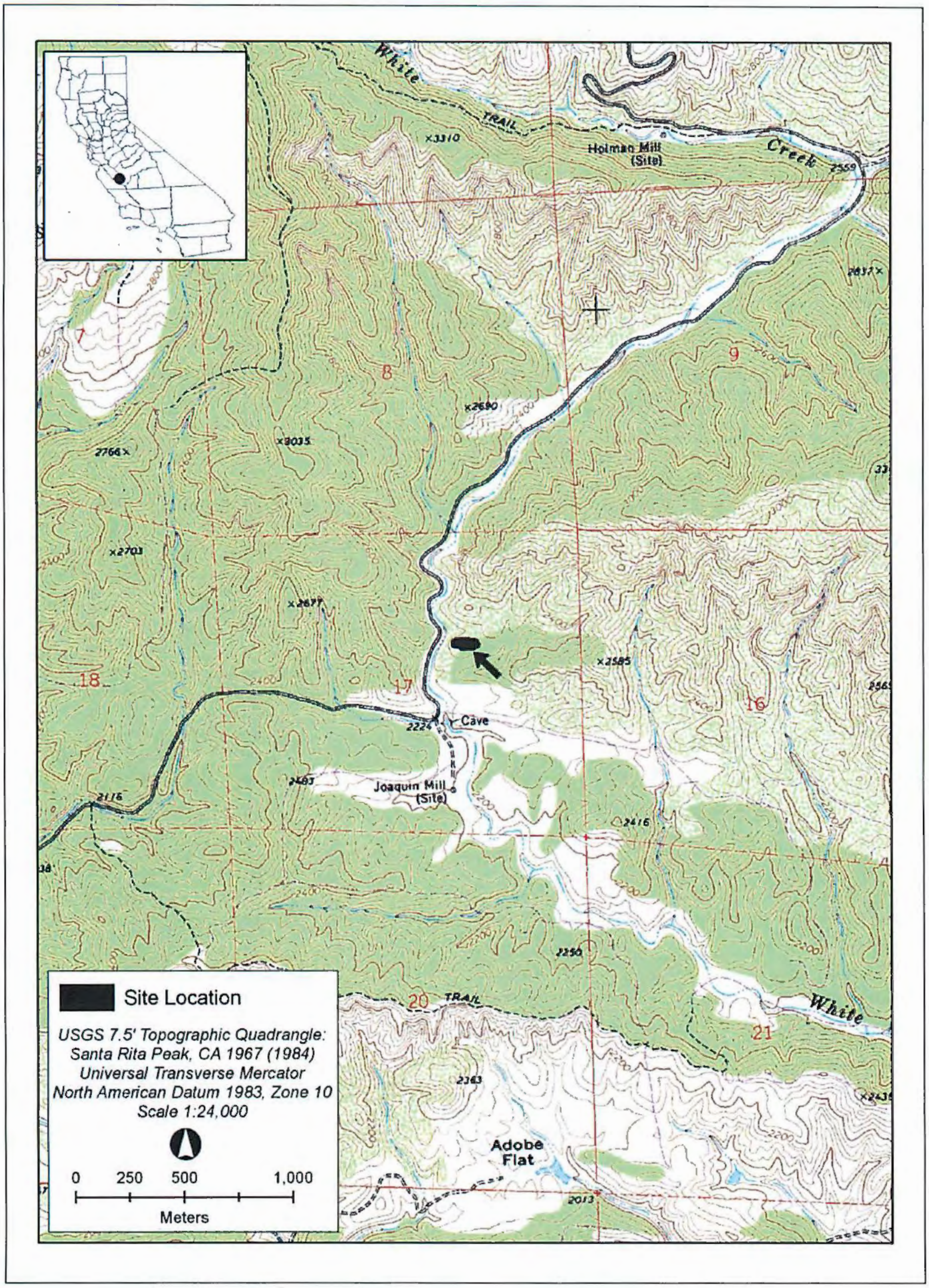

Figure 1. CA-FRE-1331 site location map.

been an acorn bread making site, for instance, one would expect groundstone or other milling tool artifacts, but since the site had been vandalized from pothunting the probability of finding such evidence is greatly diminished. California Indian east-west trade networks existed until European contact and beyond (Pilling 1950); CA-FRE-1331 might have been a "waystation" for trading travelers coming from the coast to the valley (or vice-versa). Site CA-FRE-1331 was probably not a large-scale ceremonial/trade site, such as *Poso Chana* or other sites in the west Central Valley foothills (Latta 1949, 1977; Milliken and Meyer 1997; refer to Chapter 4), but probably was a habitation zone for resource exploitation such as vegetal foods (acorns, chia, yucca, juniper, pine nuts, chamise, manzanita), various kinds of game animals, water, and lithic materials (sandstone, chert, steatite/soapstone, magnesite, cinnabar/ochre).

In order to examine these questions relating to site use, habitation, ethnicity, and trade, the theoretical framework for this research is outlined in Chapter 2. Research goals are established in Chapter 3 and a comprehensive regional background is provided in Chapter 4. In Chapter 5, the field and laboratory results of the investigations at CA-FRE-1331 are described. Chapter 6 presents conclusions reached for each research goal, followed by the appendices with the results of special studies.

CHAPTER 2

RESEARCH ORIENTATION

THEORETICAL FRAMEWORK

Archaeological data have the ability to provide information about past natural and cultural systems, generating observational statements regarding the structure and behavior of now extinct social systems. In Longacre's (1970:1) seminal study "Archaeology as Anthropology," he observed that archaeology could identify the "cultural processes of stability and change that operated in the past, thus contributing to an understanding of culture and cultural evolution". Longacre's (1970:1) investigations were conducted at the Carter Ranch site in the "ecologically heterogeneous" American Southwest culture area, a site where the people lived between A.D. 1100 and 1250. Based on his interpretations, Longacre (1970:46) viewed site settlement at Carter Ranch as being directly related to environmental changes and drew upon the work of Lewis Binford, the pioneer of processual archaeology, for theoretical support (Longacre 1970:52; Binford 1965 and Binford 1968).

Similar relationships between human populations and environmental change can also be demonstrated in the California culture area. One of the region's early researchers summarized it this way:

> There is no reason why California, one of the New World's best known ethnographic areas, should not be known archaeologically as well. Admittedly unspectacular when compared to the regions of higher technological achievement, central California contained the densest aboriginal population north of Mexico, outside the Pueblo area, and great diversity of speech groups, with significant historical implications. These considerations hold enough material to merit the attention of archaeologists interested in broad problems of human culture [Hewes 1941:133].

Many of the native systems that operated in prehistoric California prior to European contact were characterized as an "expression of cultural and sociological fitness between the people and their environment" (Barbour et al. 1993:160). The near extinction of native populations by colonists and settlers to California was "consummated by the destruction of their native habitat by the fouling of streams, clearing of forests, draining of marshes, fencing of grassland, and replacement of natural plant cover by weedy introduced species" (Barbour et al. 1993:164). Existing native systems were permanently disrupted by non-native systems imposed on an environment that had been traditionally managed and utilized by California Indians. In order to properly investigate these past systems, a theoretical perspective is called for that intertwines culture and the environment yet gives diligence to quantitative and qualitative historical data.

CULTURAL ECOLOGY

Cultural ecology may be viewed as the study of how a particular group of people has adapted to their environment as well as to other groups (Campbell 1995:7). Regional resource exploitation patterns were established by different groups of people throughout California; each pattern reflecting the resources available from that particular biome/ecotone. A "biome" is a climatic environment defined by the physical characteristics of rainfall, vegetation, topography, etcetera; "ecotones" are the zones between biomes that tend to display greater biological "density and diversity" (Campbell 1995:12).

Given that an increase in biological density and diversity occurs at an ecotone, there is also an expected increase in human population density and cultural diversity (Bettinger 1991). For example, the Chumash culture area of southern California demonstrates the human by-products of exploiting a very productive set of ecotones. Bettinger's (1991:200) discussion of the evolution of ethnic markers (e.g., ethnicity) argues that when groups of people interact across an ecotone the "greatest symbolic differentiation between groups and highest correlation between adaptive and symbolic traits within groups" occurs at the ecological boundary itself.

Horne (1981:139) used a site catchment analysis method (Vita-Finzi and Higgs 1970) with cultural ecology theory as the basis for his research with Inland Chumash archaeological sites. Site catchment analysis relies upon the concept of "minimization of the energy costs of resource exploitation" (Horne 1981:136). Horne's description of the Inland Chumash study area could almost be applied verbatim (sans Monterey Formation) in describing the White Creek study area:

> The ranges were a storehouse of raw material and a source of shelter. The Monterey Formation, common in many of the ranges, provided chert for the lamellar core industry. The Franciscan Formation, also common in many of the ranges, contains serpentine, which was fashioned into beads, ornaments, and vessels, and many-colored cherts. The marine sandstones which are found in many formations have weathered into caves and ledges which served for shelter, storage, and ceremony. The ranges are a rugged land of steep, heavily dissected slopes. Thus, travel was difficult. As a result, most aboriginal transportation was likely to have been confined to the major drainages [Horne 1981:18-19].

A generalized seasonal round for foodstuff procurement by the Chumash were acorns in October and November, chia in the summertime, mescal (yucca) between January and May, and cacomites/Blue Dick bulbs (*Brodiaea* sp.) in the early spring (King 1976:291). In the foothill and mountain region of the Santa Clara Valley, the food resource exploitation pattern for the Costanoan were similar: deer and elk in January and December, acorns in October and November (and sometimes December), buckeye in October through December, pine nuts beginning May or June continuing through September, and other small hard seeds and berries beginning April or May and continuing through September (Elsasser 1986:9).

DIRECT HISTORICAL APPROACH

Bridging the gap between ethnographic documentation, ethnohistoric records, and archaeological data is extremely important for research in the CA-FRE-1331 study area. Unfortunately, the separation of archaeological research into prehistoric and historic subfields has created the "ambiguous role" that ethnographic and ethnohistoric sources have in archaeological research today (Lightfoot 1995:204). Ethnohistoric and historic data tend to vary in the degree of precision relative to archaeological data (Charlton 1981:156). A cautious use of historical analogy has the ability to create a "link between historical data and archaeological data" within the framework of the direct historical approach, allowing historical data to strengthen observational inferences interpreted from the archaeological record (Charlton 1981:153-154).

The archaeological record for most of the California culture area is reasonably well understood for the period of the last four to five thousand years (Moratto 1984). Beyond this span of time, much less is known as the archaeological record is far less complete; therefore, it is difficult to "gain a coherent picture of what areas were occupied and the nature of environmental adjustment" that occurred (Heizer 1978a:3). The direct historical approach has never really been employed in California although glottochronology and archaeology have been extensively used (Heizer 1978a:4). A significant problem to the direct historical approach was the difficulty in finding ethnographic informants born before A.D. 1850, with a noticeable reliance on utilizing informants born in the A.D. 1860s to 1880s (Heizer 1978a:4). It could be argued that in many instances territorial boundaries and information concerning neighboring tribelets may have been lost by the time ethnographers could record the information (Heizer 1978a:5).

"Salvage" ethnographies, designed to collect orally transmitted cultural data before it was lost within a larger American culture, were hindered by many obstacles during collection. Native ecosystems and vegetation had been "reduced to a skeletonized version of the complex cover it once was," making plant lists and their corresponding native uses only piecemeal (Barbour et al. 1993:164). Moreover, plant lists were generally incomplete because "predominantly male anthropologists tended to interview men" but it was native women who were the gatherers of plant foods (Barbour et al. 1993:164). Some informants who were recalling old customs "second- and third-hand" had never done the things they were recounting for ethnographers. For instance, Heizer (1978b:692) felt that the Walla Walla Indians' vermilion expedition to New Almaden in Santa Clara County may have been a historic period phenomenon, claiming the trade distance from the Columbia River Plateau to the San Francisco Bay was too great and the trek was known to be made on horses until A.D. 1848. Heizer also believed that other long distance treks may also have been post contact phenomenon (e.g., Pilling 1950). Heizer (1978b:693) cautioned researchers from "depending too heavily on ethnographic analogy" and regarded historic analogy as a *reflection* of prehistoric sociopolitical systems.

Gibson (1983:51) utilized the documents of Missions Soledad, San Antonio de Padua, San Miguel, and San Luis Obispo to reconcile the ethnohistoric record with ethnographic and archaeological accounts. The mission records contained some personal names, baptism patterns, and the ethnohistoric location of native Salinan rancherias. Although some of the locations were not correlated with specific archaeological sites, Gibson made it possible to "utilize the locational information in the mission registers to locate *rancherias* approximately in various areas" (Gibson 1983:76). For example, the major Salinan village of Cholaam was "said to be located fourteen leagues (36.4 miles) east of San Miguel Mission" (Gibson 1983:76). The use of this ethnohistoric data is key, especially in the face of the existing interpretations for village locations based on ethnographic and archaeological inference. He concluded that the Coalinga area "previously suggested as being Yokuts" could be the Salinan territory of the *rancheria* of *Chenez,* also known as Posa Chana" (Gibson 1983:91; italics in original). The present day Avenal area was determined to be within the Southern Salinan territory, and the Kettleman City area was in Yokuts territory (Gibson 1983:91).

AN INTEGRATED APPROACH

The intent of this thesis is to take an integrated approach to solve the questions of whom, how, and when did people at CA-FRE-1331 adapt to their environment. By incorporating the principles of cultural ecology theory and direct historical approach a better site interpretation is created, thus resulting in a more accurate depiction of past human behavior and the ability to test and compare regional prehistoric settlement models.

CHAPTER 3

RESEARCH DESIGN AND GOALS FOR CA-FRE-1331

BACKGROUND

Baseline data is the "minimal set of information that most archaeologists agree must be retrieved from an excavation or survey," which allows inferences to be made about a variety of behavioral categories including subsistence, trade connections, and site type (Redman 1987:258). When this material data is examined collectively, the "contextual relationship of artifacts, ecofacts, and features, both inside and outside structures, across residential settlements, and over broader regional landscapes, can provide insights into the organizational principles of households and communities" (Lightfoot 1995:207). In addition of baseline information, a middle-range theoretical approach is widely depended upon for archaeological research. "Middle-range theory" in archaeology is not intended to encapsulate site formation processes, etcetera, but rather as a means toward theory development for specific problems like communication exchange or hunter-gatherer behavior (Raab and Goodyear 1984:256, 264). For the CA-FRE-1331 study area, an examination of regional ethnography in addition to baseline data is extraordinarily important because so little information is available about the region. Middle-range theory can help develop broad research goals into research questions (see following discussion).

Archaeological sites located within the study area have been characterized as "temporary campsites or resource utilization areas, with an occasional larger occupation site or residential base" (Breschini et al. 1983:66). Excavations at nearby site CA-FRE-1333 (less than ½ mile away from CA-FRE-1331) resulted in the identification of at least five components to that site's function: food procurement, food preparation, interment, bone tool manufacture, and recurrent use (Breschini et al. 1986:46). Lithic and vertebrate assemblages from this site also indicated a wide variety and diversity of tool forms and processed game, respectively (Breschini et al. 1986:82, 105). Prior to excavations at CA-FRE-1333 (Breschini et al. 1986), the age of the sites in the study area were "difficult to determine on the basis of existing information" (Lipp 1984:4). It is now known that CA-FRE-1333 is a Late Period site (Phases 1 and 2) that corresponds to the Panoche and Gonzaga Complexes of the San Luis-Little Panoche chronology developed by Olsen and Payen (1969) (Breschini et al. 1986:11-12, 43, 46).

RESOURCE AVAILABILITY AND SETTLEMENT PATTERNS

Horne's (1981) research into the settlement patterning of the Inland Chumash provides much insight into the relations between resource availability and settlement location - which by and large can dictate site function. Horne identified two types of village residence for the interior Chumash: base villages and summer villages. He further determined that Inland Chumash base villages were "situated with reference to four major considerations: major trails, permanent water, access to food resources, and moderate winter weather" (Horne 1981:152). Trails facilitated the movement of "people and products between allied villages" which reinforced alliance networks (Horne 1981:153). Water was a limiting factor for interior/inland Chumash demography and settlement patterning; a key resource in light of the fact there are so few locations of year round water as one moves away from coastal watershed systems (Horne 1981:154). Access to foodstuffs also determined base village location, situated in a location which became the "the central collecting point of storable foods drawn from many plant communities...rather than situated with disproportionate accessibility to a single major plant community" (Horne 1981:154). Under Horne's criteria, "moderate winter weather" is directly related to elevation. In the Sierra Madre Potreros Mountains, summer villages were located at approximately 1,400 m. above sea level, and base/permanent villages were located at approximately 760 m. above sea level. The base village *Kastiq* of the interior/inland Chumash, the "highest known permanent Chumash village," was located at 1,000 m. above sea level (Horne 1981:155).

In addition to the criteria above, Horne (1981) determined that base villages should also exhibit some other characteristics that were by-products of the human beings that lived there. These characteristics included the presence of developed midden soil; evidence of structures like houses and sweat lodges; other features like storage facilities, dance floors, and roasting pits (Horne 1981:155-163). Base village sites should also contain a "complete spectrum of non-perishable artifacts," including domestic implements, hunting implements, stone tool manufacturing tools and debris, evidence of storage and ritual, and ornaments or currency used for exchange (Horne 1981:168-170). Finally, the base village site type should have a cemetery within or adjacent to the site itself (Horne 1981:170).

Conversely, Horne's definition of a summer village type hinges upon only "two major considerations, permanent water and access to food resources" (Horne 1981:173). Physical components of the summer village site would be fundamentally different than a base village site type: summer villages would be "completely abandoned and then re-occupied each year. A domestic unit would not be expected to be made on exactly the same spot on the same site year after year. Therefore, clustering of occupational debris [would] be less distinct or more blurred than at a base village" (Horne 1981:176). A summer village might have the same level of "activity diversity" as a base village but exhibit less discrete clustering of artifacts because of the "occupational instability" related to seasonal occupation (Horne 1981:180). An example of a summer village site would be an acorn processing camp: it has "accessibility to the acorn crop" and "accessibility to water," meeting Horne's criteria for an Inland Chumash summer village type site. The overall size of a summer village site would be smaller compared to a base village site because it would only have to accommodate food production for the size of a single household during "relatively brief, cyclical visits" (Horne 1981:183). Inland Chumash seasonal rounds were probably established by the Middle Period (Horne 1981:194-195). Binford expressed this difference in site assemblages as a function of hunter-gatherer mobility (Binford 1980:17). A "rough grained" artifactual assemblage would show a diversity of forms, indicating multiple functions and tasks being performed at the same locality (Horne's "base village" type). By contrast, a "fine grained" artifact assemblage with less activity diversity would tend to indicate greater mobility and less sedentism (Horne's "summer village" type).

INTERREGIONAL EXCHANGE

The White Creek drainage study area is tentatively ascribed to Yokuts territory during the Late Prehistoric and Protohistoric periods in California. This assumption has been based almost exclusively upon ethnographic research conducted in the twentieth century by Frank F. Latta (Latta 1949, 1977; Breschini et al. 1986) and A. L. Kroeber (1925). Archaeological excavations at CA-FRE-1333 attempted to ascertain an ethnic affiliation for the White Creek drainage, but based upon the recovered data (including bead analysis) a "specific ethnicity" could not be assigned to the site or the region (Breschini et al. 1986:47, 118). Two burials were encountered at CA-FRE-1333, one intact and articulated enough to be classified as a flexed burial. According to Olsen and Payen's (1968) San Luis-Little Panoche chronology, flexed burials occur during the Pacheco A Complex (ca. 3,500 to 1,650 B.P., California's Middle period) and mark "an incursion of coastal people to the west edge of the [San Joaquin] valley" (Olsen and Payen 1968:41). More recent investigations, however, have determined that burial posture (other than fully extended) is not significant in itself and that extended burials occur throughout the various chronologies (Olsen 1999).

In precontact California native trade alliances stretched across ecological zones and "involved considerable exchange in a wide range of goods" (Preston 1981:38). The site of *Poza Chana* (or *Posa Chana*) was a trading center for the Tachi Yokuts to interface with other trading groups west of Tulare Lake, like the Costanoan or Salinan (Latta 1949, 1977). These coastal people traveled down Los Gatos Canyon to trade with the Yokuts for piñon, "obsidian, salt, soapstone beads, seeds, and especially fish from Tulare Lake" (Jenkins 1990:3; Levy 1978:488; Davis 1966; Sample 1950). It was reported historically by local ranchers that Los Gatos Canyon had at least one Indian trail "worn at least a foot deep" (Jenkins 1990:3). This could have been a possible trade route for the Costanoans to reach the Yokuts by going "through the White Creek area" (Breschini et al. 1986:19). Other similar east-west trails existed, like the Pacheco/San Luis Gonzaga Pass used by the coastal Ohlone Indians and the San Joaquin Valley Yokuts as a trade route; they met "midway by an artesian well to exchange valley acorns and animal pelts for seafish, shells, shellfish, and salt" (Preston 1995:84; also see Davis 1966; Sample 1950).

RESEARCH GOALS

Goal 1: Time Period and Length of Occupation.

The first goal of research at CA-FRE-1331 is to investigate the notion that sites in the White Creek drainage are contemporaneous. The results will contribute valuable information "regarding the establishment of a chronology for this portion of the South Coast Range" (Lipp 1984:4) and can verify, enhance, or refute the San Luis-Little Panoche chronology. Initial indicators on the surface of CA-FRE-1331 demonstrate the presence of a Panoche Complex assemblage type and lack of any historic occupation.

Goal 2: Site Function.

The second research objective for archaeological research at CA-FRE-1331 will be to establish site function. Patterns of artifact utilization and diversity may be encountered at CA-FRE-1331 that are similar to other sites in White Creek Canyon (e.g., CA-FRE-1333) or the data may indicate that CA-FRE-1331 was a discrete component to a larger series of functionally related sites. The possibility that CA-FRE-1331 was a site for "middleman" traders between the coast and the valley rather than just a seasonal procurement area should also be considered (Hylkema 2001:81).

Goal 3: Ethnicity.

The third goal for archaeological research at CA-FRE-1331 is to determine the ethnic identity of the site's inhabitants, thus helping to provide more "accurate ethnographic boundaries for the region" between the Late Period Yokuts, Salinan, and Costanoan groups (Lipp 1984:4). This can be accomplished by reviewing the ethnographic, ethnohistoric, and archaeological data sets available for the region and comparing that to archaeological data from CA-FRE-1331. Cultural affiliation indices such as architectural styles or food taboos and preferences may provide evidence to correlate or challenge the conclusions reached by previous ethnographic analyses (Latta 1949, 1977; Kroeber 1925; Mason 1912), ethnohistoric analyses (Gibson 1977, 1983), and/or archaeological analyses (Breschini et al. 1986; Olsen and Payen 1968, 1969).

Goal 4: Trade.

The fourth research objective of archaeological investigations at CA-FRE-1331 is to investigate the trading relationships that existed during the Late Prehistoric and Protohistoric eras in Central California. Popular trade materials like obsidian and items like *Olivella* shell beads were recovered at CA-FRE-1333, indicating that trade and/or transport of non-local materials did occur in the White Creek drainage (Breschini et al. 1986:98-103, 113-117). Additional excavations at CA-FRE-1331 might be able to help to affirm trade network systems active during California's Late period or even earlier (Lipp 1984:5).

CHAPTER 4

REGIONAL BACKGROUND

ENVIRONMENTAL SETTING

Location and Climate

Site CA-FRE-1331 is situated on a flat just south of an unnamed drainage that flows west into White Creek. The study area is located in the Diablo Mountain Range of California about 25 miles (40 km.) northwest of the town of Coalinga in western Fresno County. White Creek is a tributary of Los Gatos Creek "which in turn joins the Arroyo Pasajero near Coalinga" (United States Department of the Interior 1985:34). Elevations within this portion of the Diablo Range span 2,000 to 5,000 feet above sea level, peaking at 5,241 feet above sea level on San Benito Mountain. The closest prominent mountain to CA-FRE-1331 is Condon Peak (4,970 feet above sea level), approximately two miles northwest of the study area. The topography of the land is rugged, with "interspersed small, flat lying stream terraces" (United States Department of the Interior 1995:40); archaeological site CA-FRE-1331 is on such a terrace (Fig. 2).

The region's climate is characterized as semi-arid, with rainfall primarily between November and April providing with cool wet winters and hot dry summers. Annual precipitation for the upper Clear Creek watershed averages seven to seventeen inches, largely in the form of rain with a little snow (United States Department of the Interior 1995:40; Breschini et al. 1983:20; Hickman 1993:33). Early land surveys by the U.S. government described the area as "mountainous covered with timber and dense undergrowth of pine, oak, juniper, chaparral and chamisal" with some flats on the Los Gatos and White creeks

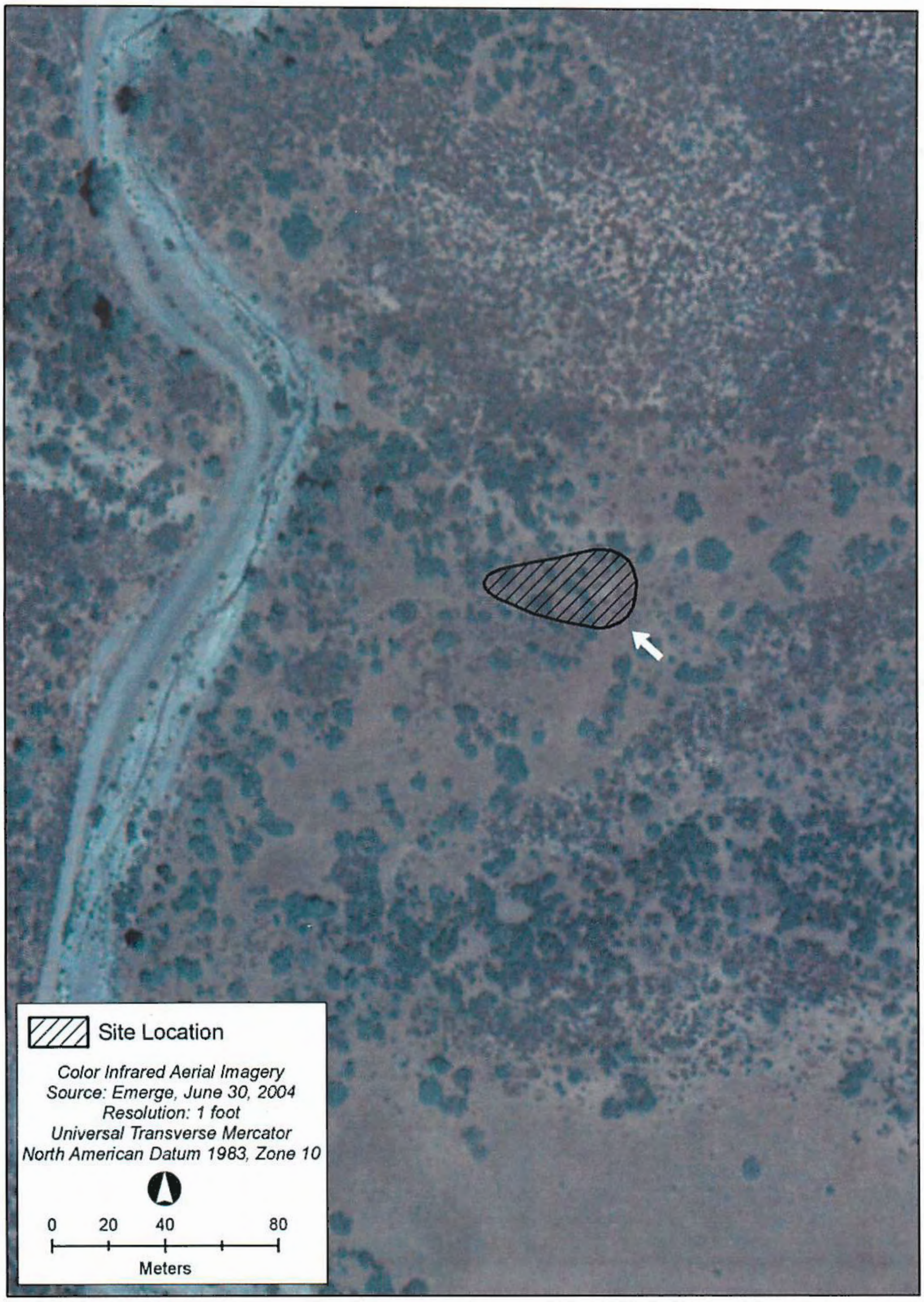

Figure 2. CA-FRE-1331 site location map detail.

being settled (United States Department of the Interior 1881). An environmental overview of the region was conducted in 1999, using the watershed as the defining ecological unit for the region (Sage 1999). According to that report, site CA-FRE-1331 is located at the edge of the Arroyo Pasajero watershed and lies within the 14 to 16 inch range for average annual precipitation (Sage 1999:2-4). Overall, as much as 22 inches of annual precipitation can occur in the upper portions of the watershed, contrasted to less than eight inches in the Coalinga area (the lower portion of the watershed) (Sage 1999:2-1, 2-3; Hickman 1993:33).

Geology

In the Arroyo Pasajero watershed of the Diablo Mountain Range, a series of northwest-southeast trending anticlinal structures create Joaquin Ridge, Anticline Ridge, Guijarral Ridge, and Kettleman Ridge (Sage 1999:2-3). Site CA-FRE-1331 rests on the Joaquin Ridge Sandstone (*Kjr*) Formation, flanked by the Etchegoin-Jacalitos (*Tej*) Formation to the south and the Waltham Shale (*Kw*; a variant of the Panoche Shale type) Formation to the north, demarcating the Los Gatos Syncline (Fowkes 1982:155). Joaquin Ridge Sandstone is a thick sequence of massive, coarse to fine grained, easily weathered sandstone that contains large concretions within its matrix (Fowkes 1982:15). The Etchegoin-Jacalitos Formation is composed of soft, light colored shales, gravels, and sandstones resistant to some erosion and considered "extremely fossiliferous" (Fowkes 1982:29). Also, a localized rare conglomerate bed occurs in the formation near the project site area (Fowkes 1982:15).

Site CA-FRE-1331 is situated near a serpentine formation. This serpentine uplift, known as the New Idria Formation, was formed over 65 million years ago (during the Cretaceous Age) and is composed of ultrabasic intrusive rocks. These rocks represent a unique collection of minerals including mercury, asbestos, and magnesite (United States Department of the Interior 1995:26). The surface geology of the New Idria formation can be characterized as "an oval dome of serpentinized ultramafic rock" with a section of the Franciscan Formation in contact with the surrounding Cretaceous Panoche Formation (Moore n.d.:1). The Cretaceous Panoche Formation is a sedimentary sandstone shale and siltstone. Mercury and cinnabar are found mainly in serpentite and the altered Panoche Formation, formed from the alteration of the serpentine (Moore n.d.:1). Surrounding the New Idria Formation is the 100 million year old Franciscan Formation, representing the oldest rocks in the study area and composed of marine sandstone interlayered with basaltic lavas and lenses of chert (United States Department of the Interior 1995:76; Sage 1999:2-6). In general, the geologic formations of the Coast Ranges are composed of soft shale, claystone, and sandstone, with some hard sheared rock types such as chert, metagraywacke, and serpentine. Other massive hard-rock types such as basalt and other volcanics and intrusives can occur locally (Prokopovich 1976:273).

Common lithic materials to the study area are cherts, steatite (schist or talc based), and cinnabar. Chert (SiO_2) is common throughout the New Idria district (Fowkes 1982:49; Goldman 1959:10) as well as Chlorite schist (metamorphic) occurring as outcrops near the southeastern end of the New Idria serpentine formation. The Chlorite schist is found in "pockets" that stretch a few feet to several hundred feet in length (Fowkes 1982:49). Glaucophane schist (metamorphic) occurs near the southeastern end of the serpentine. This kind of schist is present (at numerous locations) where there are Franciscan formation rocks (Fowkes 1982:52). Talc ($Mg_3Si_{14}O_{10}(OH)_2$), a component to the schists, is also found within the New Idria serpentine formation (Fowkes 1982:59). Cinnabar (HgS) is found throughout the area, but is concentrated mainly in two locales: the New Idria/Aurora Mines and the Archer Mine (Fowkes 1982:50; Eckel and Meyers 1946; Bain 2003). Other "indurated and fractured" veins of cinnabar with quartz are located right on the contact with serpentine, running parallel to the contact zone within the modified Panoche Shale formation (Eckel and Bradbury 1941:Plate 14).

Jadeite occurs "as thick as one inch" in dark green colored vein bodies within serpentine or schist (Fowkes 1982:53). Jadeite can be found along nearby Clear Creek within the New Idria Formation and is very rare, not only in California but is known "only in a few areas of the world, including the Far East" (Fowkes 1982:54; Coleman 1961). Magnesite ($MgCO_3$) is white to shades of light brown in color, or sometimes slightly green. The closest location of magnesite to the study area is Sampson Peak or "small veinlets or nodules" that occur throughout the New Idria Serpentine intrusion (Fowkes 1982:55). Jasper outcrops near the magnesite (Fowkes 1982:150-152) and hydromagnesite ($3MgCO_3 \cdot Mg(OH)_2 \cdot 3H_2O$) nodules are also found in the New Idria serpentine less than one mile from site CA-FRE-1331 (Fowkes 1982:159). There are no known local sources of obsidian.

Lithic materials were very important to all Californian Indians, and they utilized a wide array of different materials for hundreds of purposes. Materials like obsidian, steatite, sandstone, clay, magnesite, quartz crystals, mineral paints, pebbles, mica, asphaltum, schist, granite, alabaster, vesicular basalt, and even asbestos all had a function (Heizer 1951:43-48). One very important lithic resource in central California was steatite, or soapstone. The difference between soapstone and steatite is that soapstone is composed mostly of mineral talc, while steatite is an "unusually pure material which is composed almost wholly of the mineral talc" (Wright 1950:277). Quality steatite in large amounts was not immediately available to the Costanoan/Ohlone, Yokuts, or Salinan, but instead was imported from the Coast Ranges or the Sierra Nevada in considerable quantity (Heizer 1951:40). Steatite items were manufactured in the Santa Barbara area, probably in the vicinity of serpentine deposits found in the San Rafael Mountains and upper Santa Ines River area (King 1976:315). Another main source of steatite is Catalina Island, believed to be the choice material for trade between the Inland and Island Chumash while other steatite sources were reserved for trade beyond the Chumash homeland (King 1976:315). Other major sources of steatite/soapstone in California occur in the Inyo Mountain Range, southern Death Valley, Silver Lake in San Bernardino County, Shasta County, and in "serpentine bodies" along the Sierra Nevadan foothill counties of El Dorado, Butte, Calaveras, Tulare, Tuolumne, and Amador (Wright 1950:277-279).

Another lithic material of great import to native Californians was red ochre for mineral paint, usually made from processed cinnabar and/or hematite. It was used for adornment in ceremonial performances, while in mourning, etc. (Heizer 1951:43). The color red was widely used, so hematite and cinnabar were mined and traded for long distances between tribes. Sources for red paint were scattered throughout Central California, with outcroppings at "several places along the summit of the Coast Range" from as far south as Coalinga in Fresno County to Del Puerto Canyon in Stanislaus County (Latta 1977:599). One known source was on the east side of Mount Diablo and yet another near the study area at the Aurora/New Idria mines, "but the main locality was the New Almaden mine near San Jose" in Santa Clara County (Heizer 1951:43). As early as A.D. 1824, New Almaden was a Mexican mining claim for cinnabar. Even before the mine was located Indians were obtaining the cinnabar for pigment from a natural cave near the top of a location called "Mine Hill" (Hillhouse 1931:4). The same cinnabar was used during the Historic Period by Indians to paint the walls of Mission Santa Clara and support silver mining in Mexico (Santa Clara County Parks 2001:1-2). In A.D. 1845 while building a new mine shaft, an "Indian tunnel" mine shaft some fifty to sixty feet long was discovered along with "several skeletons" and "rude stone mining tools" (Heizer 1951:43; Heizer and Treganza 1971:358).

During Latta's ethnographic and archaeological research with the Yokuts, he learned that the Indians had a standardized "pack" of paint materials. The pack was stocked with "asphaltum and paint of various colors" which could be traded or sold for money throughout Yokuts territory. The standard was uniformly described as a size approximately that between a "tennis ball and a baseball" (Latta 1977:306). Latta's ethnographic data was substantiated by the archaeological remains recovered from widely separated portions of Yokuts territory. For example, at the Menjoulet site while screening the backdirt of looters, Latta found two "standard pack" balls of red pigment and one white (Latta 1977:306-307). More excavations in grave lots on Los Baños Creek in western Merced County also revealed several chunks of crude cinnabar "as well as one molded ball of prepared pigment" (Latta 1977:599).

Flora

In general, the Diablo Range is composed of blue oak-foothill pine forest, mixed hardwoods, chaparral, valley oak savanna, juniper savanna and California prairie (Breschini et al. 1983:22; Hickman 1993:42; United States Department of the Interior 1995:52). Correspondingly, the study area "supports a mosaic primarily of summer-dry blue-oak/foothill-pine woodland and chaparral" (Sage 1999:3-2). General physical characteristics of the Blue Oak Woodland are upland valleys with gentle to steep slopes and shallow, infertile, moderately to excessively drained soils. The soil surface may be covered with stones or rock outcrops (Sage 1999:3-7). Soil composition consists of sandy loams with a very high erosion hazard and "rapid to very rapid surface runoff" (Sage 1999:4-10). A basic floral description for the Blue Oak Woodland type is a woodland dominated by *Quercus douglasii*, including individuals of several other oaks as well as *Pinus sabiniana*. Stands can vary from open savannas with grassy understories to dense woodlands with shrubby understories (Holland 1986:71).

The study area also exhibits the elements of a juniper-oak woodland. The Juniper-Oak Cismontane Woodland type is basically a "compact woodland of *Juniperus californica* and shrubby *Quercus douglasii*" found principally in California's Inner South Coast Ranges (the Diablo Range) (Holland 1986:78). Chaparral occurs frequently in the Coast Ranges (Baumhoff 1978:18). On north slopes, a typical vegetation community can include manzanita (*Arctostaphylos* sp.), scrub oaks, ceanothus, and chamise (*Adenostoma* sp.). South slopes, however, are "dominated by chamise" (Baumhoff 1978:19). In general, this chaparral zone is useful to animals and people when managed with fire (Baumhoff 1978:19).

The typical vegetation communities of the mixed blue oak-foothill pine and juniper-oak woodlands with chaparral are present in the study area. This includes blue oak, maul oak, coast live oak, interior live oak, valley oak, buckeye, and "serpentine endemic plants" such as leather oak (*Quercus durata*), silk tassel (*Garrya congdonii*), and twist flower (*Streptanthus insignis insignis*), as well as non-endemic species such as foothill pine (*Pinus sabiniana*), Mexican manzanita (*Arctostaphylos pungens*), Indian Valley bush mallow (*Malocothamnus aboriginum*) and California barberry (*Berberis dictyota*) (United States Department of the Interior 1995:52; Sage 1999; Munz and Keck 1959:16; Baumhoff

1978:18). Along the riparian corridors within the serpentine formation the more common plants include Brewer's willow (*Salix breweri*), saltgrass (*Distichlis spicata*), grass-of-parnassis (*Parnassia palustris*), Indian paintbrush (*Castilleja minuata*), and columbine (*Aquilegia eximia*) (United States Department of the Interior 1995:53). No cottonwoods have been observed in the White Creek Canyon riparian corridor (Sage 1999:2-14), although some are present in other tributaries along Los Gatos Creek. Also present in the study area are wild onions (*Allium* sp.) and an unusual oak known as the John Tucker variety (*Quercus turbinella* var. *californica* or *Q. john-tuckerii*). A partial species listing for the White Creek drainage is provided in Appendix A.

Grasses of the region are dominantly non-native species, *Avena barbata* and *A. fatua*, the latter an oat eaten by native Californians during the historic period (J. Hamon 2000, personal communication; Hickman 1993:662). Controlled burning and clearing of the surrounding vegetation at CA-FRE-1331 would have been productive, as the advantages to using fire would result in increased bulb and seed production, increased game habitat, and the reduction of hazardous vegetation while facilitating easier travel through brushy country (Keeley 2002:310-312).

It seems reasonable to state that much of the landscape was "type converted" from shrublands to grasslands and much of that landscape has been maintained by European-American land management practices (Keeley 2002:303).

Fauna

A variety of upland game resides in this portion of the Diablo Range. Large mammals include two species of deer; California mule deer (*Odocoileus hemionus californicus*) and Columbian black-tailed deer (*O. hemionus columbianus*) (United States

Department of the Interior 1985:37; Pine 1989). Other fauna and avifauna are mountain lions (*Felis concolor*), golden eagles (*Aquila chrysaetos*), and prairie falcons (*Falco mexicanus*) (United States Department of the Interior 1985:40). Valley quail (*Lophortyx californicus*) occur throughout the region with the highest densities found in grassy openings within the chaparral and the annual grassland/shrubland zones (United States Department of the Interior 1985:39), similar to the conditions at CA-FRE-1331. Nonnative feral pigs (*Sus scrofa*) also inhabit the study area.

Faunal analysis completed by Paul E. Langenwalter II (1986) for nearby site CA-FRE-1333 also offered insight to the present animal environment. Analysis indicated that the predominant species at the site were deer and rabbit (*Sylvilagus* sp. and *Lepus* sp.), along with the expected Rodentia remains of mice and pocket gophers (*Thomomys bottae*) (Breschini et al. 1986:77, 79). A large amount of wood rat (*Neotoma* sp.) specimens were also recovered (Breschini et al. 1986:85-88). Overall, the vertebrate sample from CA-FRE-1333 indicated that the present day climate and habitat regime for that part of the study was the same today as during the Indian occupation of the site (Breschini et al. 1986:78).

ETHNOGRAPHIC SETTING

Precontact Central California Indians

The Northwestern California and Southern California subareas are "seen as adumbrations of the larger Northwest Coast and Southwestern culture areas," thus the Central California culture area "stands as the most distinctively Californian" (Heizer 1978a:3). Some of the key components that define the area are reviewed below.

Languages. At least 64, and perhaps up to 80 different languages were spoken in pre-contact California, each language having numerous dialects (Shipley 1978:80). The oldest identifiable language group in California appears to be the Hokan (Shipley 1978:81). Prior to 12,000 years ago, California was occupied by speakers of languages unknown (Moratto 1984:543). With the possible exception of Yukian, Hokan is the oldest known language stock in California (Moratto 1984:536). Even without glottochronological dates, "linguistic geography and internal differentiation attest to great time depth for the Hokan stock in California" (Moratto 1984:536). Most likely California was a Hokan speaking province until 4,000 years ago (Moratto 1984:551). Taylor (1961) proposed that Hokan speakers were the first to settle California, and there is both archeological and linguistic evidence that "the Hokan dispersion occurred well before 10,000 years ago" (Moratto 1984:543; Hopkins 1965). Moratto (1984:544) has suggested that pre-Hokan languages may have been associated with PaleoIndian and Archaic archaeological assemblages like the Western Fluted point tradition and the development of the Western Pluvial Lakes Tradition (WPLT) with its regional variants. Washo, Salinan, and Chimariko languages have their Hokan roots "so deep that specific ties with other Hokan languages are difficult to establish" (Moratto 1984:536).

The Coast Ranges south of Monterey Bay were held by ProtoSalinan peoples (Moratto 1984:551). The Salinan language has three variants: Migueleño, Antoniano, and a third possible dialect Playano, with approximately 2,000 total speakers at contact (Shipley 1978:86). In the Santa Barbara Channel area, the late Early Period transition from the archeological manifestations of the Encinitas to Campbell Traditions may reflect the "continuity of Hokan populations and the gradual evolution of a maritime economy" (Moratto 1984:551). The Chumash expanded both along the coast and inland as far as the edge of the southern San Joaquin Valley. The widespread presence of the Campbell

Tradition indicates that "Chumashan peoples were widely established in their ethnographic homeland earlier than 2,000 years ago" (Moratto 1984:558). The Chumashan language family had no less than six languages with approximately 10,000 total speakers (Shipley 1978:86).

Hokan languages compared to Penutian languages lie much deeper in time, a fact paralleled by their geographic discontinuity. Hokan languages are dispersed "like a broken chain around the margins of the compact California Penutian heartland" (Shipley 1978:85). The Hokan area was probably disrupted by the incursion of Penutian spreading through the great central valley, which marginalized Hokan speakers (Shipley 1978:81). A "Penutian migration" into California may have comprised several separate events, not just a single migration (Elsasser 1986:20). Penutian speakers appeared in Central California as early as 5,000 years ago, and Penutian speaking Costanoans were in the San Francisco Bay, Santa Clara Valley, and Monterey Bay areas by 4,500 to 2,000 years ago (Levy 1978). Circa 4,500 years ago, an Utian population (ancestral to the Miwok-Costanoan group) is thought to have entered the lower Sacramento Valley. Linguistic geography and archaeological continuities suggested that "the advent of the Utian speech community in central California may relate to the early Windmiller Pattern" (Moratto 1984; Breschini et al. 1983). The earliest occurrence of the Windmiller pattern is at site CA-SJO-68, dating to 4,400 years ago (Moratto 1984:552).

The Penutian Stock gave rise to the Yokutsan language family, some 40 to 50 tribes each with a distinct dialect approximating eighteen thousand total speakers. The plains and foothill Yokuts spoke different dialects, probably a factor of "physiographic isolation and of close association between foothill peoples and their non-Yokuts neighbors to the east and west; the Western Mono and Salinan, respectively" (Kroeber 1925:487; Preston 1981:41). The Penutian stock also generated an Utian language family, with Miwok and Costanoan subgroups. There were eight languages within the Costanoan subgroup (after Levy 1970), divided into the Northern Division (Karkin, Chochenyo, Tamyen, Ramaytush, and Awaswas) and Southern Division (Mutsen, Rumsen, and Chalon) (Shipley 1978:83-84). Esselen (Hokan-speaking) territory was "greatly reduced as a result of Costanoan expansion," limited to a small enclave south of Monterey Bay about 2,000 years ago (Moratto 1984:558). By European contact, the Esselen language was spoken by a few hundred people (Shipley 1978:86).

Despite affixing physical boundaries to language distributions and making ethnic inferences about the populations that resided in these areas, these boundaries were not permanent. Boundaries were "rather arbitrary or indefinite, tending to merge gradually, especially between peoples with strong social ties" (Moratto 1984:531). For example, Foothill Yokuts and Southern Sierra Miwok often intermarried and lived in mixed villages near a common border (Moratto 1984:534, from Broadbent 1964).

Social Structure. The notion of the "Tribelet," akin to "village community," was coined by A. L. Kroeber and meant to define the most "basic, autonomous, self-governing, and independent sociopolitical group" (Heizer 1978a:5). The tribelet in California was the most commonly identifiable social structure across different ethnic groups. Tribelets could be a combination of family and household groups, comprised of parents, children, "collateral, lineal, or affinal relatives, and sometimes non-relatives" (Bean 1978:673). In central California, patrilineal organization was the norm (Bean 1974:15). An average number of persons in a tribelet could approach 200, although tribelet populations seemed to have ranged from about 50 to 500 persons. Larger tribelets "usually had several permanent villages; frequently these were located in close proximity to one another" (Gibson 1983:89). Typically, a central town or village served as a political, ceremonial, and economic center, with several other smaller and subordinate settlements supporting the central village (Bean 1974:15, 1978:674).

Ceremonialism. Ceremonialism "touched upon almost every aspect of life in California" because it was in this context that the various "ecological and social subsystems articulated" (Bean 1974; Blackburn 1974:110, 1976:242). There were few occasions during the course of a year when the life of an average person was not directly or indirectly affected by its social or economic impacts (Blackburn 1976:233). Ceremonial events were common, as with the Chumash: "birth, the naming of children, adolescence, the drinking of toloache, marriage, illness, wakes, a chief's birthday, the appearance of rattlesnakes in the Spring, the completion of the harvest in the Fall, and the summer and winter solstices," even for raising money for a chief or dancers (Blackburn 1976:233). For the Yokuts, the Tucuyu and Dumnah groups would dance in wake ceremonies for the Kahwatchwah group at their village of Kahwahchu (Latta 1949:16). These types of mourning anniversaries/ceremonies were held every one to three years (Blackburn 1974:99), and although every mourning anniversary usually involved three different tribelets, such occasions normally attracted spectators from a larger geographical area (Bean 1974; Blackburn 1974:100). Moiety exogamy, as with Salinan and Yokuts groups, was associated with ritual reciprocity and served to define potential marriage alliances as well as "religious, economic, and sometimes military associations" (Bean 1974:18, 1978:676). There were also "pseudo-moieties" that participated in social and ritual activities, but these groups did not control economic exchange similar to groups in south-central and southern California (Bean 1974:19).

Ceremonial exchanges within and between different social groups served a "functionally significant context for a wide range of forms of social interaction in California" and was "frequent, intense and colorful" (Bean 1976:242). Prescribed social interaction within a well-developed economic system was important for "exploiting economic resources in the area," thus increasing resource allocation and expanding the "amount and diversity" of energy potential between tribes and tribelets (Bean 1974:18, 1976:105, 1978:675). Trading, ritual, and military alliances seem to correlate with ecological parameters over all of California and these linkages helped to create "very extensive social networks between neighboring groups" (Bean 1974:18, 1978:675). In central California, alliances involved "at least three tribelets, whose ecological potential was mutually useful - for example, as ocean, river, foothill, and mountain peoples allied for mutual exchange and protection" (Bean 1978:675).

Cross tribelet interfacing usually involved people within a radius of fifty to seventy-five miles for ritual or trade feasts, bringing several hundred to several thousand people together into a single temporary community (Bean 1974:18, 1976:104, 1978:675). These communities served as centers for intense sociopolitical and economic interaction. The "economic equilibrium" maintained through this network involved dozens of villages or tribelets, commonly two or more tribal groups, and several ecological zones (Bean 1974:18, 1976:105, Bean 1978:675). A community of this type probably existed at the village on the Coalinga plain, ethnographically known as *Posa Chana* (Latta 1949, 1977) and perhaps referred to ethnohistorically as *Chene* (Gibson 1983). Here ceremonialism was crucial to the interface between different ethnic groups, creating a "significant nexus of intra- and intersystemic articulation" and playing an important role in the expression of cultural processes (Blackburn 1976:228). In precontact central California this "equilibrium between resources and population" was attributed to a complex system of socioeconomic checks and balances (Bean 1974:15).

Economics and Trade. Organization of inter-village exchange systems were "an expression of the profit motive on the individual level, and the operation of the law of supply and demand" (King 1976:296). Shell beads made from *Olivella biplicata* were used as a form of money as well as status. *Olivella* callus beads were accessible to everyone regardless of ascribed status in most areas of California. These "money" beads apparently could be used by anyone in trade in exchange for goods (King 1978:60).

Disk and cylinder beads made from stone and the walls of certain shells were used differently from "money" beads. These types of beads had a value resulting from the costs of manufacture but they were not considered "money," rather as "decorative" beads. These beads were status items used to validate high social status involved in "lag" time exchange (King 1978:60). By "lag" time, this meant that the medium of exchange for 'decorative' beads did not demand instant reciprocation as with "money" beads. Regular "money" beads had no "lag" time; there was an instant exchange of goods/materials/services (King 1978:60-61). This type of bead system in California developed over thousands of years, ultimately reaching beyond the California culture area (Gifford 1947). Towards the end of the Late Period circa A.D. 1700s however, the California bead system had reached its height of complexity (King 1978:62).

Trading between tribes occurred on the occasion of friendly visits or as participants in a ceremonial performance, generally to which outsiders were invited or villages of different tribes situated near a common border (Heizer 1978:690). Social status and prestige were inherently involved in the trading that took place, especially when "different tribal elements got together for a ceremonial performance" (Heizer 1978:690). Contrary to a strictly Marxian materialist interpretation (noneconomic determinism), trading occurred for other reasons beside economic profit. Lineages and clans made alliances for material purposes but also made alliances to retain political autonomy, to assure that the lineage or clan could continue to live on as a self governing, autonomous group, and "not be decimated or destroyed as a distinct corporate and political entity by aggressive and hostile outsiders" (Dalton 1977:208).

King (1976:318) demonstrated how between group exchange behavior within an area resulted in "regularities in ethnographic, historic and archaeological data." He further hypothesized that economic behavior varied between populations as a result of "the efficient adaptation of each population to its particular environmental arrangement of critical resources" (King 1976:290). Further, between group interaction resulted in the accumulation of more resources than the members of a local group could consume, thereby creating a production surplus of exchange goods for transportation and marketing (King 1976:290). Despite the economic and social advantages of interethnic trade, two key factors restricted a "free and reciprocal exchange of goods" between neighboring groups: geography and hostility (Davis 1966:13).

The Chumash were one of the most sophisticated trading groups in California. They maintained a "market economy" with standardized and portable mediums of exchange used to purchase subsistence materials, most manufactured goods, and other services (King 1976:289). There was variability in the environmental settings for the Chumash, categorized as Inland, Mainland Coast, and Island. This variability allowed for different resources to be exploited by the Chumash in each zone for exchange with other groups. The Mainland Coast and Island settings were very similar in environment and available resources, but the Inland area was different: "a mountainous landscape with small areas of relatively flat bottom-lands" supporting valley oak and various grasses (King 1976:290). Moving from the valley bottoms up onto mountain slopes, the vegetation changed from grasses and oaks to a zone of sage, or chaparral, or toyon and groves of live oak (King 1976:291). Trade between the Island Chumash and the Inland Chumash included whole shells and otter skins in exchange for acorns and finished beads, respectively (King 1976:292-293).

Resource Procurement and Resource Management. Throughout various seasons of the year "parties went out from the villages to temporary camps at scattered locations in the tribelet territory to engage in fishing, hunting, and collecting of plant foods" (Gibson 1983:89). This pattern of resource utilization became part of a regular seasonal round in different ecological areas. For instance, the Oak Woodland-Grassland area exists at a higher elevation (1,000 to 4,000 feet above sea level), bordering on a grassland at a lower elevation. The Oak Woodland-Grassland regime is similar to the lower grassland zone, except with trees and brush interspersed throughout the landscape. This type of ecotone was "probably the most important California floral zone for the Indians" because it produced large quantities of acorns and grass seed while providing both forage and browse for larger game (e.g., deer) (Baumhoff 1978:18). The forage and browse areas could be refreshed as needed to attract more game animals because fire management was practiced by native Californians (Barbour et al. 1993:168; Blackburn and Anderson 1993).

A wide variety of oak trees and shrubs provided a wealth of acorn types from which the Indians could choose. Twenty species of oaks were identifiable to the native Californians, but only nine were of "economic importance:" Tan or Tanbark oak (*Lithocarpus densiflorus*), Valley oak (*Quercus lobata*), Oregon oak (*Q. garryana*), Blue oak (*Q. douglasii*), Scrub oak (*Q. dumosa*), Canyon or Maul oak (*Q. chrysolepis*), Coast live oak (*Q. agrifola*), Interior live oak (*Q. wislizenii* var. *wislizenii*), and "especially" California black oak (*Q. kelloggii*) (Barbour et al. 1993:170). The Scrub oak (*Q. berberidifolia*) was also used by Native Californians (Hickman 1993:661; Baumhoff 1978:16). Oregon oak is not present in the study region. Central and Northern California are arguably richer in their acorn crop production in comparison to southern California (Baumhoff 1978:18). In a discussion of the South Coast Range culture area, Baumhoff (1978:21) pointed out that the region receives less rainfall than the North Coast Range, therefore, the South Coast Range consists mainly of Southern Oak Woodland (as described by Munz and Keck 1959:16) and thus has an economically inferior acorn crop. The acorns of the Coast live and Engelmann (*Q. engelmann*) oaks were less desired by Native Californians as a food product (Baumhoff 1978).

Other nuts, seeds, and berries also constituted a large part of the Native Californian diet. Pine nuts from the foothill pine (*Pinus sabiniana*) could be eaten "raw, roasted, boiled, or pounded into a rich, dark, oily butter" (Barbour et al. 1993:176). Pine nuts collected in October were already mature and roasted for consumption; nuts collected in June were green and eaten fresh (Barbour et al. 1993:176). Pine pitch was used as an adhesive, sealant, and even an antiseptic. It could also be boiled into a tea to cure "colds, rheumatism, tuberculosis, flu, indigestion, fever, nausea, kidney and bowel disorders," and even used as an eyewash (Barbour et al. 1993:175). Seeds of native shrubs and bunchgrasses were also important. Large quantities "could be obtained and stored for long periods of time," like chia (*Salvia columbarie*) for example (Barbour et al. 1993:167). Berries were food by itself, but also could be added to other food products or could be made into beverages. Manzanita (*Arctostaphylos* sp.) berries were versatile and nutritious, and they could be ground into a powder for bread or mush. A Manzanita berry cider was also made by grinding the berries into flour: the seeds and skins were removed first, ground into flour meal and then saturated with water. Like coffee grounds, water is passed through the saturated meal to make a "delicious beverage" (Barbour et al. 1993:174). Roots, bulbs, and tubers were common "associates" of bunchgrasses in coastal prairie, Central Valley prairie, and foothill woodlands (Barbour et. al. 1993:169). These items were used for food and other various products. For example, wild onions (*Allium* sp.) and soap plant (*Chlorogalum* sp.) were frequently harvested. Soap plant bulb hairs were used for brushes; the bulbs were used for soap, a fish toxin/stunner, or could be eaten after roasting the bulbs for at least 36 hours (Barbour et al. 1993:175).

Staple foods in California were typically acorns, fish (with other sea foods), and large to small mammals (Baumhoff 1978:16; Heizer 1925). Secondary or "emergency" staples were buckeye (*Aesculus californica*) and chia (*Salvia* sp.) (Baumhoff 1978:17). Buckeye was the "true emergency staple" throughout California, apparently only eaten in times of starvation. The poison was leached out by pouring water over the seeds. Chia, or sage seeds, was "plentiful in the South Coast Range and along the coast from Point Conception to San

Diego" (Baumhoff 1978:17). It was "well liked" but was not necessarily a primary staple because in some areas it was difficult to harvest enough seeds and properly store them to last over a long period of time (Baumhoff 1978:17; Timbrook 1986).

Postcontact and Missionization. The exploration of North America in the sixteenth century led to the eventual colonization of Alta California by Spain in the mid to late eighteenth century. Native plant and animal regimes also changed quickly in the face of European contact. Ecological systems adjusted to evasive nonnative species and the subversion of native management practices. As part of the colonization process, the Catholic Church created a Mission system in New Spain to incorporate, convert, and acculturize the native populations. The process of the displacement of native peoples highlighted how interconnected the change of indigenous cultures was tied to the decline of native vegetation and ecosystem management (Barbour et al. 1993:182). The native peoples were viewed by the Europeans from a variety of perspectives: curiosities, savages, labor, souls in need of salvation, but rarely as equal human beings. Consequently, Spain's Indian policies in California were "a mixture of economic, military, political, and religious motives" (Castillo 1978:100).

In A.D. 1771 Mission San Antonio de Padua was established by Father Junipero Serra in the heart of Salinan territory (Phillips 1993:32). Mission San Antonio was one of the first missions created for the conversion of the large native population in the region, but it also functioned as a "prosperous cattle and sheep ranch until the Mexican period" (Schuyler 1978:70). Twenty years later, the Mission Nuestra Senora de la Soledad was founded (1791) near the Esselen-Salinan linguistic divide, and in A.D. 1797 Mission San Miguel was created to recruit the northern Chumash and remaining Salinan populations (Phillips 1993:44).

Mission Soledad had a large Chumash, Salinan, and Esselen population, as well as 700 Costanoan/Ohlone probably of the Chalon subgroup "from the Gabilan Range on the eastern side of the Salinas Valley" (Elsasser 1986:10). Both the Indians and colonists at Soledad endured harsh weather conditions and other adverse factors, including an epidemic in A.D. 1802 (Schuyler 1978:73).

By the early nineteenth century many of the missions ceased to expand, largely due to the fact that the missionaries were running out of local native populations to recruit from (Phillips 1993:45). In A.D. 1805, Mission San Antonio had only 1,296 neophytes in residence; Mission Soledad fell to 688 (Phillips 1993:45). A diminishing labor pool combined with the inherent contradiction of the Franciscans' vow of poverty (especially in the face of driving one of the most profitable ventures in world history) complicated the Mission mandate (Cleary 2001). Very few native coastal settlements and *rancherias* were still occupied after A.D. 1805. The decline of the coastal population forced the Franciscans to "increasingly probe the interior for mission recruits" (Phillips 1993:45). Most Southern Salinan rancherias were abandoned by A.D. 1807 to 1810, and San Miguel Mission began baptizing Yokuts speakers after A.D. 1813 (Gibson 1983:90). Between A.D. 1813 to 1816, San Miguel and San Luis Obispo baptized many Southern Valley Yokuts from Tulare Lake to Buena Vista Lake (Gibson 1983:90). Father Juan Martin of Mission San Miguel "journeyed to the village of Cholam of the Tachi (Yokuts), seeking from the local leader, Guchapa, children to take back to the mission;" Father Martin was denied his request (Phillips 1993:46). Similar expeditions were made earlier in A.D. 1804 to *Bubal*, the main village of the Wowol Yokuts (Phillips 1993:46).

As the missions became secularized and economics demanded more labor from a shrinking labor pool, the recruitment expeditions into the Central Valley became more common and more brutal. Several of these expeditions were documented. From A.D. 1800 to 1830, large scale, well organized military expeditions sought fugitive neophytes from the missions and new Indian labor recruits, with punitive measures taken against mission escapees once caught. Then during A.D. 1830 to 1848, smaller scale, more frequent forays (military and nonmilitary) "of the character of private retaliatory incursions and slave-hunting raids" became more common and increasingly brutal (Cook 1943:2, 5). Pico's expedition to the San Joaquin and Kings Rivers, and Rodriguez' journey to the San Joaquin River and Buena Vista Lake are prime examples (Cook 1962:181-186).

Widespread Indian resistance by the mid A.D. 1810s changed native systems of internal and external tribal relations, as well as warfare tactics (Cook 1943:33). By the end of mission secularization, the Indians' defensive stand against colonists' had turned into an offensive approach (Cook 1943:34). An enormous number of horses, cattle, and other commodities were taken from settlers and eaten by the natives of the interior; thousands of animals were "rustled" for survival (Cook 1943:23, 1962:186-192). By A.D. 1840 to 1845 the peak of Indian resistance ended with the steady stream of American emigrants (Cook 1943:36).

The keys towards understanding native Californian population decline were homicide, disease, and starvation (Cook 1943). Disease itself was not a serious factor in population decline, save that the missionization experience bred diseases and increased their spread. Climate change (relative to the relocation of Indians) and food spoilage/contamination at the missions increased susceptibility to disease (Cook 1943:14).

After the mission era, however, outbreaks were more commonly reported (Cook 1943:14). Until the A.D. 1830s, the most common disease was syphilis, but then there was the "pandemic" of A.D. 1833. This outbreak was probably not smallpox or malaria; it may have been cholera and/or typhus (Cook 1943:14). Starvation was also not a major factor in demographic decline, revealing only one documented report of "starving Indians" in the Central Valley (Cook 1943:23). If anything, the "disruption" to native Indian ways was probably the greatest factor on population decline (Cook 1943:24). Disruption entailed four components: 1) destruction of property, 2) desertion of established villages, 3) captivity and removals (which led to a kidnapping "industry" by A.D. 1848), and 4) the internecine struggle (Cook 1943:24-30). The disruption of native lifeways is reflected not only in the documentary record but in the archaeological record as well. Howard (1970) excavated three middens that may have been associated with a former rancheria in existence prior to the Mission San Antonio de Padua settlement, and the change in Salinan culture was apparent: archaeological remains demonstrated a retention of use of some native wild plants but also a "marked dependence" on European introductions such as pigs, cattle and sheep (Schuyler 1978:70).

Southern Valley Yokuts

Distribution. The Yokuts in the vicinity of CA-FRE-1331 were either of the Tachi group or Kahwatchwah group. The Tachi were "one of the largest of all Yokuts divisions," the western limits of their territory reaching "to the Mount Diablo chain of the Coast Range" (Kroeber 1925:484). According to research by the Yokuts ethnographer Frank F. Latta, the CA-FRE-1331 study area is "on the edge of the Tache (also Tachi) Yokuts territory" (Breschini et al. 1986:18; Latta 1977:141). The Tachi villages of *Holon*, *Udjiu* (*Posa*

Chana), and *Walnau* lied along a major trade route between the San Joaquin Valley and the coast. This route led west from *Posa Chana* near Coalinga and through Los Gatos Canyon, then forked to the location of both present towns of San Benito (down San Benito River) and King City (down San Lorenzo Creek) (Latta 1949, 1977:316).

Kroeber was able to identify only two ethnic groups for the upper west side of the San Joaquin Valley: the Tulamni Yokuts and the Tachi Yokuts. These people inhabited the areas west and northwest of Tulare Lake and the Kings River, and of these two groups the Tachi preferred to cross to the east side of Tulare Lake towards the Sierra Nevada when summer came, rendering their winter habitat "a virtual desert" (Kroeber 1925:476).

During Kroeber's era, there were few details to accurately ascribe the west side to the Tachi Yokuts. Faced with a lack of conclusive data, Kroeber tentatively concluded that the area "belonged to the Yokuts, though in default of precise information it has sometimes been attributed to the Costanoan people or the Miwok" (Kroeber 1925:476). He also concluded that due to the ethnographic "doubt" centered around the ethnic ownership/management of the area, the west side region must have been an "unimportant occupation," visited only by a few Yokuts as part of a seasonal resource collection strategy (Kroeber 1925:476). Interestingly, United States military reports from exploration efforts in the San Joaquin Valley around A.D. 1856 describe a change in the main village location for the Tachi Yokuts, moved "now on the northwest shore of the lake," probably as a result of past missionization pressures (Farquhar 1932:35).

According to Kroeber, the Tachi (or Tache, Tadji, Dachi) "wintered at Udjiu, downstream from Coalinga, and at Walna, where the western hills approach the lake. Golon (Huron) was theirs. In summer they crossed to the east of the [Tulare Lake] outlet and gathered seeds in the neighborhood of Lemoore" (Kroeber 1925:484). *Udjiu* was located at the confluence area of three creeks: Jacalitos, Los Gatos, and Warthan (Wallace 1990:4, 1995). The Tachi Yokuts lived there "most of the year," with a population of several hundred (Wallace 1990:4, 1995). The Tachi also met with "Salinan-people from various Coast Range villages" at *Udjiu* to trade for nonlocal goods (Milliken and Meyer 1997:54).

The Kahwatchwah Yokuts had villages along Los Baños Creek, "from the valley floor westward into the hills, as well as occupying, or at least occasionally utilizing as a resource exploitation zone, the hills south from Los Baños Creek to Panoche Creek" (Breschini et al. 1983:478). The Hoyumne Yokuts resided across the San Joaquin River from the Kahwatchwah Yokuts (Latta 1949, 1977). The Yokuts tribe immediately to the south of the Kahwatchwah were the Tucuyu (possibly a subgroup of the Kahwatchwah), who inhabited the area from the present day Firebaugh area to Tranquility, practicing the same basic resource exploitation patterns as the Kahwatchwah (Latta 1949, 1977:146). It has been assumed in the ethnographic record that the western limits of these tribelets were the ridges separating the San Joaquin Valley watershed from that of the coast watershed, however, there are "no specific references in the available literature which would prove or disprove this" (Breschini et al. 1983:478).

Housing. Kroeber (1925:521-522) was able to identify at least five types of Yokuts housing. The *kawi* was a communal house, mat-covered with a shade porch, and could hold up to ten families (may have been used by the Tachi). The *dumlus* was a Yowlumne house similar to a *kawi.* A *chi*, or *te*, was an elliptical or oblong house with rounded ends, and approximately twelve feet long (used by the Tachi). The *te*, a winter house of the Yaudanchi, was conical in shape with an open top for a smoke hole, and made with tule. A variant of the *te* was used in the hills in the summer, called a *samish*, and was similar to a *te* but built with bark instead of tule.

Tachi Yokuts above ground houses (*chi*) were typically elliptical or oblong in shape with rounded ends. The basic form consisted of a ridgepole with two posts, five poles on each side of the ridgepole for support, and the door was on one side of the front post. An alternate method of construction included no ridgepole, rather the support poles were bent all the way over from one side of the house to the other or were lashed together. As described above, these houses were generally twelve feet in length and were covered by tule mats (Kroeber 1925:521-522). Less permanent and smaller structures (*samish*) were built by the Tachi when camping or traveling in the hills during the summer. A sun shade called a *ch'iniu*, a flat roof on posts, was utilized by practically every Yokuts tribe (Kroeber 1925:522). A modern ethnographic example of a house constructed by Yokuts descendants (circa A.D. 1929) resembles the *chi* style of house, but is semi subterranean (Latta 1976:56).

Subsistence. Kroeber recognized the importance of the seasonal round in resource exploitation and its relation to the Yokuts' environment. The dry and hot summers made "an outdoor life in the hills, near the heads of vanishing streams, a convenience and a pleasure" which coincided almost exactly with the opportunity to hunt and gather the various natural resources as they became available (Kroeber 1925:523-524). Edible plants were varied and abundant along the foothills and streams, including clover, peppergrass, fiddle neck, mustard, filaree, and many grasses (Preston 1981:35).

Ethnographically, one species of oak stood out as "relatively important" to the Yokuts: Valley oak (*Q. lobata*) (Wallace 1978b:414). Purportedly the acorns from Tanbark oak were "considered superior" to the acorns of other oaks because of the whiter meal that it produced (Levy 1978:491). Acorn mush from the Blue oak (*Quercus Douglasii*) was regarded as having a very bitter taste to the Yokuts palate (Gavin 1992:4). The Yokuts also utilized foothill pine (*Pinus Sabinia*) nuts. This resource stood second only to acorn use, harvesting the green pine cones late in the summer, roasting them, and then removing the seeds for storage and use during the winter months (Gavin 1992:12). Junipers (*Juniperus californica*) provided berries that were eaten fresh, or gathered for drying and added into acorn flour (Gavin 1992:6). Manzanita (*Arctostaphylos*) berries were also used, ground into a pulp and mixed with water to make an unfermented cider. The burnt roots of the Manzanita were used as the base for black dye in basketmaking (Gavin 1992:8). Chamise (*Adenostema fascilatum*), a "common" chaparral plant, surprisingly had several diverse uses. The leaves were used to make a poultice, the bark was processed to make a medicinal tea, and root splinters were fashioned to make drills for steatite bead manufacturing (Gavin 1992:13). In fact, this same kind of drill tool may have also "been used with clam shell disk bead production" (Gavin 1992:13).

The Yokuts ate a variety of game and fish. Large mammals like elk, pronghorn, and deer, to small mammals like jackrabbits, were eaten (Latta 1949, 1977:721). Anadromous (spawning) fish like steelhead were available only along the San Joaquin River (Baumhoff 1978:17; Wallace 1978b:449-450, 1978c:464). Interestingly, the Yokuts ate dogs regarded as taboo food in nearly all other parts of California (Kroeber 1925:526).

Trade. Proper food resource utilization by the Yokuts generated a food surplus that could be used in trading. One of Latta's (1949, 1977) informants, Yoi-mut (a Chunut Yokuts from northeastern Tulare Lake region), related that the Yokuts used to trade fish, *kots* (obsidian), salt from saltgrass, seeds, and *kuts* (beads) for whole sea shells and shell beads of *Haliotis*, clam and *Olivella* from coastal peoples (Latta 1977:729).

Trips were made into Costanoan territory, as well as Salinan and Chumash territory, specifically for trade (Sample 1950:4). As mentioned above, the Yokuts supplied "obsidian, fish, salt grass salt, some seeds" and piñon nuts to the Costanoan (Sample 1950:20). In return, the Yokuts received shell beads, unworked shell, and fish (Sample 1950:20). Apparently, the raw shell trade between the Salinan and the Tulare Lake Yokuts, specifically the Tachi and Wowol, was of key importance to both groups (Sample 1950:21, from Gayton 1948). According to ethnographic data, the Tachi Yokuts controlled the shell trade at *Udjiu* and they did not allow traders from the west up to the shores of Tulare Lake (Latta 1977:728). *Udjiu* was later renamed *Poso* (or *Posa*) *Chana*. The official renaming comes from *poso*, a Spanish word meaning springs or wells. The word *chane* comes from the name of a Yokuts Indian chief (Padgett et al. 1976:151). *Chane* might also refer to a Salinan place-name (Gibson 1983). Ho-En-Nick, a Yokuts ethnographic informant (Werlof and Vierhus 1956a:66), suggested that *Udjiu* was the Tachi Yokuts tribal center and people went into the nearby foothills and mountains for food and raw materials (Wren 1987:61-62). Raw material goods such as wood and stone were in short supply in the Tulare Lake region, and therefore important acquisitions for the Yokuts (Wallace 1978b:451).

Trade continued and thrived after European contact. In the early to mid A.D. 1800s, the Yokuts derived at least part of their supply of currency manufactured from shell disks acquired "through visits to the ocean" (Kroeber 1925:498). Documented accounts of these expeditions are readily available (Pilling 1950). One journey in particular had several observers: Indians that traveled from the Central Valley to the Central Coast. Written accounts from a Daniel Hill stated that the Tulare Indians came to Monterey once a year (twenty to thirty males and females) on foot, bringing panocha (or "thick sugar") and tobacco chew (mixed with pine nuts and lime) (King 1976:305-306). Another account from a Spanish priest, Antonio Ripoll, remembered parties of twenty or thirty men and women arriving once a year on the coast with a thick sugar called panocha. It was made from honeydew and sweet carisa cane with wild tobacco mixed with lime, and it was chewed (Phillips 1993:29). These accounts are probably describing the same phenomenon, but the details about panocha are confused. Although documented historically, whether or not these coastal excursions were held prior to European influence is unclear.

Contact. The forcible removal of the Indians from their lands had far reaching effects. Some Yokuts taken to Mission San Luis Obispo eventually adapted to mission life and embraced their new home. After the secularization of the missions most Indians returned to their native lands but "a new generation had grown up, to whom the old mission was their home" (Powers 1877:382). These former Mission Indians began to make annual "pilgrimages" to San Luis Obispo, where they would remain about a month (Powers 1877:382).

In the Central Valley, colonial influences upon the Yokuts were gradual at first, beginning around A.D. 1770 with the entrance of Spanish missionaries along the coast and the "infiltration of a very few foreigners into the valley" (Cook 1955:31). This pattern of incursion increased over the following three decades, coinciding with a steady increase of more excursions to obtain labor and souls, resulting in more violence between native Californians and colonists (Latta 1977:723-724). In the Tulare Lake region alone (Tachi, Chunut, and Wowol Yokuts), the estimated aboriginal population of 6,500 individuals fell to less than 1,100 individuals by A.D. 1852 (Cook 1955:40, 45). The mission records use the terms "*tulareño*" or "*en el tular*" to describe the Yokuts Indians from the Central Valley (Gibson 1983:90). Diseases from European contact also affected mortality rates. Ethnographic data from Powers (1877:380) described a "terrible plague" that affected both sides of the Fresno River taking thousands of lives. According to his account it was a "black-tongue disease" (Powers 1877:380), probably cholera.

Costanoan/Ohlone

Distribution. To begin, Teixeira (1997:4) explained the term "Costanoan/Ohlone" very well, in that the use of either is a misnomer. The term Costanoan was given to the coast-dwelling Native Californians that the Spanish explorers encountered, generically calling them "Costanos." *Ohlone* was actually a single tribelet of Costanoans, but was used by the anthropological community during the late A.D. 1960s until the A.D. 1990s to replace the misnomer "Costanoan."

The Costanoan/Ohlone tribelet closest to the vicinity of CA-FRE-1331 were the Chalon Costanoan. The Chalon inhabited the region east of the Salinas River into the Diablo chain, bounded by the Salinan people to the south and west and the Yokuts to the east (Levy 1978:485). The Costanoan/Ohlone to the northwest of the Chalon were the Rumsen, and the Mutsun were to the north. Linguistic evidence suggested that the "ancestors of the Costanoan moved into the San Francisco and Monterey Bay areas about A.D. 500," probably moving south and west out from the San Joaquin-Sacramento River delta (Levy 1978:486). Glottochronological dates also seem to coincide with the appearance of Late Horizon archaeological assemblages in the San Francisco Bay area (Levy 1978:486).

The San Benito River drainage just west of CA-FRE-1331 was also occupied by the Costanoan/Ohlone (Breschini et al. 1983:479). Three Costanoan tribelets called the San Benito riparian corridor their home: the *Mutsun* (lower river), *Pagsin* (middle river), and *Chalon* (upper river) (Breschini et al. 1983:479). Based upon available archaeological and ethnographic research, the Costanoan interface with Yokuts groups can be placed "along the ridges which separate the drainages of streams flowing into the San Joaquin Valley from those which flow into the San Benito River system or into the Salinas Valley" (Breschini et al. 1983:479). This ecologically defined ethnic/linguistic boundary may be less than exact in its definition, however, especially as new research becomes published (Milliken 1995; Breschini 1999, personal communication). Interestingly, Costanoan mythology is closely related to that of the Yokuts and Salinan, especially with regards to creation stories (Levy 1978:490).

Some researchers believe that the contact-era native population on the west side of the San Joaquin Valley was not Yokuts, but rather Costanoan/Ohlone: "Costanoan-speaking tribelets inhabited the eastern Coast Range hills from Kellogg Creek near Mount Diablo south to Panoche Creek" (Milliken 1994:165). Probably by A.D. 1770, Costanoan speaking people lived in approximately fifty separate and political autonomous nations or tribelets (Gibson 1983:88). The closet group to the area described by Milliken (1994) were the "Chabant" (probably Chalon) tribelet of Costanoans, whom he believed to control the Panoche Valley. The Chalon language, one of eight branches of the Costanoan language family, was spoken in an area immediately northwest of the present day King City area and east of the Salinas River. This area also included the region around present day Pinnacles National Monument along the Chalone Creek area in San Benito County. There may have been "as many as 900 people" (Gibson 1983:88; Levy 1970:45). The Chalon southern ranged from Chalone Creek to the San Benito River; the headwaters of Tres Piños Creek delineating the eastern limit and the western limit along the east side of the Salinas River (Elsasser 1986:13-14). This group was identified in the records from A.D. 1798 to 1806 at Mission Soledad, and may possibly be the "Chapana" from San Juan Bautista mission records. The Costanoan/Ohlone residing at San Juan Bautista called the Yokuts "Yawisun" (Kroeber 1925:488). However, little is understood about the Chabant/Chapana group at this time because "detailed genealogical relationships have not been carried out for individuals listed in the Mission Soledad vital registers" (Milliken 1994:177). Information from those registers could provide the evidence to place each tribelet in a general area, but probably not enough information to delineate specific boundaries (Milliken 1994:178).

Housing. Costanoan/Ohlone houses were similar in construction to houses of the Yokuts. The structure was primarily a set of poles covered with brush or tule matting. According to Kroeber's research, there were no references to Costanoan/Ohlone construction of the earth-covered lodges of the Central Valley, but he speculated that "it can hardly be imagined that they were entirely unknown" (Kroeber 1925:468). Fiber for cordage came from milkweed (*Asclepias fascicularis*), Indian hemp (*Apocynum cannabinum*), and nettle (*Urtica* sp.). Skins were used for clothing, and the plants used in weaving were willow (*Salix* sp.), rush (*Juncus* sp.), and tule (*Scirpus* sp.) (Levy 1978:493).

Subsistence. The Costanoan/Ohlone entertained a broad-based and mixed subsistence strategy that included hunting, fishing, collecting, and seasonal rounds to small camps from a large village center (Levy 1978:485, 490-491). As in other parts of California, the Costanoan/Ohlone used controlled burns to 1) increase/stimulate seed growth, 2) keep chaparral species at bay, and 3) increase grazing area for game animals (Levy 1978:491).

Four species of acorn were identified as being relatively important to the Costanoan: Coast live oak (*Q. agrifola*) and Valley oak (*Q. lobata*) acorns in terms of their available quantities; Tanbark oak (*L. densiflora*) acorns were considered superior for their white meal, and Black oak (*Q. kelloggii*) acorns were second only to Tanbark oak acorns (Levy 1978:491). Other important nuts came from other plants like the buckeye (*A. californica*), California laurel (*Umbellularia californica*), and hazelnut (*Corylus cornuta* var. *californica*). Although these alternatives were considered "inferior" foods to the Costanoan, they were staples in times of emergency (Levy 1978:491; Baumhoff 1978:17). The nuts from the laurel and hazelnut could be eaten cooked or raw with little preparation, unlike the buckeye which could be poisonous if not processed properly. Plant foods that were roasted included dock (*Rumex* sp.), tarweed (*Madia* sp.), chia (*Salvia columbariae*), foothill pine nuts (*Pinus sabiniana*), and the ground seeds of the holly leaf cherry (*Prunus ilicifolia*) (Levy 1978:491). The Costanoan/Ohlone enjoyed a wide variety of berries to eat throughout their homeland, like blackberries (*Rubus ursinus*), elderberries (*Sambucus* sp.), strawberries (*Fragaria* sp.), Manzanita (*Arctostaphylos* sp.) berries, gooseberries (*Ribes* sp., *subgenus Grossularia*), madrone (*Arbutus menziesii*) berries, and wild grapes (*Vitis californica*) (Levy 1978:491). Edible roots and bulbs were also plentiful, there were wild onions (*Allium* sp.), cattail (*Typha latifolia*), chuchupate (*Lomatium californicum*), and the young shoots of clover (*Trifolium* sp.) (Levy 1978:491). They even ate tule (*Scirpus acutus*) pollen, rolled into balls and then baked (Levy 1978:491).

Animal foods provided most of the protein in the Costanoan/Ohlone diet. Large mammals included black tailed deer, Roosevelt Elk, antelope, grizzly bear, mountain lion, sea lion, and whale. Medium and small mammals consumed were brush rabbit, cottontail, jackrabbit, tree squirrel, ground squirrel, woodrat, mouse, mole, dog, wildcat, skunk, and raccoon. With respect to avifauna, waterfowl was most important and included geese (Canadian, snow, white-fronted) and ducks (pintail, coot, shoveler, green winged teal). Other important birds were mourning dove (*Zenaida macroura*), robin (*Turdus migratorius*), California quail (*Lophortyx californicus*), and hawks. Eagles, owls, ravens, or buzzards were taboo and never eaten (Levy 1978:491). Fish were also an important foodstuff: steelhead (*Salmo gairdnerii*), salmon (*Oncorhynchus* sp.), sturgeon (*Acipenser* sp.), and lampreys (*Entosphenus tridentatus* and possibly *Lampetra ayresi*). The Karkin had access to the salmon and sturgeon, and the steelhead ran in the San Lorenzo River (Awaswas country) and in the Carmel River (Rumsen country) (Levy 1978:492). "All varieties of reptiles appear to have been eaten," but frogs and toads were not (Levy 1978:492). Insects like yellow jacket larvae, grasshoppers, and caterpillars were common fare. Mussels, abalone, and octopus were the mollusks on the menu (Levy 1978:492).

Trade. A variety of exotics were exchanged for, as the Costanoan/Ohlone access to unique maritime and geological resources made them attractive trading partners. Nonlocal lithics like obsidian were obtained for locally procured materials. For example, certain minerals were used in body painting for various ceremonies. The white paint came from a "type of clay," and red paint came from hematite and cinnabar. The hematite source came from the Oakland Hills in the eastern San Francisco Bay and the cinnabar came from the New Almaden area in the Santa Clara Valley just south of San Francisco. The New Almaden source of cinnabar was known throughout California because of its fine quality (Levy 1978:493). In fact, conflicts arose between the Awaswas and Tamyen Costanoan groups over the right to use and control the cinnabar deposits there (Levy 1978:493).

Contact. The Costanoan/Ohlone people were some of the first Native Californians to encounter the effects of western contact. Similar impacts from Missionization as described above with the Yokuts occurred in this region, but with much harsher severity as the Yokuts were buffered by natural topography - unlike the Costanoan/Ohlone that made the coastal (i.e., "first contact") areas their home. Due to the large coastal populations at contact, several missions were created to make use of the large native labor pool. The Missions of Santa Clara, San Carlos de Borromeo (Carmel), San Francisco, San Juan Bautista, Santa Cruz, and San Jose (Fremont) were established for this purpose.

Salinan

Distribution. Salinan territory occupied about fifty miles of coast with an unprotected western exposure, bounded by the Esselen and Chumash occupied coasts, then extended inland about fifty miles into the mountainous interior (Baldwin 1972:5). Ethnographically, it was accepted that the Salinan homeland extended from the Pacific coast to the crest of the Coast Range, with the mountains of the Coast Range used as hunting grounds with no permanent settlements (Mason 1912:103). Based upon further research, however, this assumption was incomplete (see discussion below; Gibson 1983). Mason concluded that the Yokuts and the Salinan were influenced to some extent by the Chumash culture, and that the Salinan were most similar in "cultural affinities" to the Tachi Yokuts (Mason 1912:200). The Salinan, like the Yokuts, also maintained a moiety system (Mason 1918:215-219).

Kroeber's study of the Salinan also led him to conclude that their "industries and customs" were Yokuts influenced. The Salinan and Yokuts traded, visited, and interacted freely, whereas the Costanoans to the north were generally their enemies, and the Island Chumash to the south were too distant (Kroeber 1925:548). Kroeber's observations may ring true in the late prehistoric and protohistoric eras, but the possibility exists that the Hokan-speaking proto Salinans may have been more closely related linguistically and culturally to the proto Chumash (e.g., Campbell Tradition, etc.).

Religious beliefs and practices of the Salinan were substantially similar to those of the Tachi and other valley Yokuts (Kroeber 1925:549). It is likely that the Salinans participated in the Toloache cult, as the Yokuts and the Chumash (Bean and Vane 1978:662, 667-669). The Toloache was the ritual consumption of carefully processed datura seeds, ingested by young males as part of a rite of passage or shamans on a vision quest.

Housing. The basic social and domestic unit was the nuclear family (or possibly the extended family), which would live together in a house. Several houses would be grouped together to form a rancheria, or village (Gibson 1983:132). A "common" house construction for a single family was described as "quadrangular but made without excavation," approximately 10 feet by 10 feet with a post at each corner and one in the center, made of tule material (Mason 1912:126).

Subsistence. An environmental analysis of the interior Salinan region reveals oak woodland, grassland, and chaparral ecozones. Characteristic chaparral species are *Adenostoma*, *Ceanothus*, and *Quercus* shrubs (Baldwin 1972:24; Burcham 1957:92-95). Common oak woodland species include foothill pine (*Pinus sabiniana*), California laurel

(*Umbellularia californica*), buckeye (*Aesculus californiana*), and of course various oak species (*Quercus* sp.) (Baldwin 1972:24; Burcham 1957:86).

The Salinan ate a wide breadth of foods. According to Kroeber (1925:547), every "obtainable variety of fish, reptiles, birds, and mammals, with the single exception of the skunk, and possibly the dog and coyote, was eaten." The list of edible plant foods was just as diverse, including six kinds of acorns, three kinds of clover and grasses (each), two different kinds of pine nuts, six different kinds of berries, and an assortment of sunflower, chia, sages, wild oats, grapes, yucca, and bulbs (Kroeber 1925:547). Ethnographic informant Maria Ocarpia said that "The Old People" (referring to precontact Salinans) ate various "seeds and roots," deer and elk. They adorned themselves in "dresses of tule" and used baskets to gather "wild seeds, chia and acorns." (Mason 1918:117-118). According to Mason (1912:122), the Salinan also ate amphibians and so did the Northern Valley Yokuts, but the Southern Valley Yokuts did not.

The six oak species identified as being of "economic importance" were: Tanbark (*Lithocarpus densiflora)*, Canyon or Maul *(Quercus chrysolepis)*, Coast live *(Q. agrifolia)*, Black *(Q. kelloggii)*, Valley *(Q. lobata)*, and Blue *(Q. douglasii)* (Baldwin 1972:24; Baumhoff 1963:162). Tanbark, Black, and Valley oak were the most abundant varieties in Salinan territory (Baldwin 1972:26). Apparently, the acorns from live oaks were preferred for mush and those of deciduous oaks for bread (Gibson 1983:29; Mason 1912:117-121). Wild oats were a staple seed, and was claimed by ethnographic informants to have been cultivated. However, this claim was probably "applicable only to the post-mission period" (Mason 1912:120). Of the two species of pine nuts available, very little ethnographic information was collected on their type or use. One of the species was "a very common variety," most likely foothill pine (*Pinus sabiniana*), and the other was "found only in the mountains on the coast." Mushrooms were not eaten by the Salinan, though ethnohistoric reports state that they were utilized by the Costanoan and the Yokuts (Mason 1912:121).

Trade. The Costanoan/Ohlone (Utian speakers) were on poor terms with the Salinan, probably as a result of the aggressive population/linguistic displacement of the Esselen (Hokan speakers), especially as those changes migrated steadily south into traditional Salinan territory. Ethnological analysis indicated that the Salinan were "on perfectly friendly terms with the Yokuts tribes to the east, and that frequent visits were made by the former to the Tulare lakes and by the latter to the sea" (Mason 1912:108). Three main passes through the Coast Ranges were the Cholame, Panoche Pass, and Pacheco Pass, all which served as conduits for trade and social exchange (Baldwin 1972:20; Davis 1961:76). Considerable exchange existed between the Salinan and Yokuts, an "entente cordiale" evidently existed (Mason 1912:179). Overall, frequent warfare and limited trade characterized Salinan interactions with the Costanoan and only occasional warfare with the Yokuts or the Chumash (Gibson 1977:26). Beads ("*xe 'nes*" in Salinan) were trade staples manufactured for economic exchange and status development by the Salinan, as with other Central California tribes. Salinan beads were made from mussel or abalone shell in three colors, each color representing a different economic value (Mason 1912:131) (Table 1). It is interesting to note that in the Mission Indian vocabularies from San Antonio de Padua circa A.D. 1878, the Salinan word for "bead" is listed as "*kišotel*," which is very similar phonetically to the name for the bead with the highest value "*kicho 'tĕl*" (and "blue" is "'*sa xan*") (Heizer 1952). The word had apparently changed between the late nineteenth and early twentieth centuries, but

Table 1
ETHNOGRAPHIC SALINAN INDIAN ECONOMIC BEAD VALUES (MASON 1912:131)

Value	Color	Bead Name
Great	Blue	*kicho 'tĕl*
Good	Pink	*k 'mĕllĭ*
Least	White	*trĕ pĭnoctú*

in essence the meaning remained very similar. Higher status Salinan beads and ornaments were manufactured from stone steatite and serpentine sources (Hester 1978:501).

Comparisons with the Inland Chumash. Baldwin (1972:5) generalized that similarities between cultures exist because they share similar environmental regimes, in that the "environment affects the culture of peoples with a similar technological level of development." She compared the "habitat and artifacts" of the Salinan with "those of their neighbors to the east and north, but mostly with their neighbors to the south," specifically the Inland Chumash (Baldwin 1972:1). Basically the climate, landforms, and natural resources of the two groups were similar except for the coastal and island inhabitants in the Santa Barbara Channel area (Baldwin 1972:26). Population estimates for the interior Chumash area are difficult to estimate, but based upon the available data approximately one thousand inhabitants resided in the Cuyama region and "several hundred" in the Emigdiano region (Grant 1978:534). Overall, the Chumash population totaled about ten thousand, compared to the Salinan population that totaled approximately two to three thousand (Baldwin 1972:3; Hester 1978:501; Kroeber 1925:547-551).

Caution should be used, however, in simply comparing artifacts between cultures and drawing inferences. As such, Baldwin utilized a cultural ecological approach as the foundation for her analysis. Cultural ecology was able to present a "number of known factors in the environment where tools occur, against which to test hypothetical conclusions concerning apparent culture continuity" (Baldwin 1972:6). Baldwin (1972:13) used data from the only excavated Salinan sites at the time, only two of which were inland sites. These sites were Pico Creek (with separate occupations at 1,200 B.C. and A.D. 1400) and Willow Creek (occupational date of A.D. 100). Unfortunately, archaeological data from the Interior Chumash territory is largely unknown. Very few systematic excavations have been undertaken, little ethnographic information is available, and there is virtually no ethnohistoric data due to the fact that "there were no established missions to record vital statistics" (Grant 1978:530).

Baldwin (1972:56-57) examined the changes in projectile point size over time from the inland Salinan sites, as well as the differences between Inland and Canaliño Chumash. She concluded that the Inland Chumash retained the use of "larger, cruder, stemmed points not because of backwardness, but because it was ecologically reasonable" (Baldwin 1972:57). In comparison, many of the points from the Buena Vista Lake area (Yokuts) resembled Inland Chumash and Salinan (Baldwin 1972:57; Wedel 1941:Plates 38-39). Desert side notched (DSN) projectile point forms "rarely" occurred in the Coastal Chumash region, yet were common at the inland Salinan and Interior Chumash sites (Baldwin 1972:34).

Baldwin concluded that the Inland Chumash resembled the Salinans in their ecological adaptations, artifact assemblages, and general cultural patterns. Both groups differed from the Coastal Chumash in many ways, and those "similarities and differences are largely a function of their environment" (Baldwin 1972:7).

Contact. The effects of Missionization had similar devastating effects on the Salinans, as with the Costanoan and Yokuts peoples. Mission records, especially from San

Antonio de Padua, have been the main source of data about Salinan village locations and socio-political organization (Gibson 1977:15). The Mission San Antonio de Padua population "grew rapidly" and became the largest of the California missions in A.D. 1790. Salinan neophytes were primarily of the northern division (Antonianos) and a few from the coast (Playanos) (Hester 1978:503). Mission San Miguel "also expanded rapidly" relying on the population from the Southern Salinan division (Migueleños), as well as the Playanos, Yokuts, and northwest Chumash (Hester 1978:503). Ethnohistorically at least, there seemed to be very little interaction between the Northern and Southern Salinan groups (Gibson 1977:25). Ethnographic informant Maria Ocarpia said that when the white settlers came to their homelands, the Salinan people "escaped into the mountains; some died and some hid in caves" (Mason 1918:118).

ARCHAEOLOGICAL SETTING

San Luis-Little Panoche Chronology

The earliest published excavations for the Diablo Range-San Joaquin Valley region were conducted by the California Department of Parks and Recreation (DPR) for various water projects along the northwestern San Joaquin Valley (Olsen and Payen 1968, 1969, 1983; Pritchard 1970, 1983). Except for the early investigations by researchers like Gifford and Schenck (1926), Hewes and Massey (MS), Wedel (1941), and the reservoir projects from the A.D. 1960s at San Luis, Los Baños, and Little Panoche detention dams (Olsen and Payen 1968, 1969), "the San Joaquin Valley remains one of the least known archaeological areas in California" (Moratto 1984:215). This research culminated into a suggested temporal sequence for the "San Luis-Little Panoche" locality along the west Central San Joaquin Valley (Olsen and Payen 1969; Breschini et al. 1983:78).

The San Luis-Little Panoche chronology identifies at least 5,500 years of west side valley occupation. The cumulative pattern of material remains recovered from archaeological site MER-S-94 and "other western Valley sites" (discussed below) generated the San Luis-Little Panoche regional temporal sequence (Olsen and Payen 1968, 1969; Moratto 1984). There is little "early- to mid-Holocene archaeology in the Central Valley," the only representative assemblage - dubbed the Positas Complex - identified archaeologically by "perforated flat cobbles, small mortars, and millingstones" was found in Zone D at MER-S-94 (Moratto 1984:215). The Positas Complex dates from 3,300 to 2,600 B.C., and is also represented by other groundstone (short cylindrical pestles) and spire-lopped *Olivella* beads.

The next Complex is divided into two parts, Pacheco B (2,600 to 1,600 B.C.) and Pacheco A (1,600 B.C. to A.D. 300). Pacheco B is characterized by foliate bifaces, rectangular *Haliotis* ornaments, and thick rectangular *Olivella* beads. By the Pacheco A Complex, *Olivella* bead types become more diverse (spireground, modified saddle, saucer, and split-drilled) and there are more *Haliotis* ornaments as well as disk beads. The presence of perforated canine teeth, bone awls, whistles, grass saws, and large stemmed and side-notched points are typical. Both Pacheco B and A Complexes have an "abundant" concentration of millingstones, mortars, and pestles (Moratto 1984:192). The Pacheco A Complex "may reflect Yokutsan occupation, although this ascription is especially tenuous" (Moratto 1984:557).

After the Pacheco Complex series is the Gonzaga Complex, dating to A.D. 300 to 1000. This assemblage is represented by extended and flexed burials, bowl shaped mortars and pestles, squared and tapered stem projectile points, fewer bone awls and grass saws than observed in the Pacheco A Complex, thin rectangular split-punched and oval *Olivella* beads, and distinctive *Haliotis* ornaments. The Gonzaga Complex is "altogether an assemblage like that of the Delta Late Horizon, Phase I" (Moratto 1984:192). Then there appears to have been a hiatus of approximately 500 years between circa A.D. 1000 and 1500. This may reflect abandonment "due to adverse environmental conditions" (Moratto 1984:193).

The apparent cultural hiatus is followed by the Panoche Complex, lasting from A.D. 1500 to 1850. The Panoche Complex is represented by large circular structures, flexed burials, primary and secondary cremations, few millingstones, a variety of mortars and pestles, bone awls, saws, whistles and tubes, small side notched points, clamshell disk beads, *Haliotis* epidermis disk beads, and *Olivella* lipped, side ground, and rough disk bead types. The presence of these types of *Haliotis* and *Olivella* beads are comparable to those found in the Delta Late Horizon, Phase II sites (Moratto 1984:193). While the Panoche Complex, and perhaps Gonzaga, may register a Yokutsian presence, "the earlier complexes are not easily linked to any particular ethnic or linguistic groups" (Moratto 1984:193).

Based on the excavation results from the west side of the San Joaquin Valley, Olsen and Payen (1969) "concluded that the western edge of the Valley was long occupied by groups basically oriented to an acorn-gathering and hunting economy" (Moratto 1984:193). The data recovered left "little doubt" that Kroeber's conclusions lacked the necessary demographic data to make the claim that the west side of the San Joaquin Valley was "unimportant" and had "few residents" (Pritchard 1970:45, citing Kroeber 1925:476). Despite this improved understanding of the western San Joaquin Valley, a "virtual absence" of archaeological data for some groups (like the Salinan) still exists (King 1978:58).

Comparison of Chronologies

Between eleven to four thousand years ago in California there occurred an expanding utilization of the diverse native food resources, indigenous technological improvement and elaboration, and an overall growth in population. This in turn created an increase in the size and relative stability of individual communities, and "finally, as time passed, the gradual emergence of regional cultures" (Wallace 1978a:35).

Circa four to five thousand years ago, an Utian population (ancestral to Miwok or Costanoan) is believed to have entered the lower Sacramento Valley, and may relate to the early Windmiller Pattern as represented at CA-SJO-68. This belief is based on glottochronological data and archaeological "continuities" through time (Moratto 1984:552). The Utian presence has been referred to as the Meganos Aspect to the Berkeley Pattern, represented in the Late Middle Period of the Central California Taxonomic System (CCTS) (Hughes 1994:7-14). The CCTS identifies regionally derived temporal units defined as the Windmiller (Early), Berkeley (Middle), and Augustine (Late) Patterns (Hughes 1994:43; Lillard et al. 1939).

Other comparative cultural chronologies for prehistoric California groups are more heavily defined on spatial dimensions, as material culture regionally varies between groups. To make sense of these regional chronological variants, some scholars attempted to define universal spatial units for California by modifying Willey and Philips' (1958) definitions of "Site" and "Locality;" then added District, Region, Subarea, and Area (Hughes 1994:15-24). A "Locality" was viewed as "*cooperative groups* of tribelets" (Hughes 1994:20; italics in original). Spatial units operating within the vicinity of CA-FRE-1331 do not conform to a single Region (as defined by Hughes 1994): the study area could belong to either the Central or Southern California Coastal Subarea, moreover there is no "Western San Joaquin Valley" Region.

In a further attempt to grasp the complexities of California's prehistory, some scholars viewed distinct cultural components operating within defined spatial units as a "Pattern," each with varying "Aspects" to that larger Pattern (Hughes 1994:21). In Fredrickson's 1993 treatment "Archaeological Taxonomy in Central California Reconsidered" (Hughes 1994:91-104), Fredrickson offers the most parsimonious use of the term "Locality:" a geographic space with respect to village-sensitive locations (Willey and Philips 1958:18), contrary to some definitions that view Locality as a geographic space exhibiting "cultural homogeneity" (Hughes 1994:96). The "Pattern" is seen as similar to Binford's (1965:208-209) "adaptive sphere" of cultural similarities (Hughes 1994:94). Some have proposed that cultural districts equate to linguistic communities (Hughes 1994:78), but Fredrickson believed that on the basis of ethnographic and protohistoric parallels a cultural district is made of a "series of interacting communities" linked through intermarriage and kinship (Hughes 1994:78).

Another more regionally focused chronology was created for the San Francisco Bay/Lower Sacramento Valley/Monterey Coast Patterns, based upon the generalized Central California Prehistoric Culture Sequence (Elsasser 1986:17). Periods I through III were temporal components based upon resource procurement emphases interpreted from the archaeological record: Period I (Hunting) from 9,000 to 6,000 B.C.; Period II (Collecting) from 6,000 to 3,000 B.C.; Period III (Diversified Subsistence) from 3,000 to 2,000 B.C. (Wallace 1978a:25-26). The archaeological manifestation known as the Millingstone horizon corresponded to Period II (Wallace 1978a:28), and during Period III "Windmiller flourished" (Wallace 1978a:32). The Millingstone horizon may date as early as 10,000 B.C., but most sites date from 9,000 to 7,000 B.C., sometimes persisting into the late Holocene (Fitzgerald and Jones 1999:71). Recognized Windmiller sites include CA-SCR-177 in the Santa Cruz Mountains and CA-SLO-585 in Diablo Canyon (Fitzgerald and Jones 1999:73-80).

In central California, Elsasser (1978:46) discussed material culture Districts and highlighted the fact that the "Monterey County-Coastal Region" and the "Southern San Joaquin Valley" were areas without District status. Elsasser created a regional development model for the Monterey County-Coastal Region based upon the excavation of two coastal sites: CA-MNT-281 and CA-MNT-282 (Pohorecky 1964). The material from these sites could be ascribed to influences from the north, the south, or perhaps even both (i.e., flexed burials and red ochre in graves). The Southern San Joaquin development pattern was based upon excavations from the southwestern shore of Buena Vista Lake: CA-KER-39, CA-KER-40, CA-KER-41, and CA-KER-42 (Wedel 1941). These sites demonstrated "a number of direct chronological links" with the Coastal Chumash from southern California as well as a Sacramento Delta (Middle Horizon) influence from northern/central California (exhibited by Type 3a2 *Olivella* split punched beads and Type 3d disks, and a single Type H3 or H4 *Haliotis* disk bead (Elsasser 1978:47).

Archaeological data indicates an early influence from southern California into the Central Valley. In the southern San Joaquin Valley, it appears that the inhabitants of Lake Buena Vista were influenced by the Santa Barbara culture center and southern California more than influences from the Delta, San Francisco Bay, or anywhere to the east or west (Wedel 1941:156). Greater material complexity is reflected in the Protohistoric period than in the later Historic Period, especially after disease and further colonization had decimated the native populations. The Protohistoric Period occurs during Phase 2 of the Late Horizon (Central California Taxonomic System), approximately A.D. 1500 to 1770 (King 1978:59). Upon review of these various chronologies, a proposed site chronology for CA-FRE-1331 is presented in Table 2.

PaleoIndian/Clovis

It is postulated that Clovis and post-Clovis peoples in California, and North America in general, developed "generalized, broad-spectrum" adaptive subsistence strategies; not exclusively focused on big game hunting, but rather "tethered" to mesic environments with a wide range of food and water resources despite increasing aridity (Willig 1991:111). An initial Pleistocene desiccation occurred between 12,600 and 10,600 B.P., followed by a general trend in aridity lasting from 10,600 to 7,500 B.P. Studies in environmental reconstruction have revealed the need for individual environmental histories within each pluvial basin due to the fact that each basin's climatic regime changed at different times and not simultaneously across the continent (Willig 1991:106).

It is believed that the earliest lithic Western Stemmed complexes, first appearing about 11,000 to 10,000 B.P., were localized technological developments born out of "a brief but ancestral" western Clovis presence (Willig 1991:109). A similar pattern is seen between Eastern fluted points and Folsom points. In fact, typological and technical studies suggested that western Clovis complexes represented a temporal continuum between fluted point forms and the Western Stemmed and Early Archaic complexes (Willig 1991:109). Eventually, the diversification of technology and culture through time during intense environmental change culminated in the development of original western Archaic adaptations (Willig 1991:111).

Table 2
CHRONOLOGY FOR THE SAN LUIS-LITTLE PANOCHE REGION

YEARS BEFORE PRESENT	COMPLEX/TRADITION[1]	PERIOD/PHASE[2]	PATTERN/ASPECT[3]
150 to 50	Historic; Protohistoric Traditions	Historic Period; Late Period, Phase 3	Augustine
500 to 150	Panoche Complex	Late Period, Phase 2	Augustine
1,650 to 500	Gonzaga Complex	Late Period, Phase 1	Augustine
3,550 to 1,650	Pacheco A Complex	Middle Period	Berkeley
4,550 to 3,550	Pacheco B Complex	Early Period	Windmiller
5,250 to 4,550	Positas Complex	Early Period	Windmiller
7,500 to 5,250	Hiatus?	Early Period	Windmiller
11,000 to 7,500	Western Pluvial Lakes Tradition	Early Period	Windmiller
12,500 to 11,000	Fluted Point Tradition	Early Period	Windmiller

[1] (from Olsen and Payen 1968, 1969)
[2] (Central California Sequence from Moratto 1984)
[3] (Central California Taxonomic System from Bennyhoff and Hughes 1987; Moratto 1984)

The closest Pleistocene era pluvial lake to the study area was Lake Tulare. Professional archaeological research and avocational collection around the shores of former Lake Tulare have identified the region as an area of major fluted point concentration in the West, documenting at least 49 fluted point artifacts (Willig 1991:96). These forms were probably the forerunners to the local diversification of later Archaic point forms.

Summaries of Previous Research

The sites, surveys, and excavations discussed below are significant to the understanding of cultural processes at CA-FRE-1331. The summaries below are only highlights of archaeological results and are not intended to encapsulate the full set of results or analyses. Please refer to the original reports and texts for complete information.

Hewes and Massey. Hewes and Massey conducted their reconnaissance of the central San Joaquin Valley in A.D. 1939, the study area bounded roughly by the Merced and Stanislaus County line to the north and the Gifford and Schenck survey (1926) of the southern San Joaquin Valley to the south. The A.D. 1939 effort focused primarily on survey, with some surface collection and excavation (Hewes 1939, 1941). Their expectations were low, citing that the "Diablo Range to the west, in the Coast Range rain-shadow, supported a scanty population, concentrated on semi-permanent water-courses well within the foothills; arid conditions did not favor the plants and animals on which central Californians subsisted" (Hewes 1941:125). However their results were surprising, recording at least 107 sites and assigning them to 14 "regions" on the basis of geography (Hewes 1941:123). They concluded that the west side was sparsely settled, perhaps only seasonally. However, the Los Gatos Creek and Coalinga regions were more heavily settled (Hewes 1941:125-126).

Sixty of the one hundred and seven sites had burial components, although the "foothill sites show few burials" (Hewes 1941:126). The largest number of houses on a single site was in the Los Baños area, with few observed housepit remains south of Los Baños (Hewes 1941:127). Bedrock mortar complexes were sparse and manos and metates were less common, with metates "absent in the Newman, Helm, Coalinga, San Joaquin River, and Stanislaus Gorge regions" (Hewes 1941:127).

Sites in the Coalinga region "are marked by the use of red chert and little obsidian" but on the Valley floor obsidian can be more common (Hewes 1941:129). Tool forms with shouldered points and tapering stems were morphologically similar to those types occurring in Chumash (Canaliño) and Salinan territory (Hewes 1941:129). Quartz crystals were also found with red ochre, yet not in burial association (Hewes 1941:128). Observed rock art contained few petroglyphs with no pictographs noted (Hewes 1941:131).

Evidence for European contact was the occurrence of glass beads in the Sierra foothills, but on the valley floor and "along the San Joaquin River and in Diablo Range north of Coalinga there was no post-contact evidence" (Hewes 1941:131). Trade material distributions agree with the known history of contact. A single Spanish era bottle was found in a Coalinga region burial, at the site identified as Kroeber's "*Udjiu*" (Hewes 1941:131-132).

Missions San Miguel, San Antonio, and San Juan Bautista were perceived to have been the most influential on San Joaquin protohistory, the other Missions being less accessible to the Valley. Escaping mission Indians and the expeditions to recover them entered the Valley through Pacheco Pass or other canyons (e.g., Los Gatos) (Hewes 1941:132). The discovery of an large village site in the Los Baños region with 66 visible housepits was believed to represent a settlement established by mission renegades during the early nineteenth century (Hewes 1941:133).

CA-FRE-128 and CA-FRE-129. Both sites CA-FRE-128 and CA-FRE-129 were excavated for the Little Panoche reservoir project, salvage based archaeological recovery in the face of dam construction. Of the two sites, CA-FRE-129 had the more complete analysis and interpretation. The assemblage recovered from CA-FRE-128 appeared to have "definite links with groups to the south or west, rather than to the north" (Olsen and Payen 1968:39). Site CA-FRE-129 was probably occupied between A.D. 1700 to 1800, and similarly the assemblage appeared to have "definite links with groups to the south or west" (Olsen and Payen 1968:39).

The midden deposit for CA-FRE-129 only reached a depth of twenty to thirty cm., but horizontally occupied a large area, approximately 80 to 90 m. north to south by 40 to 50 m. east to west (Olsen and Payen 1968:40). Most of the site deposit was described as "extremely superficial," but the considerable surface extent suggested an intensive occupation for a short period of time (Olsen and Payen 1968:40).

Sixteen burials were encountered, occurring in groups of 11 and 2, with three isolated individuals. Nine of the burials were in a tightly flexed position and 3 in a semiflexed position. The excavations only could gather burial orientation data for 12 of the 16 total burials (Olsen and Payen 1968:63-65).

A total of 508 shell beads was recovered from CA-FRE-129, including eleven types of *Olivella* shell beads (Olsen and Payen 1968:8, 41). The most frequent *Olivella* types were the small thick disk (Type 3e), small cupped/thick lipped (Type 3a1), small thin disc (Type 3d), and small rough-edged disc (no Type designation) (Olsen and Payen 1968:10). There were also *Haliotis* callus beads, clamshell disk beads, and related fragments (n=13) (Olsen and Payen 1968:11, 13). Steatite disk beads were recovered in association with the *Olivella* Type 3a1 and clamshell disk beads, attributable to the Late Horizon Phase II (Lillard, Heizer, and Fenenga 1939:80; Olsen and Payen 1968:12).

Bone tools were also recovered, including awls, pins, incised bird bone, and deer scapulae fashioned into cutting implements (Olsen and Payen 1968:14-15, 45). Stone projectile points of chert and obsidian (35% obsidian, 61% silicates) were recovered from CA-FRE-129. Nine point forms including the triangular Panoche and Desert side notched (DSN) forms were identified. There was also very little obsidian debitage (Olsen and Payen 1968:16, 47). Groundstone included bowl mortars of sandstone and andesite (Olsen and Payen 1968:51), slab mortars, whetstones; and pestles, manos, metates, and fragments of such tools (Olsen and Payen 1968:23-24, 51). The recovery of steatite vessels, sherds, and bead blanks (50 *Olivella* fragments; indicative of bead manufacture) implied that the materials might have been trade items from the southern San Joaquin Valley (Olsen and Payen 1968:21-22, 43).

Five structures were encountered at CA-FRE-129. They were identified as a Yokuts sweat house (No. 1; 4 m. wide), a housepit (No. 2; 8 m. wide and 15 to 20 cm. to 50 to 60 cm. deep), another housepit (No. 3; 16.4 m. wide and 60 to 70 cm. deep), and two more housepits (No. 4; 10 m. wide, and No. 5; 10 to 11 m. wide) (Olsen and Payen 1968:30-37). Additional related features included wooden posts, ash lenses, prepared floors, burnt/lined pits or hearths, and burnt cobble concentrations (Olsen and Payen 1968:29, 58-62). One of the housepits (No. 3) exhibiting an inner ring construction style with no observable house posts was also found at site 4-MER-14 (CA-MER-14), dating to Phase 1 of the Late Period in Central California (Olsen and Payen 1968:37-38). A typical house for the region would have been 8 to 13 m. length, "somewhat less in width," and approximately 60 cm. deep (Olsen and Payen 1968:38). The differential filling in of the house depressions indicated seasonal occupation of the site (Olsen and Payen 1968:39).

CA-FRE-1333. The analysis of data recovered from excavations at CA-FRE-1333 indicated that the site corresponded to the Gonzaga and Panoche Complexes of the San Luis-Little Panoche sequence, dating to California's Late Period Phases 1 and 2 (post A.D. 600 to contact, approximately 1,420 to 280 B.P.) (Breschini et al. 1986:43-44). The bead analysis from CA-FRE-1333 (Gibson 1986) proved to be the most elucidating information relative to inter-regional trade and social organization. The types of beads recovered were:

- Type E1a *Olivella* thin lipped round (n=1) (450 to 300 B.P., Phase 2 of the Late Period); "utilized as a medium of exchange between individuals and households" (Gibson 1986:113).
- Type G2a *Olivella* saucers (n=2) (2,800 to 3,400 B.P., Phase M1/M2a of the Middle Period); In Central California, *Olivella* saucers are generally indicative of Middle

Period occupation, becoming less frequent during the Late Period, possibly being replaced by rectangular *Olivella* forms (Gibson 1986:114). The recovered specimens from CA-FRE-1333 are probably from the Phase 1 of the Late Period, 450 to 950 B.P. (Gibson 1986:115). According to the Chumash, these *Olivella* saucer beads were not money beads, "but were used to validate sociopolitical status" (Gibson 1986:115).

- Type G4 *Olivella* saucer with dorsal grinding (n=1); This bead is usually indicative of the early Middle Period, 2,150 to 1,850 B.P., but this specimen may be a "local variant" because of its size difference and the corresponding C14 dates (Gibson 1986:115-116).
- *Haliotis rufescens* Epidermis disc (n=1) (450 to 150 B.P.); A rare bead valued by those with political power in Chumash territory and "all groups adjacent to the Chumash" by the Phases 2 and 3 of the Late Period (Gibson 1986:116). These beads were used in the regions "historically occupied by the Yokuts all the way up to the northern boundary near Stockton," and not used in the San Francisco Bay Area (Gibson 1986:117; Gifford 1947:16).
- *Olivella* wall fragments (n=3); These fragments "could represent bead blanks or fragments for the manufacture of *Olivella* saucers" but no other bead detritus is present (Gibson 1986:117).
- Stone bead (n=1); This light colored green talc schist disk bead is suggestive of Phase 2 of the Late Period (Gibson 1986:117).

No historic or protohistoric materials were recovered at CA-FRE-1333, and the assemblage most closely resembled Olsen and Payen's (1968) Gonzaga and Panoche Complexes of the

San Luis-Little Panoche chronology (Breschini et al. 1986:45). Both status beads and economic monetary beads were being used at CA-FRE-1333; the site's occupants were probably engaged in "similar forms of sociopolitical and economic organization" with the surrounding region (Gibson 1986:118). However, specific ethnicity could not be assigned solely on the basis of the recovered beads from CA-FRE-1333 (Gibson 1986:118). Occupational evidence from the site exhibited food procurement and preparation, interment, tool manufacture, tool maintenance, and return visits to the site indicating a seasonal round pattern by a small group (Breschini et al. 1986:46). The site area may even have "provided a refuge during a time when the northern San Joaquin Valley was undergoing climatic changes" which affected the local populations during the Late Period (Breschini et al. 1986:45).

CA-FRE-1346. Site CA-FRE-1346 is situated on the north bank of Los Gatos Creek, approximately 20 miles northwest of Coalinga (Jenkins 2001:64). The environmental regime is very similar to the conditions at CA-FRE-1331: Blue Oak/Grey Pine Woodland (Jenkins 2001:65). The "Corral site" derived its name from the presence of a circular corral constructed circa A.D. 1890 using locally available juniper. The site was recorded as a "village with midden, burials, a possible ceremonial housepit, lithics, fire-fractured rock, points, and beads" (Jenkins 2001:65).

Of three test units, sterile soils were encountered at the 50 cm. depth in two of the units - these two units produced the bulk of the artifactual material. The third unit went to a depth of 90 cm., but only yielded a total of one chert flake, one projectile point fragment, and three bone fragments (Jenkins 2001:65).

Two projectile point fragments were recovered, broken at their notching points and identified as "denticulate side-notched" (Jenkins 2001:67). Also recovered were five small obsidian flakes and one small biface fragment of obsidian. Preliminary analysis on two of the specimens suggested that the obsidian was from the Napa Valley source area (Jenkins 1992:68). Franciscan chert was the "predominant" lithic material recovered at the site, available in a cobble form from the local drainages (Jenkins 2001:68).

Most of the groundstone and milling stone artifacts recovered from CA-FRE-1346, such as bowl rims and bottom fragments, "were fashioned from locally available sandstone" (Jenkins 2001:68). Other groundstone artifacts included two fragments of a cylindrical pestle, a smoothed cobble that may have been a multifacial mano, a probable stream cobble mano, and several possible slab metate fragments. Most of the artifacts were derived from locally available sandstone and evidence of use-wear was lacking on most of these items (Jenkins 2001:69).

Only four beads were recovered from CA-FRE-1346, three *Olivella* shell beads and one steatite disk bead. The steatite bead was found at the 10 to 20 cm. level, and probably dates to early Phase 2 of the Late Period (circa A.D. 1500) (Jenkins 2001:69). Two of the beads were identified as the "Cupped Callus" type, which appeared in central California during the middle of Phase 1 of the Late Period (circa A.D. 1100), but were abandoned by early Phase 2 of the Late Period (around A.D. 1500) (Bennyhoff and Hughes 1987). The remaining shell bead was identified as a "Tiny Saucer," determined to have little or no diagnostic chronological value (Jenkins 2001:69).

One hundred eight of 1,342 faunal specimens were identified to species (approximately 9% of the total assemblage). Of the identified species, roughly 44%

belonged to rodents, lagomorphs and rabbits; 31% to artiodactyls (mostly mule deer); and 25% to "reptiles, amphibians, fish, birds, and canids" (Jenkins 2001:67). When sorted into general size categories, it was determined that over 70% of the collection was comprised of medium-large and large mammal remains (Jenkins 2001:67). Most of the bone was burned (about 90%), found in association with lots of fire-affected rock (Jenkins 2001:67).

It was concluded that CA-FRE-1346 was occupied during two phases of the Late Period. The artifactual evidence for Phase 1 (Gonzaga Complex) occupation included *Olivella* "Cupped Callus" beads and sandstone bowl mortars. Evidence for Phase 2 (Panoche Complex) occupation included a steatite bead and small side-notched arrow points. All five of the radiocarbon dates supported this conclusion and suggested that the site was most intensively occupied in "late-Gonzaga through mid-Panoche times circa 900 to 1600 A.D." (Jenkins 2001:71). Site function at CA-FRE-1346 was characterized as a "village and/or seasonal camp" (Jenkins 2001:71). Site activities indicated use of the site over extended periods of time (Jenkins 2001:72). It was felt that the site was likely inhabited by the interior Tachi Yokuts during seasonal visits to the hinterlands "rather than by coastal people passing through the canyon on trading expeditions" (Jenkins 2001:72). The possibility of coastal peoples coming through the region via Los Gatos Canyon and staying at the site was considered, but was deemed "unlikely" (Jenkins 2001:72).

CA-MER-130. Olsen and Payen (1983) conducted excavations at site CA-MER-130 (the "Menjoulet" site) for a reservoir project near the Pacheco Pass. The site is located within the uplands "rather than on or near alluvial fans of the valley proper," situated within an oak woodland habitat adjacent to "a small ravine containing a permanent or nearly permanent spring" (Olsen and Payen 1983:2-3). Although the site is only at the six-hundred to seven-hundred foot elevation level, the environmental setting is very similar to the CA-FRE-1331 study area. One of the conclusions reached after excavation was that the site's resource exploitation patterning was indicative of foothill adaptations, mainly due to the presence of very little freshwater shellfish remains (Olsen and Payen 1983:14). The faunal record suggested that large mammals (deer and antelope) were important to the diet and the remaining foodstuffs were concentrated on small animals (Olsen and Payen 1983:19).

Recovered artifacts from CA-MER-130 exhibited similarities with other western Central Valley sites. Bead types included spire lopped *Olivella* (Type A), thin rectangle with central perforation (Type M1a), and *Haliotis* (Type MB1, and fragments) (Olsen and Payen 1983:6). The *Haliotis* ornaments were "not restricted to any temporal period in central California" and infrequent within the region (Olsen and Payen 1983:7). Bone tools such as awls, bird bone tubes and whistles were also found. Projectile point types varied: small triangular points, Panoche side notched, large points, fragments, and other tools (e.g., bifaces, scrapers, knives, blanks, drills). Housepit and hearth features were also encountered (Olsen and Payen 1983:10-18).

The Menjoulet site has been ascribed to the Central Yokuts (Pritchard 1970). King's (1978:16) interpretation of burial data from the site (erroneously identified as CA-MER-3) identified social status differentiation between individuals that carried over into burial rites. The presence of *Olivella* lipped beads with low status individuals (who were given an outdoor burial plot with partially extended inhumation as the burial method) was in contrast to the high status individuals (who were cremated and buried indoors) with *Tivela* sp. cylinder and tube type beads (King 1978:60, 61).

Akers Collection. Multiple interviews of long-time local rancher Charlie Akers and his nephew Miguel Nuñez yielded some interesting data about the region (Hylkema 2001). Although exact locational data is lacking for many of the artifacts, this assemblage was recognized "as one of the larger collections known to come from the southeastern Diablo Range" (Hylkema 2001:78). It is extremely varied and the artifacts appeared to be from several time periods (Hylkema 2001:83). Overall, the Akers Collection represented a variety of activities but focused mainly on the procurement of foodstuffs. It was hypothesized that the collection possibly exhibited "a melding of upland (Costanoan/Salinan?) traits with those of valley Yokuts with a south coastal influence" (Hylkema 2001:87).

CA-FRE-2364, CA-FRE-2365, and CA-FRE-2366. Initial salvage recovery operations from CA-FRE-2364, CA-FRE-2365, and CA-FRE-2366 afforded an opportunity to examine issues of regional cultural chronology, trade relationships, subsistence and settlement patterning (LaJeunesse et al. 1996:9-16). More recent research at site CA-FRE-2365 (with less intensive investigations at CA-FRE-2364 and CA-FRE-2366) indicated that the locale was used as a seasonal trade/ceremonial site and as a "locus of occasional intensive habitation" during Phase 2 of the Late Period (Milliken and Meyer 1997:54). The site area received at least 30 to 50 visitors "who regularly visited and exchanged members with other small bands in the Silver Creek and upper Panoche Creek drainages," utilizing resources on the Valley floor (Milliken and Meyer 1997:54). These people were likely Ohlone speakers, and may have been related to the Chalon Costanoan/Ohlone, identified as such by the Padres at Mission Soledad (Milliken 1994; Milliken and Meyer 1997:55).

Recovered materials from CA-FRE-2365 included a sandstone bowl mortar, obsidian (from the Casa Diablo source), chert, basalt, *Olivella* beads, and steatite beads (LaJeunesse et al. 1996:25, 48). At site CA-FRE-2366 there was a 15 m. x 15 m. circular feature, obsidian (also from Casa Diablo), basalt, chert, serpentine, quartzite, and siltstone (LaJeunesse et al. 1996:28-29, 48). Overall, the most numerous lithic materials were chert, basalt, and sandstone; the less common materials were obsidian, quartzite, siltstone, and serpentine (LaJeunesse et al. 1996:29). Also of lithological interest, it was reported that at least one hammerstone from the data recovery had cinnabar residues (LaJeunesse et al. 1996; Moore 2000). Pine nuts and acorn shells, "neither source of which exists at the site today," were also recovered (LaJeunesse et al. 1996:50). Of the faunal remains (n=9,353), approximately 93% of the total were mammalian in origin (LaJeunesse et al. 1996:48). Identifiable vertebrate remains were categorized for analysis into "small mammal" and "medium mammal" classifications. Roughly 22% of the bones (21 elements) were determined to be "non-economically significant" (i.e., ground squirrel, pocket gopher, kangaroo rat) and 78% as "economically significant" (Simons 1996:H-1). Those "economically significant" specimens (n=76, 100%) included fish (n=1, 1%), rabbit (n=43, 57%), carnivores (n=20, 26%) and artiodactyls (n=12, 16%) (Simons 1996:H-2).

CA-MER-119. Three housepits were excavated at site CA-MER-119, located on the margin of the Central Valley floor. The first housepit was 11.7 m. x 13.5 m. x 0.5 m. deep, the second was 12 m. x 12.5 m. x 0.75 m. deep, and the third was 14m. x 15m. x 0.5 to 0.75 m. deep. Each one was built in a ring shape with the supporting posts on the inside of the floor edge along with 6 to 8 posts across the ring's center (Pritchard 1983:88-89, 98-99). Seven shell artifacts were recovered, five of which were *Olivella* shell beads: two spireground whole, two disk-shaped, one cupped (Pritchard 1983:89). One shell artifact was a triangular shaped fragment of *Haliotis rufescens* (Pritchard 1983:89). The types of lithic material recovered were scrapers (n=7), cores (n=7), mano fragments (n=2), a metate (n=1), and a mortar fragment (n=1) (Pritchard 1983:90). Seven bedrock mortars (BRMs) were also identified on site (Pritchard 1983:91). During analysis, it was determined that the material culture at CA-MER-119 was "not appreciably different" from that of the upper occupation levels at CA-MER-130, CA-FRE-128, and CA-FRE-129 (Pritchard 1983:92). It was concluded that the deposits of CA-MER-119 represented the final occupation of the Kahwatchwah Yokuts (Pritchard 1983:92).

CA-MER-S94. This site in the Central San Joaquin Valley has occupation represented as early as five thousand years ago during the Middle Period. On the basis of form and material, some of the beads in the assemblage appeared that they were "derived from the coast, presumably the Monterey Bay area" (Breschini et al. 1983:83).

CA-MAD-98. Site CA-MAD-98 was also excavated as a result of a reservoir project, but this site is located on the eastern side of the San Joaquin Valley along the south-central Sierra Nevada. The site was probably occupied during the Madera Phase, circa A.D. 1500 to 1850, closely correlating in time with the Panoche Complex. Results from the excavations were important in relation to examining foothill adaptations at the valley-montane ecotone.

Settlement patterning at the site was very similar to the Panoche Complex type: large villages near rivers with smaller settlements in the hinterlands and a large population (Hines 1988:5; also Moratto 1984:316). Typical Madera Phase architectural types average an 8 to 17 m. diameter, oval to circular shape for ceremonial structures and a smaller circular shape for residences (Hines 1988:6, 10). Subsistence rounds mainly relied upon the acorn crop, supplemented with other seeds, bulbs, greens, and berries; also hunting elk, deer, and small game (Hines 1988:6). Madera Phase lithic technology also closely resembles the Panoche

Complex attributes: Desert side notched (DSN) points, bedrock mortars, cobble pestles, and a variety of millingstones (Hines 1988:6). The mortuary pattern is also similar to the Panoche Complex, common flexed primary interments; some cremations in houses, and those cremations "are furnished with abundant artifacts" (Hines 1988:6).

CA-SCR-177. There is nearly a fourteen thousand year history of occupation at site CA-SCR-177 (the "Scotts Valley" site) in the Santa Cruz Mountains (Cartier 1983). The earliest occupation is represented as the Año Nuevo Pattern, subdivided into two phases: the Aruama Phase (13,500 to 11,500 B.P.) and the San Lorenzo Phase (11,000 to 10,000 B.P.). Based on the recovered assemblages, the early inhabitants at the Scotts Valley site were well adjusted to this region. Their geologic knowledge of exploitable lithic resources included Monterey chert, quartzite, obsidian, basalt, and Franciscan chert (Cartier 1983:116). The presence of these materials at the site seems to support the notion that "systems of economic exchange had indeed been established quite early in time" (Cartier 1983:116). The types of material brought onto the site were diverse: obsidian from Northern and Sierran sources and basalts "possibly from the Quien Sabe Volcanic Formation in the Hollister area or the Moraga Volcanics of the Berkeley Hills," or material that could have been collected from "float" washed up on beaches (Cartier 1983:155). Monterey chert comprised nearly eighty percent of the total debitage collection (Cartier 1983:155).

Lithic tool types included bifaces and unifaces, utilized flakes and scrapers, perforators, thinning flakes, metates, mortars, cobbles, hammerstones, and manos. Analysis on the some of the manos proved to be very interesting, in that red ochre residue "was found adhering to several quartzite mano specimens" (Cartier 1983:140). In fact, red ochre was found in all occupational levels, leaving "little doubt that use of red ochre was important for some reason at CA-SCR-177" (Cartier 1983:227). Four of the ochre stained manos were chosen for x-ray fluorescence (XRF) analysis, selected from different test excavation units across the site area (Cartier 1983:140). The results of the analysis demonstrated that "the red ochre pigment adhering to these samples all contained elemental mercury or cinnabar" (Cartier 1983:140).

The x-ray fluorescence (XRF) tests on the red ochre pigment residues adhering to the quartzite manos perplexed the researchers. The presence of quartzite at the site was intriguing because this material was not locally available. If this observation holds true, then the inhabitants of CA-SCR-177 "went some distance to collect and import this material" (Cartier 1983:155). Additional artifactual analysis revealed the use of natural asphaltum as a mastic, which is another imported material since there were no locally available seeps to procure asphaltum (United States Geological Survey 2000). The asphaltum was probably used for hafting purposes (Cartier 1983:227).

Additional analyses on the lithic assemblage revealed more red ochre pigment stains: a small Monterey chert flake fragment with a "slight red ochre residue present on the dorsal face," possible cinnabar residues on the remnant edge of a biface of Monterey chert, and a small chalcedony core covered with red pigment residue (Cartier 1983:151). It was assumed that the cinnabar residue originated from the New Almaden mine source in nearby Santa Clara County, but that hypothesis has not been tested. Regardless, the presence of red ochre (cinnabar) at CA-SCR-177 demonstrated the earliest recorded use of pigments within the San Francisco Bay and Monterey Bay areas (Cartier 1983:152).

The New Almaden cinnabar source was known ethnographically as a point of conflict between the local Ohlone and those who came on "vermillion expeditions" from Santa Cruz

Mission or the Central Valley (Cartier 1983:227; Heizer and Treganza 1944:311; 1971). The New Almaden source was probably known for a long time by native peoples, citing the discussion above for CA-SCR-177 and the presence of site CA-SCL-247 near New Almaden which has a component dating 6,000 to 4,000 B.P. (Cartier 1983:227). Research at CA-SCR-177 redefined material culture patterns for the greater San Francisco Bay area and Central California; red ochre and asbestos rods should be added to the list of material remains found in archaeological sites dating to California's Early Horizon (Lower Berkeley Pattern) (Elsasser 1986:27).

CA-FRE-64. Site CA-FRE-64 is located towards the east side of the San Joaquin Valley, closer to the valley floor rather than the foothills. This site is significant to the study area in that a wide array of soapstone materials were recovered there (Weigel 1985:26-29). The site was occupied during the late Raymond or Madera Phase (circa A.D. 1500 to 1700) (Weigel 1985:30). In the discussion of probable source areas likely to contain available soapstone, the Mistake Mine on the Fresno and San Benito County line near the study area is prominently mentioned (Weigel 1985:28).

CA-FRE-48. Site CA-FRE-48 (the "Tranquillity" site) is an anomalous site containing a highly fossilized human skeleton that only dated to 600 B.C., but was found in association with Pleistocene era fauna (Hewes 1943, 1946; Angel 1966; Elsasser 1978:47). Located along the east side of the San Joaquin Valley, the Tranquillity site also exhibited influences from both Southern and Northern California: mullers and milling stones indicated a Southern California influence, and the large stemmed, concave based points made of chert and obsidian demonstrated a Northern California influence. An obliquely spire ground

Olivella shell bead recovered from the assemblage could be attributed to either southern or northern California influences (Hewes 1946).

Diablo Canyon. At the Diablo Canyon excavations six sites were tested (CA-SLO-2, CA-SLO-61, CA-SLO-584, CA-SLO-585, CA-SLO-52, and CA-SLO-51), two of which had a depth of deposit reflecting a "Chumash-Hunting-Millingstone" pattern extending back in time nearly 10,000 B.P. (Greenwood 1972). Radiocarbon dates for two sites with a lengthy occupation were approximately 7,370 B.C. at site CA-SLO-2 and 6,460 B.C. at site CA-SLO-585 (Greenwood 1972:4). CA-SLO-585 yielded three serpentine beads: one tubular bead "approaching barrel shape" (1.7 cm. diameter x 3.0 cm. long) and two disk beads (0.7 cm. diameter x 0.35 cm. thick, 1.5 cm. diameter x 0.9 cm. thick) (Greenwood 1972:63). Other materials of note found at these sites were asphaltum, crystals, and cupule boulders discovered near CA-SLO-585 (boulders were not analyzed) (Greenwood 1972:65).

CA-SBN-12. A "major petroglyph site," CA-SBN-12 ("Slime Rock") is located in southeastern San Benito County and was inundated by the creation of the Hernandez Reservoir in the A.D. 1960s. This rock block, 32 m. long, 24 m. wide, and 5.5 m. high became exposed during the statewide drought of A.D. 1986 to 1988, and lent itself to archaeological analysis.

Bedrock mortars were located on top of the rock, and numerous circular features which may be quarry scars, were located on many of its surfaces. Tool marks were also common. These features appeared to be similar to steatite quarry features on Santa Catalina Island in southern California (Mark et al. 1989:49). However, this rock block is not steatite but is rather composed of "Franciscan-assemblage blueschist, rich in chlorite and glaucophane" (Mark et al. 1989:49). The high amount of chlorite in the rock accounts for the block's relative softness. In addition to the probable quarry scars, site CA-SBN-12 also exemplifies most petroglyph motifs that are typical of the San Francisco Bay area and features similar to CA-SCL-48 in the Diablo Range (Elsasser 1986:40-45; Mark et al. 1989:49).

Key diagnostic characteristics on the rock block are the numerous Pecked Curvilinear Nucleated designs (PCNs) concentrated on the lower southeast face, now covered by silt (Mark et al. 1989:49; Gillette 1998:46-48). PCNs are typically found on soft schist rocks of the northern Coast Ranges from Lake and Mendocino Counties to Marin County, and can occur as far south as Santa Barbara County (Mark et al. 1989:49-50).

Two styles of petroglyphs found in the Santa Clara Valley region are attributed to the Costanoan/Ohlone: Pecked Curvilinear Nucleated designs (PCNs) and cupules (Elsasser 1986:40). The PCN element occasionally occurs on sandstone in association with cupules in the Santa Clara Valley, but their characteristic form is seen on soft metamorphic rocks like talc (steatite) or chlorite schist, or somewhat harder glaucophane schist "often associated with grooves" (Elsasser 1986:41). CA-SBN-12 appears to fit such a depiction of those design elements from the Costanoan area.

It is probable that the quarry scars at CA-SBN-12 and the Swallow Rock site (CA-FRE-2473, discussed below) are far too small to have produced bowls. A typical removed Pecked Curvilinear Nucleated design (PCN) center measures approximately 17 to 20 cm. long, 10 to 13 cm. wide, and 4 to 8 cm. thick (Foster and Betts 1994:37). The scars observed on CA-SBN-12 are smaller than this patterning. The more likely explanation for the scars is that these centers were for use in the production of smaller artifacts, such as arrowshaft straighteners or pendants (Foster and Betts 1994:37). Coincidentally, a soapstone talc schist pendant was found by a spring on the nearby Domengine Ranch during the A.D. 1960s. Its lithological appearance was "remarkably similar" to the rock material at CA-SBN-12, measuring approximately 7.5 cm. long, 6 cm. wide, and 1 cm. thick, with two biconically drilled holes (Foster 1990:7). However, later research determined that the pendant was probably not from the Slime Rock site (Gillette 1998:84).

Rock art in the Los Gatos Canyon, inclusive of the CA-FRE-1331 study area, "exhibits a surprising degree of complexity and variability." An analysis of regional rock art attributes suggested that two distinctive "styles" were recognized: the "Coalinga Upland Style" exhibited at sites CA-FRE-2244 and CA-FRE-2261, and the "Western San Joaquin Cupule Style" seen at sites CA-FRE-2109, CA-FRE-2246, and CA-FRE-2262 (Foster, Jenkins, and Betts 1990:53). Other sites analyzed (CA-FRE-2245 and CA-FRE-1345) were categorized as "enigmatic," not exclusively belonging to either style (Foster, Jenkins, and Betts 1990:63). The Western San Joaquin Cupule style includes sites with cupule boulders, which may have served as a trail marker or ritual activities area (Foster, Jenkins, and Betts 1990:64). The cupules are the most recent petroglyph type and are probably associated with the Late Prehistoric occupation of the area by the Yokuts or Salinan (Foster and Betts 1994:38).

The Western San Joaquin Cupule and Coalinga Upland rock art styles are based upon the Abstract Curvilinear style, a broader category of rock art type for central California. Abstract Curvilinear elements are incised into the rock material: the basic technique is the "deep incising of patterns in soft rocks such as sandstone, steatite, and schist" (Grant 1971:238). Its distribution is mostly found in the foothills of the Coast Ranges (Grant 1971:238). Another major type of rock art, the Abstract Polychrome style, is also found in the coastal ranges of southern and central California. This artwork is painted onto the rock material, which is typically ancient sedimentary rock like sandstone caves (Grant 1971:239). The more elaborate paintings are found in the innermost mountain ranges and close to the western edge of the San Joaquin Valley (Grant 1971:239-240). Succinctly put, "the type of rock dictated the sort of rock art that is found in California" (Grant 1971:242).

CA-FRE-2473. Situated above the Jacalitos Creek drainage on the west side of the San Joaquin Valley is site CA-FRE-2473 (the "Swallow Rock" site). CA-FRE-2473 exhibits Pecked Curvilinear Nucleated designs (PCNs) as well as cupules (Gillette 1998:20-21), characteristics prevalent on rock features throughout the study area (e.g., sites CA-FRE-1336, CA-FRE-1338, CA-FRE-1345, and CA-FRE-2524/H). Swallow Rock also has unique features with pecked Abstract Curvilinear motifs that were "completely unknown" for any other site in the central Coast Range (Foster, Betts, Johnson, and Deford 1990:3). The closest rock art style match in the immediate vicinity to these abstract features was observed across the San Joaquin Valley near the junction of present day Merced and Mariposa Counties (sites CA-MRP-1, CA-MRP-2, and CA-MRP-546) (Foster, Betts, Johnson, and Deford 1990:3). It was tentatively concluded that the rock art style at CA-FRE-2473, while similar to some Coast Range styles, is not representative of the Coalinga Uplands style or the Western San Joaquin Cupule style.

CHAPTER 5

INVESTIGATIONS AT CA-FRE-1331

SITE DESCRIPTION

Site CA-FRE-1331 is situated on a flat terrace above White Creek (2,230 to 2,280 feet above sea level) covered with annual grasses, interior live oak, juniper, chamise, manzanita, and yucca; approximately seventy-five meters east to west by thirty meters north to south in size (Woodward 1980). It lies within the Middle and/or Lower Pliocene Marine (PmL) geological formation in contact with the Upper Cretaceous Mesozoic Marine Sandstone (Kv) formation (Jenkins 1958). The site has been described as a "large open campsite consisting of an extensive dark midden, numerous chert flakes, one bedrock mortar, burned bone, fire fractured rock, and shell" (Lipp 1984:2). The diagnostic artifacts originally collected from the site surface were a triangular-shaped projectile point tip and a steatite bead (Woodward 1980:1; Lipp 1984:2; United States Department of the Interior 1986:23). It was also observed that fossil shells and fragments had possibly been "brought to this site by the Indians" (Woodward 1980:2). Although there are some disturbances to the site's integrity from rodents, cattle grazing, and previous incidents of vandalism (in the form of pothunting), the site appears to be in stable condition and afforded "an excellent opportunity" for research (Lipp 1984:2). The site also has an isolated component: a single bedrock mortar feature that lies within the bed of White Creek, approximately 60 m. west of the midden locus.

The current condition of the site in A.D. 2000 matched the description from A.D. 1984. The only new visible impacts to the site were from a fire that came through the area during the A.D. 1990s and occasional cattle grazing on or near the site. There was also evidence of pig rooting towards the eastern end of the terrace away from the midden concentration.

RESEARCH METHODS

General Field Methods

The data recovery sampling methods designed for CA-FRE-1331 were structured to optimize field time and still be able to answer the questions posed by the research goals related to the site's length of occupation, function, sociocultural affiliations, and placement in trade networks. Redman (1987:250) defined "good" sampling as 1) having the need for specific problem orientation, 2) a careful collection of surface material, and 3) make sure to have a representative coverage. At nearby site CA-FRE-1333, four 1 m. x 1 m. units were excavated both inside and outside of a rockshelter; utilizing 1/8-inch mesh dry screen recovery (Breschini et al. 1986:20). A similar methodology was proposed for CA-FRE-1331.

Site Mapping. The site boundary was established by the artifacts and midden soil observed on the surface; this included a circular shaped depression regarded as a potential housepit feature. The archaeological site record generated by Woodward (1980) for CA-FRE-1331 was also very useful in the identification of the site boundary. One permanent datum (Datum 1) was laid into the site for reference. Another temporary datum was created to establish a true North to south line and an east to west line creating an x-y coordinate grid system for site mapping recordation and test excavation unit placement. Both a transit and a Leica TC605L Total Station survey unit were used to create data for the site map (Fig. 3).

Surface Collection. Artifact material on the surface was collected throughout the course of the project. Discreet loci of artifacts were identified on the surface

Figure 3. CA-FRE-1331 site map.

of CA-FRE-1331 and the diagnostic items - especially the more fragile ones - were collected (e.g., *Haliotis* sp. disk bead). As excavations began, more surface materials were collected. The Leica 605L Total Station unit, a Silva Ranger compass, and a hand held Garmin 3Plus Global Positioning System (GPS) Unit were used to collect this point data.

Test Excavation Units. Based upon the known recorded dimensions of CA-FRE-1331 (75.7 m. x 30.3 m.), the total area or known sampling universe was approximately 2,295 m^2. Given this figure, a single 1 m. x 1 m. test unit excavated at CA-FRE-1331 would alter (sample) roughly 0.0004% of the known site surface area. As part of the BLM management plan for the area, proposed excavations at CA-FRE-1331 were to include five 1 m. x 1 m. test units (United States Department of the Interior 1986:22); that level of recovery would have constituted less than a 0.002% sample of the known sampling universe. For the course of this investigation the research excavation strategy employed larger testing units, utilizing a 1 m. x 2 m. size. Excavations began with three test units followed up with two more additional units for a total of five 1 m. x 2 m. units.

Unit placement was set along an established north to south/east to west grid and excavation units selected for testing via judgmental sampling: diagnostic artifacts, discrete artifactual loci, and features present on the site's surface determined unit placement. Individual unit datums were situated in the northwest corner of the units (as possible). Each unit was also oriented lengthwise north to south (2 m. length). Excavations were completed by hand in 10 cm. arbitrary levels until features or pedogenic lenses were encountered, at which time they were excavated as a single component of the test unit or level. Features were collected in the field and reserved for special analyses in the laboratory. Dry screening for cultural material using a 1/8 inch mesh screen was employed. Studies have demonstrated that 90 to 95% of fish bone, small mammal bone, beads, and materials of similar size can be recovered using 1/8 inch mesh for screening (Hester et al. 1997:94; Stein 1992:95-133). The risk of losing the 5 to 10% of faunal material is low, especially since there may be relatively little fish bone to be recovered at CA-FRE-1331 (as demonstrated at CA-FRE-1333) (Breschini et al. 1986).

Test Unit A was placed at eight meters west and twelve meters south of Datum 1 (Datum 1 = 0 m. N/S, 0 m. E/W). Unit B was opened up adjacent to Unit A, along the west wall of Unit A. Test Unit C was placed at five meters east and five meters south of Datum 1. Test Unit D was placed at twenty-eight meters west and eleven meters south of Datum 1.

Unit E was placed two meters south of the Unit C south wall. All units were backfilled after excavations.

Column Samples. Three column samples were collected from across the site. Each sample size was 20 cm. x 20 cm. in area, collected in 10 cm. levels (approximating the arbitrary 10 cm. levels used during excavation). Each sample was bagged in the field for future laboratory analyses. Level samples were taken from the northwest corner of Unit A, the northeast corner of Unit C, and 100 cm. south of the unit datum (northwest corner) on the west wall of Unit D.

Laboratory Methods

Laboratory analysis encompassed the identification, sorting, weighing, measuring, and cataloging of recovered artifacts. All materials were cataloged by provenience (surface, unit, level, feature, and etcetera) and given consecutive numbers. Faunal remains were separated by material, weighed, and identified to taxon and element to the extent possible. Diagnostic artifacts were drawn, photographed and/or digitally imaged. Use of a microscope (American Optical Corporation model "Forty," 30x power) to examine the artifacts for use-wear patterning or other modifications was also incorporated. Soil feature samples and a column sample were processed via flotation with 1/16 inch mesh to recover smaller botanical and ecofactual constituents for paleoenvironmental analysis. Radiocarbon dating was also utilized, taken from a carbonized wood sample recovered from Unit E. Select stone artifacts were chosen for protein residue analysis utilizing the crossover immunoelectrophoresis (CIEP) method. Obsidian artifacts were sourced using x-ray fluorescence (XRF) and examined for hydration rim analysis.

RESULTS OF THE EXCAVATION

Stratigraphy and Soils

Test Unit A and Test Unit B. The unit was situated in a midden locus with artifacts exposed at the surface, namely beads and lithic material. The midden was surrounded by a ring of junipers that give the appearance of a circular enclosure. The Unit A datum was placed in the northwest corner, and the unit was excavated to a maximum depth of 80 cm. below datum (Fig. 4).

Unit B was established to further investigate a sandstone and metavolcanic rock concentration exposed in Unit A at approximately 30 to 40 cm. below unit datum, with the majority of the feature occurring at 40 to 50 cm. below unit datum. Unit B failed to reveal any definitive rock concentration and excavations ceased.

Test Unit C. Unit C was oriented to straddle a surface depression regarded as a possible feature, perhaps a housepit. The unit datum was placed in the northwest corner. Unit C encountered far less rocky material in comparison to Units A and B and it contained scattered charcoal throughout the matrix which was nearly uniform throughout the unit. At the bottom of the 80 to 90 cm. level a prepared floor feature was revealed in the north half of the unit. Excavation into the next level (90 to 100 cm.) exposed the floor feature following south in the unit. Excavations continued to the 90 to 100 cm. level in the northeast corner of the unit, below the prepared housepit floor in order to look for evidence of earlier floor preparations (Fig. 5). No other levels of floor preparation were exhibited. The column sample from Unit C was taken at the northeast corner of the unit in order to capture a level sample that went beneath the floor feature.

Test Unit D. This unit was also placed in the midden locus, but off center of the

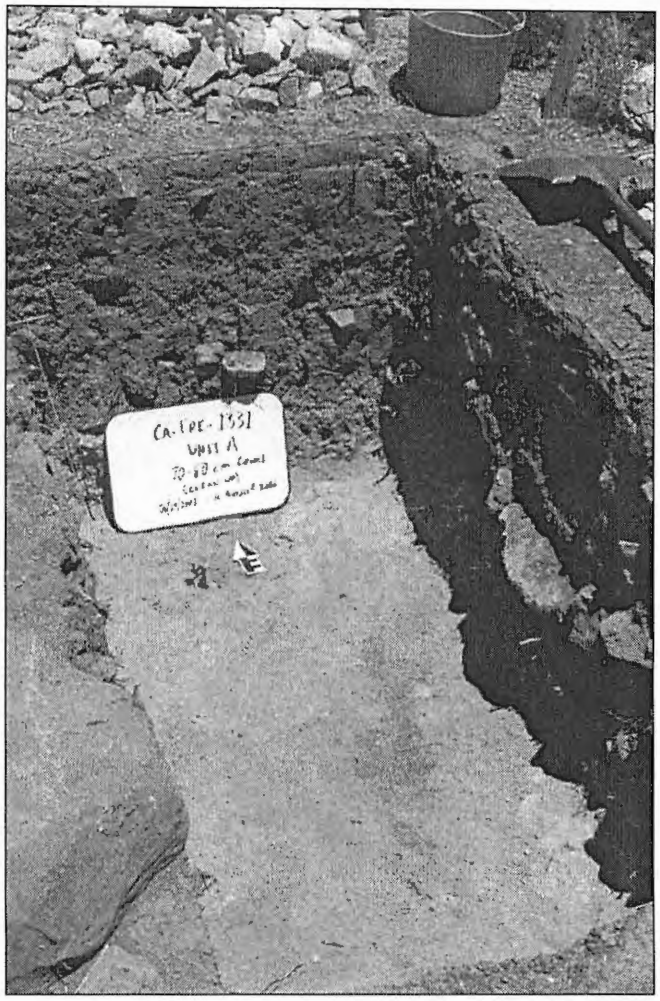

Figure 4. CA-FRE-1331 Unit A 70 to 80 cm. level.

main midden deposit with less surface artifacts and not completely enclosed by the apparent juniper ring. The unit datum was placed in the northwest corner. Unit D also had a rocky matrix similar to Units A and B, but there was no defined rock concentration feature or level. More fossil shell material was recovered from this unit in comparison to any other unit on the site.

Similar to Unit A, the cultural strata in Unit D appeared to diminish by the sixty to seventy and seventy to eighty centimeter levels. However, during excavation of those levels there were intermittent pockets of midden soil interspersed within the overall culturally

Figure 5. CA-FRE-1331 Unit C northeast corner
100 to 110 cm. level.

sterile soil. These pockets were attributed to rodent activity, but excavation of the unit continued in order to be cautious by not misinterpreting the matrices. Then in the 80 to 90 cm. level of Unit D, the highly eroded remains of a human burial were encountered. The remains were located in the south half of the unit and consisted of fragmentary long bones, primarily in situ and some disturbed from adjacent rodent activity. The feature continued into the 90 to 100 cm. level and was pedestalled into the 100 to 110 cm. level (Fig. 6). It should be noted that prior to the completion of the 90 to 100 cm. level, a significant amount of rodent overburden had to be removed and processed. The only artifact found in possible

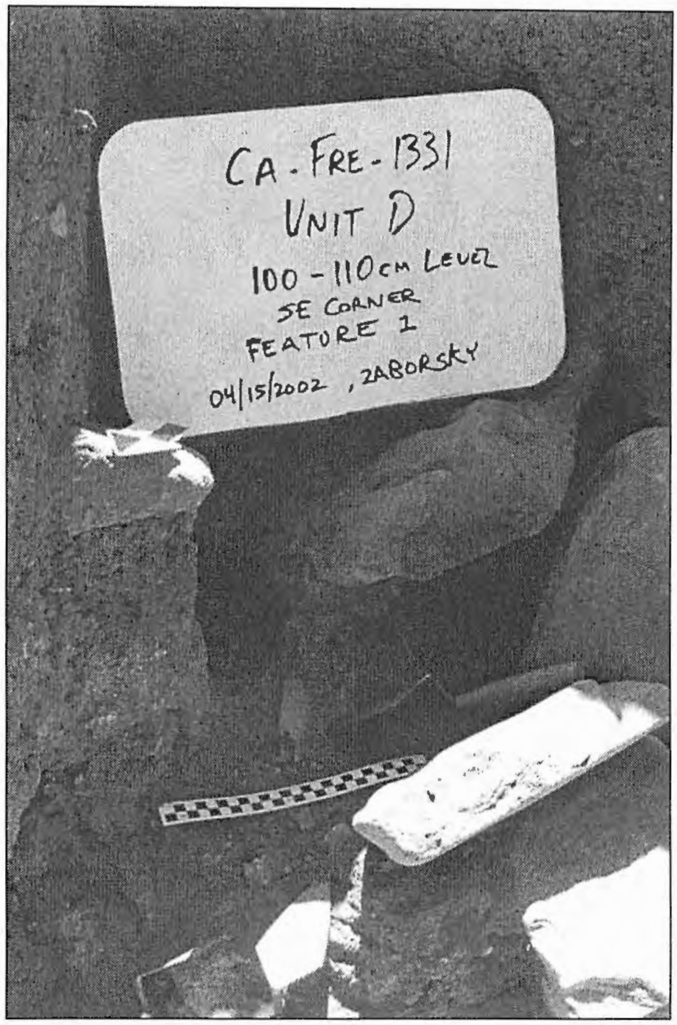

Figure 6. CA-FRE-1331 Unit D southeast corner
feature "B/1", 100 to 110 cm. level.

direct association with the burial was a slab hopper mortar with a small, shallow mortaroid depression on one face of the slab. Excavation continued in the north half of the unit in order to look for evidence of further occupational levels, while avoiding further disturbance to the burial feature. Excavations reached an apparently culturally sterile level at 110 to 120 cm. below unit datum.

Test Unit E. Unit E was placed to look for other possible attributes related to the housepit feature discovered in Unit C. Due to the surface topography created by the housepit feature, the unit datum for Unit E had to be placed in the southwest corner of the unit. At the

10 to 20 cm. level a single feature consisting of two carbonized wooden "posts" was discovered (Fig. 7). The "posts" were in situ at an angle approximately 45 degrees perpendicular to the surface. The feature was presupposed to be posts related to the supporting architecture for the housepit, although no conclusive relation was established between the posts and the floor feature. The south half of Unit E was only excavated to 30cm. below datum, as the north half of the unit was excavated to 60 cm. below unit datum to follow out the possible posts feature.

Discussion. Soil horizons varied between each test unit, but there were some common trends between Units A and B, and between Units C and E. In Unit A (and Unit B to 40 cm. below surface) there were two discreet soil horizons, the unit becoming culturally sterile around 80 cm. below site datum (Fig. 8). There was also a rocky lens or rock concentration, possibly a feature, well defined at the 40 to 50 cm. level that consisted primarily of sandstone rock mixed with some metavolcanics (Fig. 9).

In Units C and E, the soil horizons were very uniform throughout (Fig. 10). Unit E was not excavated to the same depth as Unit C, but appeared to have a similar upper 60 cm. as Unit C. The soil profile at the 90 to 100 cm. level in Unit C made a drastic change, indicating evidence of a prepared floor feature (Fig. 11). The floor was encountered in the north end of the unit and was followed out down towards the south end of the unit, nearly mirroring the original surface unit profile (Fig. 12). Unlike Unit C, which only contained small burnt fragments of wood, Unit E yielded a possible structural feature related to the housepit: "posts" (Fig. 13). Initially encountered at the 20 to 30 cm. level below unit datum, the two "posts" were side by side at an acute angle to the surface. Further excavation in the unit demonstrated that the possible posts were not intact beyond 40 cm. below the surface.

Figure 7. CA-FRE-1331 Unit E 10 to 20 cm. level and feature "P/1" with Unit C in background.

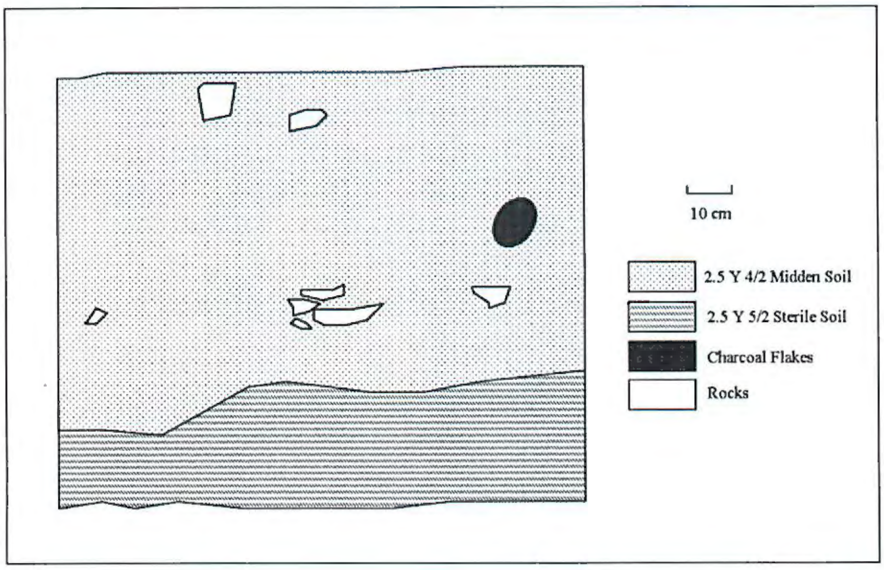

Figure 8. CA-FRE-1331 Unit A north wall profile.

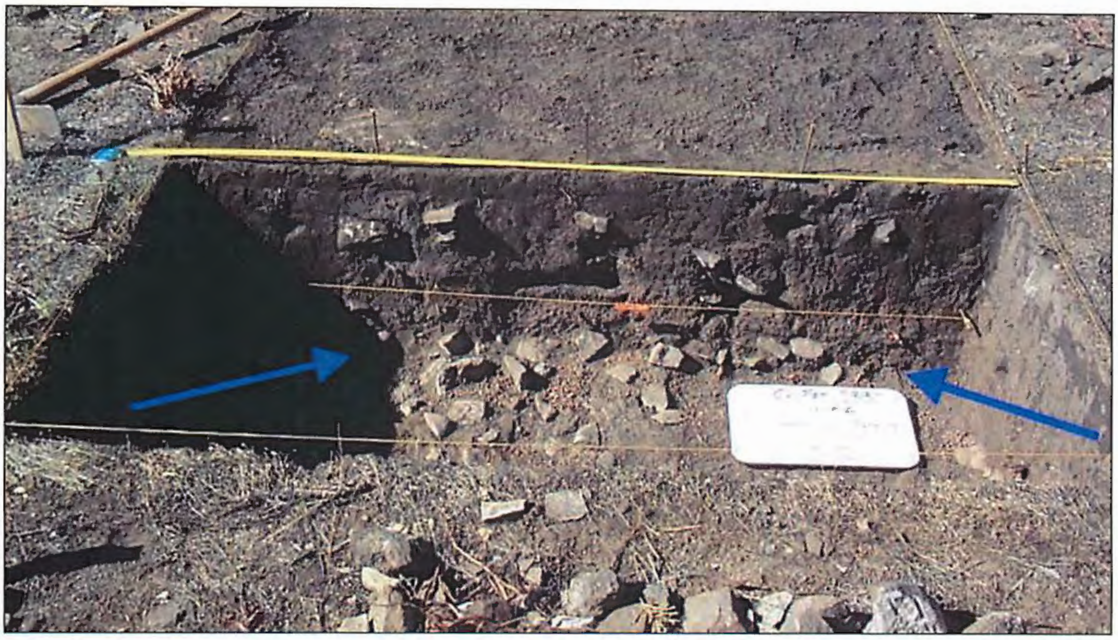

Figure 9. CA-FRE-1331 Unit A 40 to 50 cm. level western exposure (arrows denote lens).

Also of note, there was far less rocky material in Units C and E in comparison to Units A, B and D.

Unit D had a similar stratigraphy to Units A and B (Fig. 14 and Fig. 15). The cultural horizon did not appear to go below the 70 to 80 cm. level as demonstrated in Unit A. However, because of the high amount of rodent disturbance (e.g., deer mice), excavations in the unit continued beyond the 80 cm. level in order to ensure reaching a culturally sterile deposit/layer. At the 80 to 90 cm. and 90 to 100 cm. levels below unit datum that the burial was discovered.

Rodent disturbance at CA-FRE-1331 was pervasive; the primary causer identified was deer mice. As the excavations occurred over several seasons, occasionally the mice would leave backdirt piles in the units. The origin of this backdirt was generated from rodentia tunneling action on the units' sidewalls (see Bocek 1986). Diagnostic artifacts recovered from the krotovina backdirt were few:

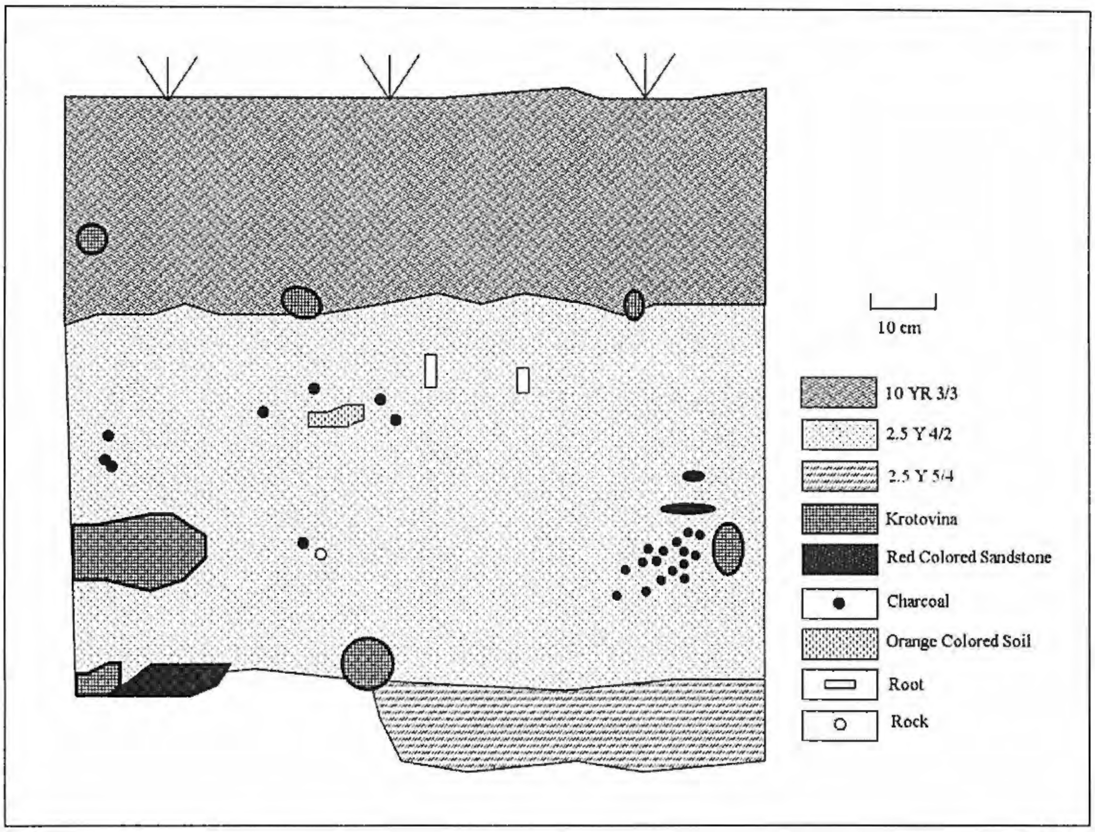

Figure 10. CA-FRE-1331 Unit C north wall profile.

- 2 beads, both *Olivella* sp. type G1 saucers (Bennyhoff and Hughes 1987) from Unit C at the 30 to 40 cm. (Cat. No. 0300) and 80 to 90 cm. levels (Cat. No. 0425). Both items came from the east wall of the unit.
- 1 biface, a Stockton serrated type of projectile point, crafted from obsidian (Cat. No. 0680). It was recovered from Unit D at the 100 cm. level (deer mouse observed).
- 2 faunal elements (teeth) from Unit B at the 30 to 40 cm. level, and Unit C also at the 30 to 40 cm. level. The tooth fragment from Unit C may belong to the Ungulates class of mammals.

One piece of possible actinolite was recovered from Unit C at the 100 to 110 cm. level below the prepared housepit floor. The presence of this material in that level may indicate that

Figure 11. CA-FRE-1331 Unit C soil color contrast between housepit floor feature and native matrix.

all the presumed actinolite recovered from CA-FRE-1331 may indeed be noncultural and only part of the natural soil matrix for the area (refer to discussion in Results section below).

Subsurface Features. Two definite cultural features were encountered at CA-FRE-1331; with probably three or perhaps even four features discovered in total. The two distinct subsurface cultural features were the prepared house floor in Unit C and the human burial in Unit D. It is very probable that the "posts" found in Unit E were related to the housepit, constituting a third feature. The thermally altered sandstone rock concentration in Unit A (and Unit B) may also be a culturally generated feature, possibly representing a fireplace (Wedel 1941), an ochre processing site or perhaps both.

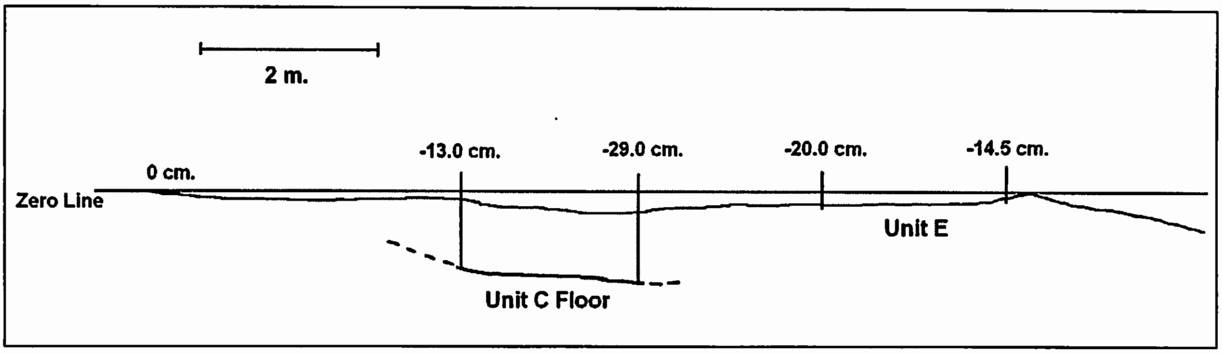

Figure 12. CA-FRE-1331 surface profile with respect to housepit feature, Unit C and Unit E.

Soil Acidity and Munsell Values. Soil acidity (pH) has the potential to indicate where anthropically modified soils occur, especially when the data is used as part of an intra-site comparison. Test soil samples were collected from the three column samples collected at Units A, C, and D. Unit A soil came from the northwest corner of the unit on the north wall, Unit C soil came from the northeast corner of the unit on the north wall, and Unit D soil came from 100 cm. south of the unit datum on the west wall. More test soil samples were taken from the various features: B/1 (burial), P/1 (possible housepit posts), and a "nonfeature" from the 30 to 40 cm. level of Unit B. This "nonfeature" was collected in the field as a possible feature, but was later determined in the lab that it was not a feature. The feature soils from Unit C were a sample of puddle mud on top of the prepared floor and a sample below the floor in the northwest quarter of the northeast quarter of the north half (NW1/4NE1/4N1/2) corner of the Unit, and the Unit D burial feature (feature wall side scrape, feature matrix, and long bones matrix).

This researcher conducted sample testing with an Orion Research 701A digital Ionalyzer at the Archaeology Laboratory of California State University, Bakersfield. Methodology for conducting the pH tests was simple: first, the testing wand was rinsed with

Figure 13. CA-FRE-1331 Unit E possible structural feature "P/1."

deionized water, before and after every sample test. Then between rinsing, the wand was recalibrated with a 7.0 pH buffer solution. 100 mL of deionized water was mixed into each sample, and then agitated with a swirling motion and a stirring rod in order to loosen soil particles and create an evenly mixed solution. The 7.0 pH buffer solution was changed for every new Unit (A, C, D) and the features. Each test soil sample was approximated by weight, not by volume (19 to 21 g. each). All samples with the exception of the features were nearly identical in volume (Table 3). Overall the results indicated there was no great amount of acidic variability between the midden and non-midden matrices at CA-FRE-1331. Perhaps more delicate studies with more sensitive testing equipment would produce finer results.

Material Culture

The artifact collection consists of beads, flaked stone, milling and processing implements, and beads. Each artifact category is summarized below.

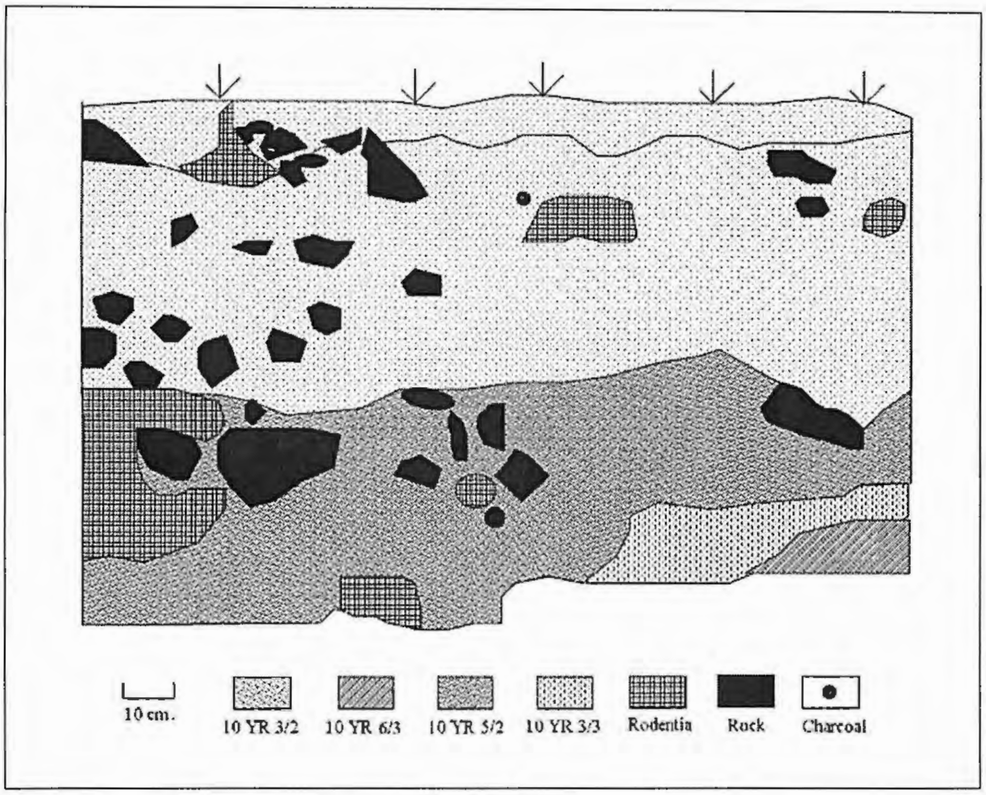

Figure 14. CA-FRE-1331 Unit D east wall profile.

Beads. Beads, as "sociotechnic objects" in California prehistory, are the "basic units for sensitive seriation" (King 1974:75). They provide relative chronometric dating for sites in the California culture area. Traditionally in archaeological shell bead analysis, at least three or four points of measurement are used in order to classify a specific bead into a temporal-regional type. However, as methods change and are refined over time through archaeological research, some scholars now recommend there should be seven points of measurement in shell bead analysis. These points are the beads' length (lateral portion of the shell), width, longest diagonal, shortest diagonal, arc thickness, edge thickness, and diameter of perforation (Milliken 2000).

Most of the beads recovered from CA-FRE-1331 can be assigned to Phase 2 of California's prehistoric Late Period, circa A.D. 1500 to 1690 (Fig.16, Table 4 and Table 5).

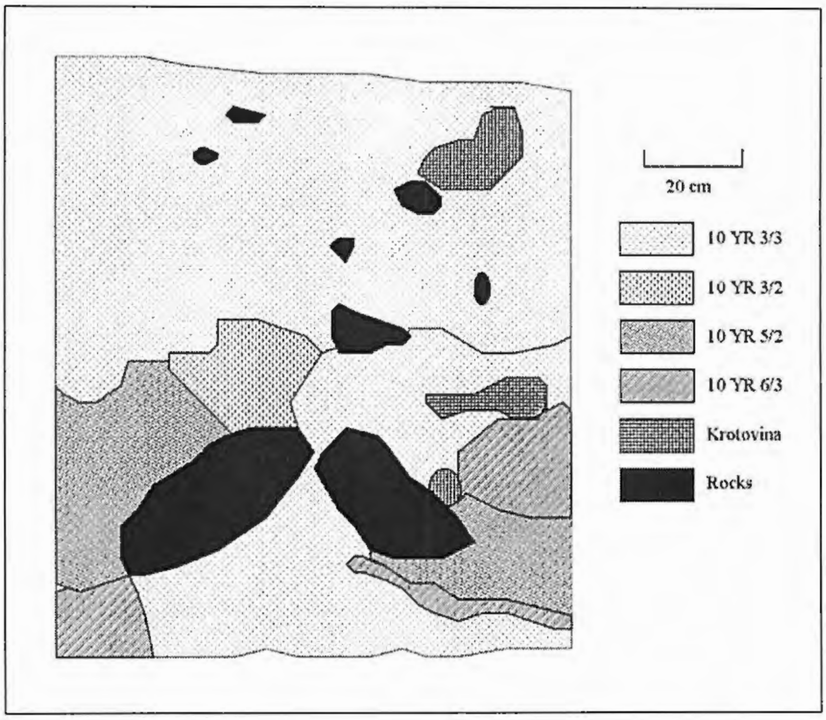

Figure 15. CA-FRE-1331 Unit D south wall profile.

The presence of the steatite disk beads, a rare *Haliotis* sp. disc bead, along with the different *Olivella* sp. shell beads (e.g., types E2a and E2b [thick lipped], J [wall disk], K1 [cupped callus]) all indicate Late Period occupation (King 1978; Bennyhoff and Hughes 1987:128-129, 136-137). The other beads from the site temporally range from the Early Period into the Protohistoric, or perhaps even the post Mission era. The whole end ground *Olivella* sp. shell beads (type B2) and whole simple spire lopped *Olivella* sp. shell beads (type A1) have a wide chronometric value, being found only in association with sites from the Early Period or Phase 1 of the Late Period (Bennyhoff and Hughes 1987:117-118). The stylistically similar whole barrel shaped end ground *Olivella* sp. shell bead (type B3) has been found in archaeological associations ranging from Early Period to Protohistoric sites (Bennyhoff and Hughes 1987:122). The majority of the beads from CA-FRE-1331 were recovered in Unit C. Almost all of these beads were the G1 type, or "tiny saucer"

Table 3
PROVENIENCE OF SOIL ACIDITY AND MUNSELL VALUES AT CA-FRE-1331

Sample No. / Cat. No.	Unit	Level/Feature[1]	pH	Field Munsell (Dry)	Lab Munsell (Dry)
1	A	0-10	8.7	10YR 3/1	10YR 3/2
2	A	10-20	8.8	--	10YR 3/1
3	A	20-30	8.9	10YR 3/1	10YR 3/1
4	A	30-40	8.8	10YR 3/3	10YR 3/2
5	A	40-50	8.7	2.5Y 3/2	2.5Y 3/2
6	A	50-60	8.7	10YR 4/3	2.5Y 3/2
7	A	60-70	8.6	10YR 3/2	2.5Y 4/2
8	A	70-80	8.6	2.5Y 4/2	2.5Y 4/2
9	C	0-10	8.4	10YR 4/2	10YR 4/2
10	C	10-20	8.5	10YR 4/2	10YR 4/2
11	C	20-30	8.5	10YR 4/2	10YR 4/2
12	C	30-40	8.6	10YR 4/2	10YR 4/2
13	C	40-50	8.6	10YR 6/3	10YR 4/2
14	C	50-60	8.6	10YR 5/2	10YR 4/2
15	C	60-70	8.5	2.5Y 4/2	10YR 4/2
16	C	70-80	8.6	10YR 3/3	10YR 4/2
17	C	70-80 (gray matrix)	8.5	--	2.5Y 4/2
18	C	80-90	8.6	10YR 4/2	10YR 4/2
19	C	90-100	8.6	2.5Y 5/2	10YR 5/2
31 / 0456	C	Floor	8.2	--	10YR 4/2
32 / 0457	C	Floor & below	8.2	--	2.5Y 6/2
20	D	0-10	8.2	2.5Y 4/2	10YR 3/2
21	D	10-20	8.3	10YR 3/2	10YR 3/2
22	D	20-30	8.3	10YR 3/3	10YR 3/2
23	D	30-40	8.3	10YR 3/3	10YR 3/3
24	D	40-50	8.4	2.5Y 4/2	10YR 4/2
25	D	50-60	8.5	2.5Y 4/2	10YR 4/2
26	D	60-70	8.5	2.5Y 4/2	10YR 4/2
27	D	70-80	8.4	2.5Y 5/2	10YR 5/3
28	D	80-90	8.4	2.5Y 4/2	10YR 5/3
29	D	90-100	8.4	10YR 3/3	10YR 5/3
30	D	100-110	8.5	10YR 5/3	10YR 5/3
33 / 0856	D	B/1	8.4	--	10YR 4/2
34 / 0858	D	B/1 (matrix)	8.5	--	10YR 5/2
35 / 0858, 0665, 0676	D	B/1 (long bones)	8.3	--	10YR 5/3

[1] Level/Feature measured in cm.

Olivella sp. shell bead (Bennyhoff and Hughes 1987:132). This type of bead is not particularly chronologically sensitive and can fall within any Period. The G1 type is similar to the G2a type ("normal saucer" *Olivella* sp. shell bead), but the G1 type has a "nearly flat" cross section and G2a represents a "marker type

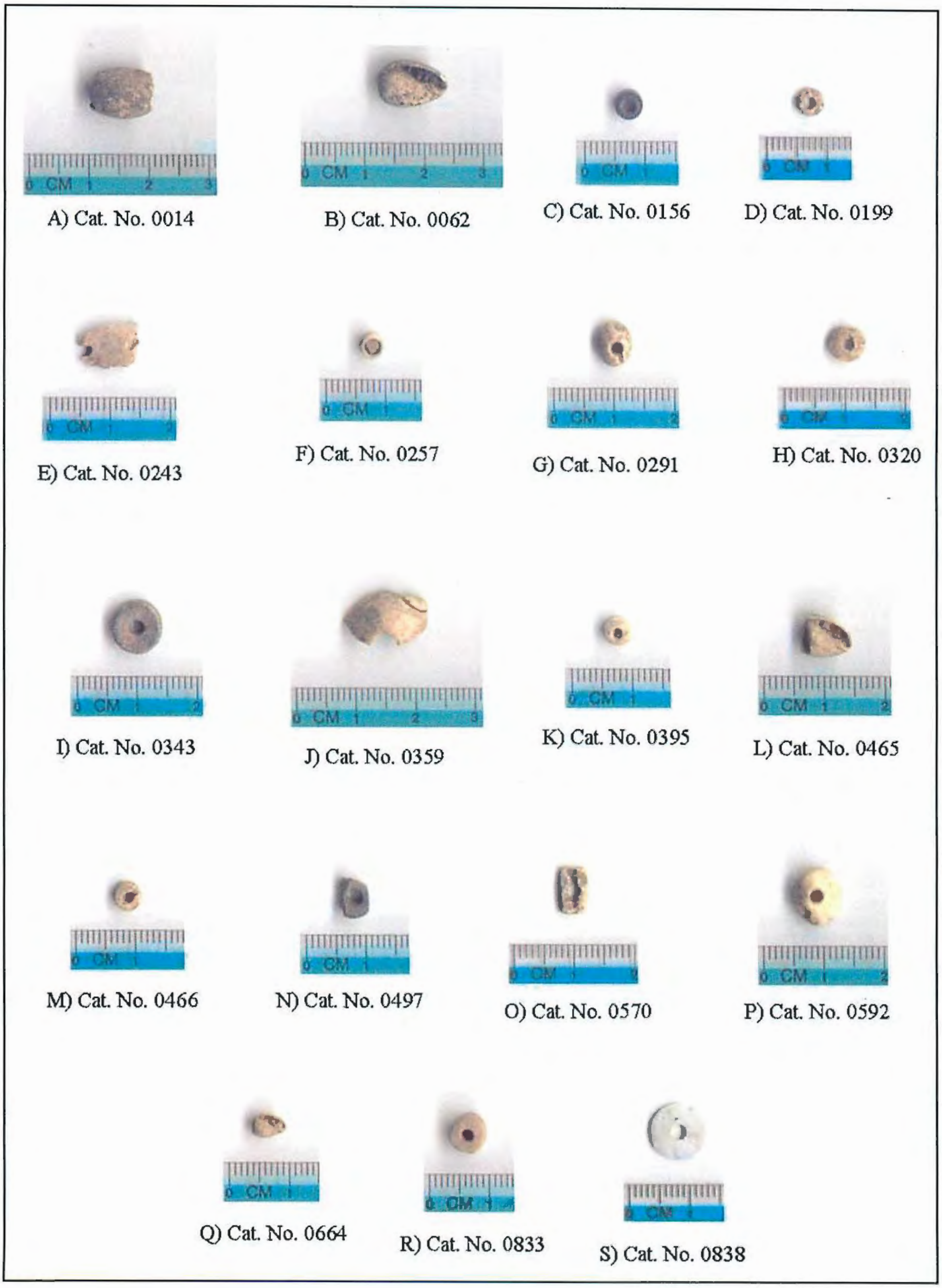

Figure 16. Representative sample diagnostic shell and stone beads from CA-FRE-1331.

Table 4
PROVENIENCE, MATERIAL, AND TYPE OF BEADS FROM CA-FRE-1331

Cat. No.	Unit	Level[1]	Material	Type (Bennyhoff and Hughes 1987), Fig.
0014	A	0-10	*Olivella* sp.	B2b (possibly B3), 16.A
0015	A	0-10	steatite	- -
0016	A	0-10	steatite	- -
0017	A	0-10	steatite	- -
0037	A	10-20	shell	B3 (Barrel)
0038	A	10-20	steatite	- -
0062	A	20-30	*Olivella* sp.	B2b, 16.B
0063	A	20-30	*Olivella* sp.	G1 (tiny saucer)
0064	A	20-30	*Olivella* sp.	G1
0065	A	20-30	steatite	- -
0109	A	50-60	*Olivella* sp.	G2a
0121	A	60-70	*Olivella* sp.	G2a
0155	B	0-10	steatite	- -
0156	B	0-10	steatite	16.C
0179	B	10-20	*Olivella* sp.	G1
0180	B	10-20	*Olivella* sp.	G1
0181	B	10-20	*Olivella* sp.	E2b (thick lipped)
0199	B	20-30	*Olivella* sp.	G1, 16.D
0200	B	20-30	*Olivella* sp.	A1b (medium spire-lopped)
0238	C	10-20	*Olivella* sp.	G1
0239	C	10-20	*Olivella* sp.	G1
0240	C	10-20	*Olivella* sp.	G1
0241	C	10-20	*Olivella* sp.	G1
0242	C	10-20	*Olivella* sp.	G1
0243	C	10-20	*Olivella* sp. (?)	shatter; possibly C6, 16.E
0255	C	20-30	steatite	- -
0256	C	20-30	*Olivella* sp.	A1a
0257	C	20-30	bone?	partially broken, 16.F
0258	C	20-30	*Olivella* sp.	E2a
0259	C	20-30	*Olivella* sp.	G1
0260	C	20-30	*Olivella* sp.	G1
0261	C	20-30	*Olivella* sp.	G1
0262	C	20-30	*Olivella* sp.	G1
0263	C	20-30	*Olivella* sp.	G1
0264	C	20-30	*Olivella* sp.	G1
0265	C	20-30	*Olivella* sp.	G1
0266	C	20-30	*Olivella* sp.	G1
0267	C	20-30	*Olivella* sp.	G1
0268	C	20-30	*Olivella* sp.	G1
0269	C	20-30	*Olivella* sp.	G1
0270	C	20-30	*Olivella* sp.	G1
0271	C	20-30	*Olivella* sp.	G1
0272	C	20-30	*Olivella* sp.	G1
0288	C	30-40	steatite	- -

Table 4 continued
PROVENIENCE, MATERIAL, AND TYPE OF BEADS FROM CA-FRE-1331

Cat. No.	Unit	Level[1]	Material	Type (Bennyhoff and Hughes 1987), Fig.
0289	C	30-40	*Olivella* sp.	E2a
0290	C	30-40	*Olivella* sp.	E2a
0291	C	30-40	*Olivella* sp.	E2a, 16.G
0292	C	30-40	*Olivella* sp.	G1
0293	C	30-40	*Olivella* sp.	G1
0294	C	30-40	*Olivella* sp.	G1
0295	C	30-40	*Olivella* sp.	G1
0296	C	30-40	*Olivella* sp.	G1
0300	C	30-40	*Olivella* sp.	G1
0318	C	40-50	*Olivella* sp.	E2a
0319	C	40-50	*Olivella* sp.	G1
0320	C	40-50	*Olivella* sp.	G2a, 16.H
0321	C	40-50	*Olivella* sp.	G1
0322	C	40-50	*Olivella* sp.	G1
0323	C	40-50	*Olivella* sp.	G1
0324	C	40-50	*Olivella* sp.	G1; edges look ground F3b
0325	C	40-50	*Olivella* sp.	G1
0326	C	40-50	*Olivella* sp.	G1
0327	C	40-50	*Olivella* sp.	G1
0328	C	40-50	*Olivella* sp.	G1
0329	C	40-50	*Olivella* sp.	G1
0330	C	40-50	*Olivella* sp.	G1
0331	C	40-50	*Olivella* sp.	probably G1
0343	C	50-60	steatite	16.I
0344	C	50-60	steatite	- -
0345	C	50-60	steatite	- -
0346	C	50-60	*Olivella* sp.	G1
0347	C	50-60	*Olivella* sp.	G1
0348	C	50-60	*Olivella* sp.	G1
0358	C	60-70	steatite	- -
0359	C	60-70	*Olivella* sp.	D1a, 16.J
0360	C	60-70	*Olivella* sp.	E2a
0361	C	60-70	*Olivella* sp.	G1
0362	C	60-70	*Olivella* sp.	G1
0363	C	60-70	*Olivella* sp.	G1
0364	C	60-70	*Olivella* sp.	G1
0365	C	60-70	*Olivella* sp.	G1
0387	C	70-80	*Olivella* sp.	E2a
0388	C	70-80	*Olivella* sp.	G1
0391	C	70-80	steatite	- -
0392	C	70-80	steatite	- -
0393	C	70-80	steatite	- -
0394	C	70-80	steatite	- -
0395	C	70-80	*Olivella* sp.	K1, 16.K
0396	C	70-80	*Olivella* sp.	A1a; probably G1

Table 4 continued
PROVENIENCE, MATERIAL, AND TYPE OF BEADS FROM CA-FRE-1331

Cat. No.	Unit	Level[1]	Material	Type (Bennyhoff and Hughes 1987), Fig.
0414	C	80-90	steatite	tubular
0415	C	80-90	steatite	- -
0416	C	80-90	*Olivella* sp.	G1
0417	C	80-90	*Olivella* sp.	G1
0418	C	80-90	*Olivella* sp.	G1
0419	C	80-90	*Olivella* sp.	G1
0420	C	80-90	*Olivella* sp.	G1
0421	C	80-90	*Olivella* sp.	G1
0425	C	80-90	*Olivella* sp.	G1
0444	C	90-100	steatite	- -
0445	C	90-100	*Olivella* sp.	G1
0446	C	90-100	*Olivella* sp.	G1
0447	C	90-100	*Olivella* sp.	G1
0448	C	90-100	*Olivella* sp.	G1
0465	C	100-110	*Olivella* sp.	B2 oblique (like B6 on top only), 16.L
0466	C	100-110	*Olivella* sp.	G1, 16.M
0467	C	100-110	*Olivella* sp.	G1
0468	C	100-110	magnesite (?)	disk; steatite?
0496	D	0-10	steatite	3 ground edges
0497	D	0-10	steatite	Fig 16.N
0498	D	0-10	shell?	G2
0499	D	0-10	*Olivella* sp.	A1b
0500	D	0-10	*Olivella* sp.	G1
0501	D	0-10	*Olivella* sp.	E2a
0502	D	0-10	*Olivella* sp.	E2a
0519	D	10-20	*Olivella* sp. (?)	G1
0520	D	10-20	*Olivella* sp.	J
0521	D	10-20	*Olivella* sp.	C2 (?)
0542	D	20-30	steatite	- -
0568	D	30-40	steatite	- -
0569	D	30-40	*Olivella* sp.	H3 (?), *Halitotis* sp. (?)
0570	D	30-40	*Olivella* sp.	L2, 16.O
0590	D	40-50	steatite	- -
0591	D	40-50	*Olivella* sp.	A1b
0592	D	40-50	*Olivella* sp.	E2a, 16.P
0636	D	50-60	bone (?)	- -
0664	D	80-90	*Olivella* sp.	A2, 16.Q
0724	E	0-10	*Olivella* sp.	G1
0725	E	0-10	*Olivella* sp.	G1
0726	E	0-10	*Olivella* sp.	G1
0727	E	0-10	steatite	- -
0728	E	0-10	steatite	- -
0742	E	10-20	steatite	- -
0743	E	10-20	steatite	- -
0744	E	10-20	steatite	- -

Table 4 continued
PROVENIENCE, MATERIAL, AND TYPE OF BEADS FROM CA-FRE-1331

Cat. No.	Unit	Level[1]	Material	Type (Bennyhoff and Hughes 1987), Fig.
0745	E	10-20	*Olivella* sp. (?)	G2
0746	E	10-20	*Olivella* sp.	G1
0757	E	20-30	steatite	- -
0758	E	20-30	steatite	- -
0759	E	20-30	*Olivella* sp.	G1
0769	E	30-40	*Olivella* sp. (?)	G1 (or K1)
0790	E	40-50	steatite	- -
0791	E	40-50	steatite	- -
0792	E	40-50	*Olivella* sp.	K1
0793	E	40-50	*Olivella* sp.	G1
0794	E	40-50	*Olivella* sp.	G1
0795	E	40-50	*Olivella* sp.	partial G1
0796	E	40-50	*Olivella* sp.	G1
0807	E	50-60	steatite	- -
0808	E	50-60	steatite	- -
0809	E	50-60	steatite	- -
0829	- -	Surface	steatite	- -
0833	- -	Surface	shell	clamshell disk (?), 16.R
0834	- -	Surface	*Olivella* sp.	E2b
0835	- -	Surface	shell?	- -
0836	- -	Surface	*Olivella* sp.	G1
0837	- -	Surface	*Olivella* sp.	K1
0838	- -	Surface	*Haliotis* sp.	disk, 16.S
0840	- -	Surface	steatite	- -
0855	A	0-10	*Olivella* sp. (?)	bead "blank" (?)
0886	C	40-50	*Olivella* sp.	probably G1
0890	C	70-80	*Olivella* sp.	probably G1 (damage to shell)

[1] Level measured in cm.

for the Middle Period" (Bennyhoff and Hughes 1987:132).

The other beads from CA-FRE-1331 date to the Early Period, the Middle Period transition into the Late Period, or post Mission eras. Some of the type assignations to these beads were tenuous, largely due to the poor preservation quality of the shell bead in the archeological deposit (which affected the originally designed shape and pattern of the bead). The presence of a single oblique spire-lopped whole *Olivella* sp. shell bead (type A2) and a single small thick rectangle *Olivella* sp. shell bead (type L2) both indicate an Early Period presence (Bennyhoff and Hughes 1987:117-118, 139). Neither one of these bead types is

Table 5
MEASURED ATTRIBUTES OF BEADS FROM CA-FRE-1331

Cat. No.	Wt.[1]	Lgh.[2]	Wdh.[2]	Arc[2]	Edge[2]	L. Diag.[2]	S. Diag.[2]	P. Diam.[2]
0014	0.7	1.2	0.8	- -	0.1	1.2	0.8	0.3
0015	0.3	0.8	0.6	- -	0.3	0.7	0.7	0.4
0016	0.3	0.8	0.7	- -	0.3	0.7	0.7	0.2
0017	0.3	0.8	0.7	- -	0.3	0.7	0.7	0.2
0037	0.1	0.3	0.3	- -	0.1	0.4	0.3	0.2
0038	0.1	0.6	0.6	- -	0.2	0.6	0.5	0.2
0062	0.5	1.2	0.8	- -	0.1	0.9	0.9	0.1
0063	<0.1	0.4	0.4	<0.1	0.1	0.4	0.4	0.2
0064	<0.1	0.4	0.4	<0.1	0.1	0.4	0.4	0.2
0065	0.1	0.5	0.5	- -	0.1	0.5	0.5	0.2
0109	0.1	0.7	0.5	0.1	0.1	0.6	0.6	0.2
0121	0.1	0.6	0.5	0.1	0.1	0.6	0.5	0.2
0155	0.1	0.5	0.4	- -	0.2	0.5	0.4	0.2
0156	0.1	0.5	0.5	- -	0.3	0.5	0.5	0.2
0179	<0.1	0.5	0.5	0.1	0.1	0.5	0.5	0.2
0180	<0.1	0.5	0.5	<0.1	0.1	0.5	0.5	0.2
0181	0.3	0.8	0.7	0.2	0.3	0.9	0.8	0.2
0199	<0.1	0.5	0.5	<0.1	0.1	0.5	0.5	0.1
0200	0.1	0.7	0.5	- -	<0.1	0.8	0.7	0.1
0238	<0.1	0.5	0.4	<0.1	0.1	0.5	0.4	0.1
0239	<0.1	0.5	0.4	<0.1	0.1	0.5	0.4	0.1
0240	<0.1	0.4	0.4	<0.1	0.1	0.4	0.4	0.1
0241	<0.1	0.5	0.4	<0.1	0.1	0.5	0.4	0.2
0242	<0.1	0.5	0.4	<0.1	0.1	0.5	0.4	0.1
0243	0.2	1.0	0.8	- -	0.1	1.0	0.8	0.1
0255	0.1	0.6	0.6	- -	0.1	0.6	0.6	0.2
0256	0.1	0.8	0.5	- -	<0.1	0.8	0.6	0.2
0257	0.1	0.3	0.4	- -	<0.1	0.5	0.3	0.2
0258	0.2	0.9	0.7	0.1	0.3	0.9	0.8	0.2
0259	0.1	0.5	0.5	<0.1	0.1	0.5	0.5	0.1
0260	<0.1	0.5	0.4	<0.1	0.1	0.5	0.4	0.1
0261	<0.1	0.5	0.5	<0.1	0.1	0.5	0.5	0.2
0262	<0.1	0.5	0.5	<0.1	0.1	0.5	0.5	0.2
0263	<0.1	0.5	0.5	<0.1	0.1	0.5	0.5	0.1
0264	<0.1	0.5	0.5	<0.1	0.1	0.5	0.5	0.1
0265	<0.1	0.5	0.5	- -	0.1	0.5	0.5	0.2
0266	<0.1	0.5	0.4	<0.1	0.5	0.5	0.4	0.1
0267	<0.1	0.5	0.4	<0.1	0.1	0.5	0.4	0.2
0268	<0.1	0.5	0.5	<0.1	0.1	0.5	0.5	0.1
0269	<0.1	0.4	0.4	<0.1	0.1	0.4	0.4	0.1
0270	<0.1	0.5	0.4	<0.1	0.1	0.5	0.4	0.2
0271	<0.1	0.5	0.4	<0.1	0.1	0.5	0.4	0.2
0272	<0.1	0.4	0.4	<0.1	0.1	0.4	0.4	0.1
0288	0.4	0.8	0.8	- -	0.4	0.8	0.8	0.2
0289	0.3	0.8	0.9	0.3	0.2	0.9	0.8	0.2

Table 5 continued
MEASURED ATTRIBUTES OF BEADS FROM CA-FRE-1331

Cat. No.	Wt.[1]	Lgh.[2]	Wdh.[2]	Arc[2]	Edge[2]	L. Diag.[2]	S. Diag.[2]	P. Diam.[2]
0290	0.2	1.0	0.6	0.2	0.1	0.9	0.8	0.2
0291	0.1	0.7	0.6	0.2	0.1	0.7	0.6	0.2
0292	<0.1	0.5	0.5	<0.1	0.1	0.5	0.5	0.1
0293	<0.1	0.4	0.4	<0.1	0.1	0.4	0.4	0.1
0294	<0.1	0.4	0.4	<0.1	0.1	0.4	0.4	0.1
0295	0.1	0.6	0.5	<0.1	0.1	0.6	0.5	0.1
0296	<0.1	0.5	0.5	<0.1	0.1	0.5	0.5	0.1
0300	<0.1	0.5	0.5	<0.1	0.1	0.5	0.5	0.1
0318	0.4	1.0	0.9	0.2	0.3	0.9	0.8	0.2
0319	<0.1	0.5	0.5	<0.1	0.1	0.5	0.5	0.2
0320	0.1	0.6	0.6	0.1	0.2	0.6	0.6	0.1
0321	<0.1	0.5	0.5	<0.1	0.1	0.5	0.5	0.1
0322	<0.1	0.5	0.4	<0.1	0.1	0.5	0.4	0.2
0323	<0.1	0.5	0.4	<0.1	0.1	0.5	0.4	0.1
0324	<0.1	0.4	0.4	<0.1	0.1	0.4	0.4	0.1
0325	<0.1	0.5	0.4	<0.1	0.1	0.5	0.4	0.2
0326	<0.1	0.5	0.4	<0.1	0.1	0.5	0.4	0.1
0327	<0.1	0.5	0.4	<0.1	0.1	0.5	0.3	0.2
0328	<0.1	0.4	0.4	<0.1	0.1	0.4	0.4	0.1
0329	<0.1	0.4	0.4	<0.1	0.1	0.4	0.4	0.1
0330	<0.1	0.4	0.4	<0.1	0.1	0.4	0.4	0.1
0331	<0.1	0.4	0.4	<0.1	0.1	0.4	0.4	0.2
0343	0.4	0.9	0.8	- -	0.3	0.9	0.8	0.2
0344	0.1	0.7	0.7	- -	0.2	0.7	0.7	0.3
0345	0.4	0.8	0.8	- -	0.4	0.8	0.7	0.2
0346	<0.1	0.5	0.4	<0.1	0.1	0.5	0.4	0.1
0347	<0.1	0.5	0.5	<0.1	0.1	0.5	0.5	0.1
0348	<0.1	0.5	0.4	<0.1	0.1	0.5	0.4	0.1
0358	0.2	0.7	0.7	- -	0.2	0.7	0.7	0.3
0359	0.4	1.5	0.9	0.3	0.1	1.0	0.8	0.4
0360	0.2	1.0	0.6	0.2	0.2	1.0	0.6	0.2
0361	<0.1	0.5	0.5	<0.1	0.1	0.5	0.5	0.1
0362	<0.1	0.5	0.4	<0.1	0.1	0.5	0.4	0.1
0363	<0.1	0.6	0.4	<0.1	0.1	0.6	0.5	0.2
0364	<0.1	0.5	0.5	<0.1	0.1	0.5	0.5	0.1
0365	<0.1	0.5	0.4	<0.1	0.1	0.5	0.4	0.1
0387	0.4	0.9	0.8	0.2	0.2	0.9	0.9	0.2
0388	<0.1	0.5	0.5	<0.1	0.1	0.5	0.5	0.2
0391	0.2	0.7	0.6	- -	0.3	0.7	0.6	0.2
0392	0.1	0.5	0.5	- -	0.2	0.5	0.5	0.2
0393	0.1	0.5	0.5	- -	0.2	0.5	0.5	0.2
0394	0.1	0.5	0.4	- -	0.2	0.5	0.4	0.1
0395	0.1	0.5	0.4	<0.1	0.2	0.5	0.4	0.1
0396	0.2	0.8	0.5	- -	<0.1	0.7	0.5	0.2
0414	0.3	0.7	0.8	- -	0.3	0.8	0.8	0.2

Table 5 continued
MEASURED ATTRIBUTES OF BEADS FROM CA-FRE-1331

Cat. No.	Wt.[1]	Lgh.[2]	Wdh.[2]	Arc[2]	Edge[2]	L. Diag.[2]	S. Diag.[2]	P. Diam.[2]
0415	0.2	0.5	0.5	- -	0.4	0.5	0.5	0.2
0416	0.1	0.5	0.5	<0.1	0.1	0.5	0.5	0.1
0417	<0.1	0.5	0.5	<0.1	0.1	0.5	0.5	0.1
0418	<0.1	0.4	0.5	<0.1	0.1	0.5	0.4	0.1
0419	<0.1	0.4	0.4	<0.1	0.1	0.4	0.4	0.1
0420	<0.1	0.5	0.4	<0.1	0.1	0.5	0.4	0.2
0421	<0.1	0.4	0.4	<0.1	0.1	0.4	0.4	0.1
0425	<0.1	0.5	0.4	<0.1	0.1	0.5	0.3	0.1
0444	<0.1	0.6	0.7	- -	0.3	0.7	0.7	0.3
0445	<0.1	0.4	0.5	<0.1	0.1	0.5	0.5	0.1
0446	<0.1	0.4	0.4	<0.1	0.1	0.4	0.4	0.1
0447	<0.1	0.5	0.5	<0.1	0.1	0.5	0.5	0.1
0448	<0.1	0.4	0.4	<0.1	0.1	0.4	0.4	0.1
0465	<0.1	1.0	0.7	- -	0.1	0.8	0.8	0.4
0466	<0.1	0.4	0.5	<0.1	0.1	0.5	0.5	0.2
0467	<0.1	0.4	0.4	<0.1	0.1	0.4	0.4	0.1
0468	<0.1	0.8	0.4	- -	0.3	0.6	0.6	0.2
0496	<0.1	0.5	0.5	- -	0.2	0.5	0.5	0.2
0497	<0.1	0.7	0.5	- -	0.3	0.6	0.5	0.2
0498	<0.1	0.9	0.6	- -	0.1	0.7	0.6	0.2
0499	<0.1	0.7	0.4	- -	0.1	0.6	0.5	0.2
0500	<0.1	0.4	0.4	<0.1	0.1	0.4	0.4	0.1
0501	<0.1	0.8	0.7	0.2	0.3	0.8	0.7	0.2
0502	<0.1	0.8	0.7	0.2	0.2	0.8	0.7	0.2
0519	<0.1	0.4	0.4	<0.1	0.1	0.4	0.4	0.1
0520	<0.1	1.1	0.7	0.2	0.2	1.1	0.8	0.2
0521	<0.1	0.9	0.7	0.1	0.1	0.9	0.7	0.2
0542	<0.1	0.6	0.7	- -	0.2	0.7	0.7	0.2
0568	<0.1	0.9	0.6	0.1	0.2	0.6	0.6	0.1
0569	<0.1	0.9	0.5	0.1	0.1	0.6	0.4	0.3
0570	<0.1	0.8	0.5	- -	0.1	0.8	0.8	0.2
0590	<0.1	0.8	0.7	- -	0.4	0.8	0.7	0.2
0591	<0.1	1.0	0.6	- -	0.1	0.8	0.4	0.2
0592	<0.1	0.9	0.8	0.2	0.2	0.8	0.8	0.2
0636	<0.1	0.4	0.3	- -	<0.1	0.5	0.4	0.2
0664	<0.1	0.6	0.4	- -	<0.1	0.5	0.5	0.2
0724	<0.1	0.5	0.5	<0.1	0.1	0.5	0.5	0.1
0725	<0.1	0.4	0.4	<0.1	0.1	0.4	0.4	0.1
0726	<0.1	0.4	0.4	<0.1	0.1	0.4	0.4	0.2
0727	<0.1	0.5	0.5	- -	0.1	0.5	0.5	0.2
0728	<0.1	0.6	0.6	- -	0.3	0.6	0.6	0.2
0742	<0.1	0.7	0.7	- -	0.4	0.7	0.7	0.2
0743	<0.1	0.8	0.7	- -	0.4	0.8	0.7	0.2
0744	<0.1	0.8	0.7	- -	0.4	0.8	0.7	0.2
0745	<0.1	0.7	0.6	<0.1	0.1	0.6	0.6	0.2

Table 5 continued
MEASURED ATTRIBUTES OF BEADS FROM CA-FRE-1331

Cat. No.	Wt.[1]	Lgh.[2]	Wdh.[2]	Arc[2]	Edge[2]	L. Diag.[2]	S. Diag.[2]	P. Diam.[2]
0746	<0.1	0.5	0.5	<0.1	0.1	0.5	0.5	0.2
0757	<0.1	0.5	0.5	- -	0.2	0.5	0.5	0.2
0758	<0.1	0.6	0.8	- -	0.3	0.7	0.7	0.2
0759	<0.1	0.5	0.4	<0.1	0.1	0.5	0.4	0.1
0769	<0.1	0.5	0.4	0.1	0.1	0.5	0.4	0.1
0790	<0.1	0.5	0.5	- -	0.2	0.5	0.5	0.2
0791	<0.1	0.7	0.7	- -	0.2	0.7	0.7	0.2
0792	<0.1	0.4	0.4	<0.1	0.2	0.4	0.4	0.1
0793	<0.1	0.5	0.4	<0.1	0.1	0.5	0.4	0.2
0794	<0.1	0.5	0.4	<0.1	0.1	0.5	0.4	0.1
0795	<0.1	0.5	0.4	<0.1	0.1	0.4	0.4	0.1
0796	<0.1	0.5	0.4	<0.1	0.1	0.5	0.4	0.2
0807	<0.1	0.8	0.8	- -	0.2	0.8	0.8	0.2
0808	<0.1	0.8	0.6	- -	0.3	0.7	0.6	0.2
0809	<0.1	0.8	0.4	- -	0.2	0.7	0.6	0.2
0829	<0.1	0.7	0.7	- -	0.4	0.7	0.7	0.2
0833	<0.1	0.6	0.6	- -	0.5	0.6	0.6	0.2
0834	<0.1	0.9	0.8	0.1	0.1	0.8	0.8	0.2
0835	<0.1	0.6	0.6	- -	0.2	0.6	0.6	0.2
0836	<0.1	0.5	0.5	<0.1	0.1	0.5	0.5	0.1
0837	<0.1	0.4	0.4	<0.1	0.2	0.4	0.4	0.1
0838	<0.1	1.0	0.9	<0.1	<0.1	1.0	0.9	0.2
0840	<0.1	0.6	0.5	- -	0.2	0.6	0.5	0.3
0855	<0.1	1.5	0.7	0.2	0.1	1.5	1.3	0.4
0886	<0.1	0.6	0.5	<0.1	0.1	0.6	0.5	0.2
0890	<0.1	0.6	0.5	<0.1	0.1	0.6	0.5	0.1

[1] Weight (Wt.) is measured in g.
[2] Total length (Lgh.), total width (Wdh.), arc width (Arc), edge thickness (Edge), longest diagonal (L. Diag.), shortest diagonal (S. Diag.), and perforation diameter (P. Diam.) is measured in cm.

found in association with anything but California's prehistoric Early Period: the oblique spire lopped bead (A2) is indicative of the Early Period in Central California, and more often associated with the Early and Middle Periods in Southern California (Bennyhoff and Hughes 1987:117-118); the small thick rectangle bead (L2) occurs in "all but the earliest phases" of the Early Period (Bennyhoff and Hughes 1987:139). Although both of these diagnostically Early Period beads were recovered only from one unit - Unit D - they were found at drastically different levels: 30 to 40 cm. below unit datum for L2 type and 80 to 90 cm.

below unit datum for A2 type. However, the extensive krotovina (e.g., rodent disturbance) throughout the unit and the overall site area may account for some the bead distribution.

The Middle Period beads from CA-FRE-1331 were diverse in their typology. A split drilled *Olivella* sp. shell bead (type C2) was recovered from the upper deposit of Unit D, chronometrically indicating a Middle Period occupation (Bennyhoff and Hughes 1987:123). An *Olivella* sp. bead from Unit C exhibited apparently ground edges and looked very similar to the Middle Period "small saddle" *Olivella* sp. shell bead (type F3b), but was probably more attributable to the tiny saucer (type G1) bead (Bennyhoff and Hughes 1987:131-132). Another *Olivella* sp. shell bead, or possible bead fragment, was recovered from Unit C. This fragment may have once been doubly perforated and later broken, which in that case would make the bead a "split drilled double perforated" *Olivella* sp. shell bead (type C6), placing the bead into the terminal Middle Period with a Great Basin origin (Bennyhoff and Hughes 1987:125). It is also probable that this *Olivella* sp. fragment represents detritus created during bead manufacture or alteration.

One bead appeared to have the elements of a post Mission era "chipped disk" bead (type H3) common to southern California (Bennyhoff and Hughes 1987:135). This bead was ultimately typed as just an *Olivella* sp. fragment.

The source for the shell beads presumably came from the coast, acquired through trading or individual procurement. The steatite beads may have been derived from locally available outcroppings of schists along the New Idria serpentine body or were traded from elsewhere, probably southern California. The variation of color between the steatite beads in the collection may indicate a variety of sources and/or thermal alteration. There may be one magnesite bead in the collection (Cat. No. 0468, recovered from Unit C 100 to 110 cm. floor level), which could be a local product as a significant magnesite outcropping is only a few miles to the north of the study area (Moore 1988:2).

Flaked Stone Artifacts. The most common lithic materials recovered at CA-FRE-1331 were cryptocrystalline cherts and jaspers; followed closely by sandstone, then basalts with other mixed volcanics and metavolcanics. A similar pattern was seen in the lithic constituents recovered from site CA-FRE-1346, a small, late prehistoric occupation site only 3 miles to the north in upper Los Gatos Creek Canyon (Jenkins 1992:68). This pattern included projectile points, bifacial implements, flakes and debitage.

Projectile Points. The predominant projectile point form recovered from CA-FRE-1331 was the Panoche side notched (PSN) type, a variant of the Desert side notched (DSN) series found in the western United States (Fig. 17 and Table 6). First identified and classified as PSNs by Olsen and Payen (1968, 1969), these points are commonly found at sites along the west side of the San Joaquin Valley. The point type typically corresponds to an occupational date of mid to late A.D. 1500s into the late A.D. 1800s, approximate to the Panoche Complex from the San Luis-Little Panoche Chronology (Olsen and Payen 1968). All of the PSNs from CA-FRE-1331 are made from cryptocrystalline chert and have very similar morphological attributes (Table 6).

The other projectile points recovered from CA-FRE-1331 were not readily identifiable under the typical San Luis-Little Panoche point series types, although similar points had been found at archaeological sites that possessed components of the later San Luis-Little Panoche Complexes. A serrated point of obsidian material that was recovered from Unit D at the 100 cm. level from rodent backdirt resembled a serrated Stockton series point (Fig. 17, Cat. No. 0680). Interestingly, a single fragmentary Stockton serrated point

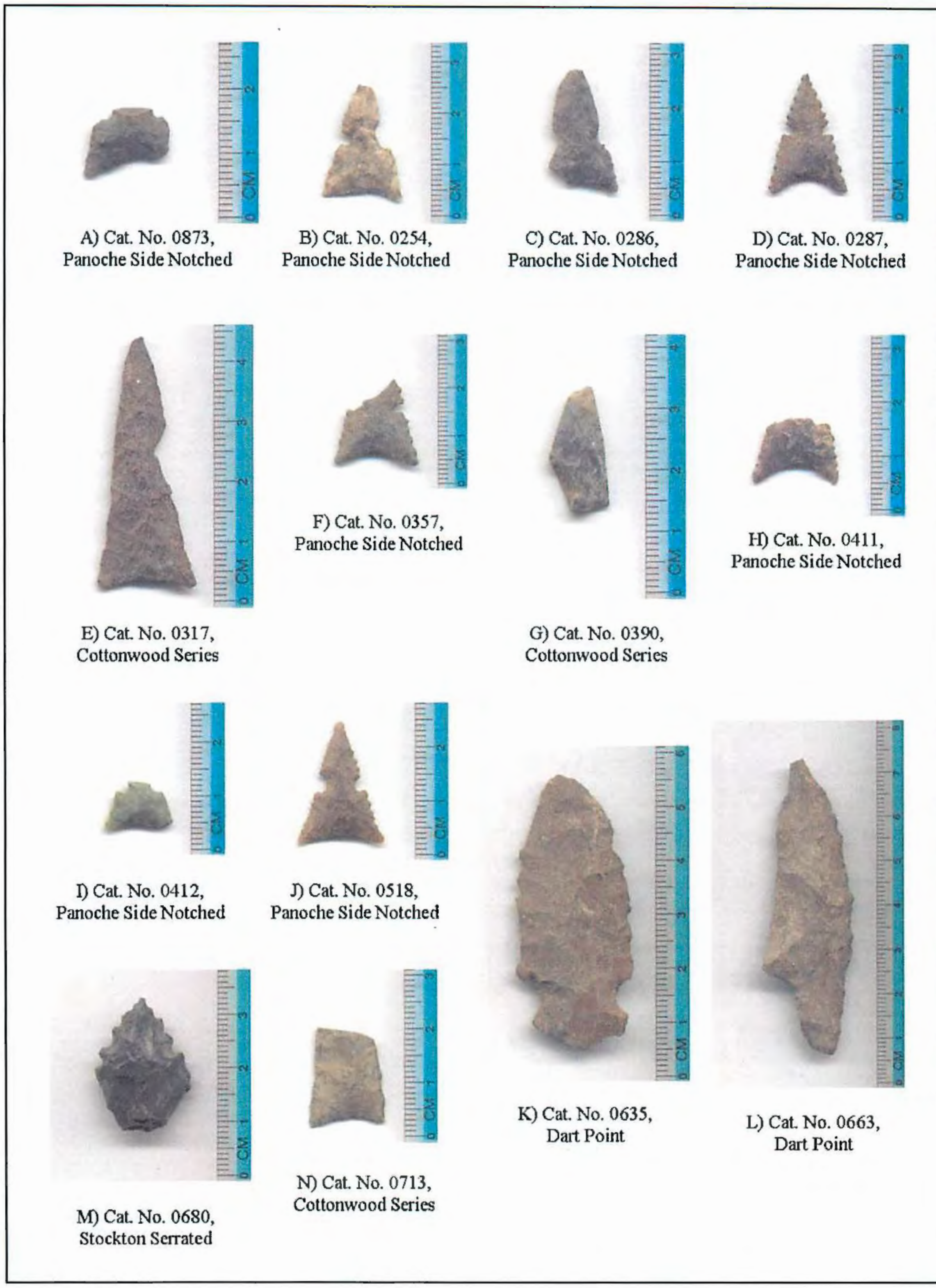

Figure 17. Representative diagnostic projectile points from CA-FRE-1331.

Table 6
PROVENIENCE AND ATTRIBUTES OF PROJECTILE POINTS AT CA-FRE-1331

Cat. No.	Unit	Level[1]	Wt.[2]	L.[1]	W.[1]	T.[1]	Material	Type	Fig.
0873	B	0-10	0.4	1.1	1.5	0.3	Chert	Panoche Side Notched	17.A
0254	C	20-30	0.9	2.2	1.6	0.3	Chert	Panoche Side Notched	17.B
0286	C	30-40	0.9	2.2	1.4	0.3	Chert	Panoche Side Notched	17.C
0287	C	30-40	0.7	2.2	1.5	0.3	Chert	Panoche Side Notched	17.D
0317	C	40-50	1.8	4.2	1.7	0.4	Chert	Cottonwood Series	17.E
0357	C	60-70	0.9	1.9	1.8	0.4	Chert	Panoche Side Notched	17.F
0390	C	70-80	0.6	2.1	1.1	0.3	Chert	Cottonwood Series	17.G
0411	C	80-90	0.5	1.3	1.6	0.3	Chert	Panoche Side Notched	17.H
0412	C	80-90	0.3	0.9	1.3	0.3	Chert	Panoche Side Notched	17.I
0518	D	10-20	0.7	2.3	1.6	0.3	Chert	Panoche Side Notched	17.J
0635	D	50-60	8.4	5.2	2.3	0.8	Chert	Dart Point	17.K
0663	D	80-90	12.6	6.7	2.4	1.1	Chert	Dart Point	17.L
0680	D	100	3.2	2.5	1.9	0.9	Obsidian	Stockton Serrated	17.M
0713	E	0-10	0.9	1.9	1.5	0.4	Chert	Cottonwood Series	17.N

[1] Level, Length (L.), Width (W.), and Thickness (T.) is measured in cm.
[2] Weight (Wt.) is measured in g.

was recovered in the "grave pit fill" from site CA-FRE-128 (Olsen and Payen 1968:47, Figure 26t). The other identifiably diagnostic point type resembled the Cottonwood series form, another variant of the Desert side notch (DSN) series. All of these projectile points were made from cryptocrystalline material (Fig. 17, Cat. Nos. 0317, 0390, 0713). The two remaining points were different from the rest of the projectile point assemblage, resembling dart points. Both were recovered from Unit D, both at depths at or below the 50 to 60 cm. level (Cat. No. 0635, recovered in the screen from the 50 to 60 cm. level of the south half of the south half (S1/2S1/2) of the unit; and Cat. No. 0663, recovered from the 80 to 90 cm. level of the unit). These two points were cryptocrystalline material, but were much heavier and larger in comparison to the other forms recovered from the site (Table 6 and Fig. 17). These forms represent earlier point form technologies for larger game.

Bifaces and Cores. The few biface fragments recovered at CA-FRE-1331 appeared very similar to material classified as "fragments" recovered at CA-FRE-128 (Olsen and

Payen 1968:48), but their exact function was not clear from an archaeological context. Some large cores and flakes were also recovered, but quantitatively less than the other types of lithic waste. The bifaces and cores were primarily made of chert material.

Edge Modified Flakes. Several edge modified flakes were also identified at CA-FRE-1331 (Table 7 and Fig. 18; Cat. No. 0470). These modified flakes were exclusively fashioned from chert material, with the possible exception of one flake from the 10 to 20 cm. level of Unit B (Fig. 19, Cat. No. 0166). This flake appears to be made from fossil material from a visual analysis of the cortex. However, the edge modified area takes on a grayish chert color appearance. Most of the flakes are small, retouched implements that would be appropriate for the light duty cutting or trimming of plant or animal material. One modified flake recovered from Unit A in the 40 to 50 cm. level (Cat. No. 0090) was larger and heavier than the other modified flakes and functionally may have been designed for heavy duty chopping.

Debitage. Lithic debitage from CA-FRE-1331 indicated many activities, but the primary focus was on lithic reduction or tool refinement (e.g., sharpening). The majority of the debitage is tertiary flake waste, a by-product of late stage tool manufacture and/or maintenance (Table 8). Cryptocrystalline material from CA-FRE-1331 varied greatly in color, intimating a diversity of sources. A single frosted quartz flake (Cat. No. 0825) recovered on the surface of the site might have been procured locally from the present-day Archer mine just north of the study area (Fowkes 1982:65). No other flakes of this type were recovered on site or in the area: it may possibly have been a flake of post occupation origin (e.g., from pothunters), especially given its orientation upon discovery (resting on the lower limb of a dead juniper). An unusual flake (Cat. No. 0190) was recovered from the

Table 7
PROVENIENCE OF EDGE MODIFIED FLAKES AT CA-FRE-1331

Cat. No.	Unit	Level[1]	Material	Weight[2]	Comments
0871	A	0-10	chert	4.3	- -
0872	A	0-10	chert	1	- -
0073	A	30-40	chert	18.1	fragment
0090	A	40-50	chert	82.1	edge wear, chopper (?)
0166	B	10-20	other	1.6	fossil shell (?)
0334	C	50-60	chert	11.8	- -
0335	C	50-60	chert	0.4	- -
0869	C	50-60	chert	14.1	modified (?)
0433	C	90-100	chert	6.8	*in situ*
0470	D	0-10	chert	1.2	- -
0471	D	0-10	chert	4.4	- -
0474	D	0-10	chert	1.2	- -
0877	D	20-30	chert	4.9	- -
0748	E	20-30	chert	16.1	- -
0761	E	30-40	chert	5.9	- -
0762	E	30-40	chert	1.3	- -
0772	E	40-50	chert	4.5	- -
0773	E	40-50	chert	3.2	- -
0831	- -	Surface	other	0.5	one side multifacial (?)
0832	- -	Surface	chert	8.4	- -

[1] Level is measured in cm.
[2] Weight is measured in g.

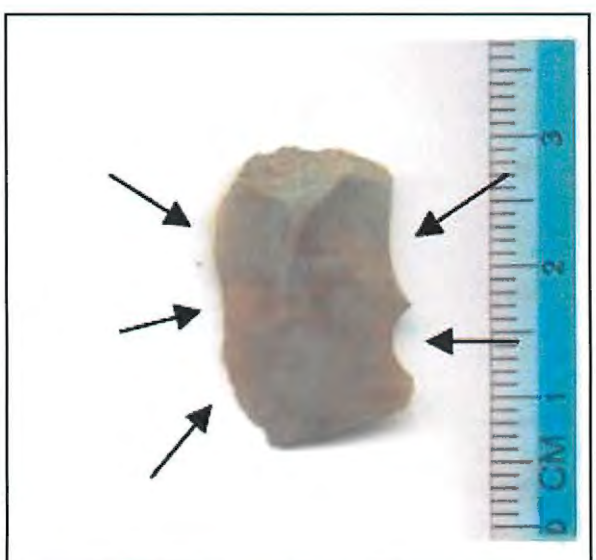

Figure 18. Edge modified flake from CA-FRE-1331 (Cat. No. 0470, edge modifications identified by arrows in figure).

Figure 19. Edge modified flake from CA-FRE-1331 (Cat. No. 0166, edge modifications identified by arrows in figure).

20 to 30 cm. level of Unit B. It is a clastic material, identified as "altered serpentine" (Fowkes 1982), which is geologically akin to "serpentine in progress" (Moore 2003, personal communication).

Milling and Processing Implements. Groundstone material was recovered from every test unit at CA-FRE-1331 as well as the surface collection. A wide array of milling implements were identified (Table 9), including manos and metates, pestles, a hopper mortar, and bowl mortars (specifically partial bowls and bowl fragments). The materials of choice were sandstone or steatite. The sandstone was probably of local origin, while the steatite may be an import from southern California or perhaps derived from the locally available schists.

During examination and analysis of the groundstone artifacts, human modified use wear patterns were observed on various materials. Different use wears cause the formation of specific damage patterns: adhesive wear, abrasive wear, fatigue wear, and "tribochemical

Table 8
PROVENIENCE OF LITHIC DEBITAGE AT CA-FRE-1331

Cat. No.	Unit	Level[1]	Material	Quantity	Weight[2]
0011	A	0-10	chert	158	117.3
0012	A	0-10	other	6	130.2
0032	A	10-20	chert	136	74.0
0033	A	10-20	other	24	118
0036	A	10-20	obsidian	1	0.1
0054	A	20-30	chert	159	52.8
0055	A	20-30	other	18	93.6
0060	A	20-30	obsidian	1	0.3
0075	A	30-40	other	10	121.4
0076	A	30-40	chert	117	21.0
0091	A	40-50	chert	57	49.7
0097	A	40-50	chert and other	12	5.8
0102	A	50-60	chert and other	58	46.0
0116	A	60-70	chert and other	103	26.4
0122	A	70-80	other	1	52.7
0126	A	70-80	chert and other	64	17.7
0132	A	70-80	chert	5	0.2
0135	A	0-80	other	2	100.3
0148	B	0-10	chert and other	329	170.9
0167	B	10-20	obsidian	1	0.2
0168	B	10-20	chert and other	177	97.1
0190	B	20-30	other	1	65.4
0191	B	20-30	other	1	49.1
0192	B	20-30	chert and other	101	68.7
0203	B	20-30	chert and other	20	6.4
0208	B	20-30	chert and other	5	0.8
0216	B	30-40	chert and other	125	48.9
0860	B	30-40	chert	4	0.3
0224	C	0-10	chert and other	7	7.8
0231	C	10-20	other	46	29.0
0232	C	10-20	other	1	10.5
0234	C	10-20	chert	1	14.3
0246	C	20-30	chert and other	119	160.1
0248	C	20-30	obsidian	1	0.1
0280	C	30-40	chert and other	52	26.6
0297	C	30-40	other	10	13.7
0301	C	30-40	chert and other	5	6.5
0304	C	30-40	chert	5	4.1
0307	C	40-50	chert and other	92	109.2
0875	C	40-50	obsidian	1	0.1
0336	C	50-60	chert and other	100	60.8
0349	C	60-70	chert and other	91	88.6
0366	C	70-80	chert and other	113	159.0
0367	C	70-80	chert	1	2.9
0368	C	70-80	chert	1	22.9
0382	C	70-80	chert and other	4	6.6
0389	C	70-80	chert	1	0.7

Table 8 continued
PROVENIENCE OF LITHIC DEBITAGE AT CA-FRE-1331

Cat. No.	Unit	Level[1]	Material	Quantity	Weight[2]
0397	C	70-80	chert and other	4	11.6
0401	C	80-90	chert and other	155	178.8
0402	C	80-90	chert	1	10.9
0422	C	80-90	chert and other	6	17.7
0426	C	80-90	chert	1	<0.1
0429	C	80-90	chert	1	0.2
0432	C	90-100	chert and other	50	18.3
0434	C	90-100	sandstone	1	58.9
0449	C	90-100	chert	2	0.3
0450	C	100-110	chert	3	0.4
0454	C	100-110	chert	1	2.7
0458	C	100-110	chert and other	36	35.3
0469	D	0-10	chert and other	326	393.3
0472	D	0-10	chert	1	7.0
0473	D	0-10	chert and other	2	6.7
0475	D	0-10	obsidian	2	0.2
0494	D	0-10	chert	1	0.4
0503	D	10-20	chert and other	72	20.8
0504	D	10-20	chert and other	4	20.0
0505	D	10-20	chert	1	1.4
0509	D	10-20	obsidian	1	0.1
0522	D	20-30	chert and other	84	56.8
0523	D	20-30	obsidian	1	0.1
0524	D	20-30	other	1	21.6
0525	D	20-30	chert	1	5.9
0526	D	20-30	chert	2	9.1
0541	D	20-30	other	1	0.9
0546	D	30-40	chert	111	53.0
0547	D	30-40	other	2	110.4
0548	D	30-40	chert	2	1.7
0571	D	40-50	chert and other	175	44.0
0572	D	40-50	obsidian	1	0.2
0573	D	40-50	chert	1	1.6
0574	D	40-50	other	1	2.0
0575	D	40-50	chert	1	2.4
0576	D	40-50	chert	1	1.4
0593	D	40-50	chert and other	17	196.2
0608	D	40-50	chert and other	23	6.8
0615	D	50-60	chert and other	119	45.0
0616	D	50-60	chert	1	2.7
0617	D	50-60	chert	1	0.9
0619	D	50-60	other	3	286.3
0634	D	50-60	chert	1	0.2
0638	D	60-70	chert and other	84	37.1
0639	D	60-70	obsidian	1	0.1
0647	D	60-70	chert	1	4.1
0648	D	70-80	chert and other	30	29.4

Table 8 continued
PROVENIENCE OF LITHIC DEBITAGE AT CA-FRE-1331

Cat. No.	Unit	Level[1]	Material	Quantity	Weight[2]
0655	D	80-90	chert and other	54	21.2
0668	D	90-100	chert and other	61	13.2
0669	D	90-100	other	1	1.0
0670	D	90-100	other	1	6.3
0671	D	90-100	chert	1	4.1
0678	D	100	chert and other	10	2.6
0679	D	100	chert	1	4.3
0684	D	100-110	chert and other	40	9.5
0696	D	100-110	chert and other	12	2.4
0701	D	110-120	chert	4	12.4
0712	E	0-10	chert and other	67	137.6
0729	E	10-20	chert and other	62	74.0
0730	E	10-20	obsidian	1	0.1
0747	E	20-30	chert and other	39	17.2
0760	E	30-40	chert and other	27	15.2
0770	E	40-50	chert and other	100	34.0
0771	E	40-50	obsidian	1	0.1
0774	E	40-50	chert	1	4.3
0775	E	40-50	chert	1	6.3
0797	E	40-50	chert	1	1.8
0798	E	50-60	chert and other	8	22.2
0812	- -	Surface	other	1	32.0
0815	- -	Surface	other, basalt (?)	1	6.5
0816	- -	Surface	other, basalt (?)	1	9.5
0825	- -	Surface	other	1	4.4

[1] Level measured in cm.
[2] Weight measured in g.

wear (a combination of mechanical and chemical interaction)" (Adams 2002:27). These different use wear types were not "mutually exclusive" in how they changed the groundstone surface.

One very interesting groundstone fragment represents the rim of a steatite bowl, retaining a decorative pattern around the edge of the rim (Fig. 20, Cat. No. 0839). Some of the artifacts exhibited staining. A single rounded, spherical mano recovered *in situ* at 23 cm. below datum from Unit B was darkly stained on one face. The slab hopper mortar was recovered from Unit D associated with the burial feature (B/1). That particular mortar did

Table 9
PROVENIENCE OF GROUNDSTONE AT CA-FRE-1331

Cat. No.	Unit	Level[1]	Weight[2]	Description
0001	A	0-10	8.0	steatite bowl fragment
0002	A	0-10	138.9	basalt (?) mano (?) fragment
0003	A	0-10	63.7	metate fragment
0006	A	0-10	142.3	2 basalt mano fragments
0027	A	10-20	321.7	mano
0028	A	10-20	394.4	mano (?) fragment
0030	A	10-20	552.2	mano, mano (?), and 7 metate fragments
0040	A	20-30	112.9	mano fragment with possible ochre stain
0823	A	0-30	312.5	possible; sandstone
0083	A	40-50	925.3	bowl fragment with ochre stain
0084	A	40-50	284.0	mano with possible ochre (?) stain
0085	A	40-50	230.1	mano fragment
0111	A	60-70	109.2	mano, *in situ*
0134	A	0-80	792.7	possible; found in backdirt rockpile
0138	B	0-10	89.8	mano fragment
0139	B	0-10	225.9	mano fragment
0144	B	0-10	16.4	mano (?) fragment
0149	B	0-10	15.4	steatite bowl fragment
0162	B	10-20	78.5	mano fragment
0163	B	10-20	113.5	mano fragment
0164	B	10-20	9.6	fragment
0183	B	20-30	154.9	fragment
0184	B	20-30	174.5	possible mano
0187	B	20-30	904.2	mano, *in situ*
0188	B	20-30	221.9	mano fragment
0201	B	20-30	110.3	steatite bowl fragment, *in situ*
0332	C	50-60	177.8	mano fragment with battered end
0333	C	50-60	166.1	mano (?) fragment
0369	C	70-80	144.0	fragment
0460	C	100-110	5.6	mano (?) fragment, rodent backdirt
0484	D	0-10	472.1	5 fragments
0485	D	0-10	72.3	fragment
0528	D	20-30	65.4	mano (?) fragment, *in situ*
0529	D	20-30	130.6	fragment
0530	D	20-30	43.2	pestle (?) or mano (?) fragment
0544	D	0-30	230.0	fragment
0545	D	0-30	197.6	metate fragment
0550	D	30-40	12.5	fragment
0551	D	30-40	83.2	fragment
0552	D	30-40	87.3	2 mano (?) fragments
0553	D	30-40	70.7	small pestle
0557	D	30-40	37.8	pestle (?) or mano (?) fragment
0563	D	30-40	1219.5	sandstone metate
0579	D	40-50	105.2	metate (?) fragment
0595	D	40-50	24.4	fragment

Table 9 continued
PROVENIENCE OF GROUNDSTONE AT CA-FRE-1331

Cat. No.	Unit	Level[1]	Weight[2]	Description
0596	D	40-50	178.9	mano fragment
0625	D	50-60	1.7	fragment
0711	D	100-110	6577.1	sandstone hopper mortar
0737	E	10-20	422.3	pestle or mano (?) fragment
0738	E	10-20	1006.8	metate fragment, *in situ*
0814	- -	Surface	42.4	fragment
0818	- -	Surface	366.8	two sided fragment
0819	- -	Surface	364.3	fragment with ochre (?) stain
0820	- -	Surface	508.8	sandstone bowl fragment
0839	- -	Surface	14.2	steatite rim fragment with pattern

[1] Level is measured in cm.
[2] Weight is measured in g.

not appear to be stained and had only been modified on one side, barely utilized (Fig. 21, Cat. No. 0711). Much of the groundstone material was probably "fashioned from locally available sandstone" as similarly observed at site CA-FRE-1346 - only 3 miles away from site CA-FRE-1331 (Jenkins 1992:68). Most of the groundstone artifacts were identifiable as tools and implements, such as manos (Cat. No. 0187, Fig. 22) or metates (Cat. No. 0563, Fig. 23), but some of the items did not lend themselves directly to categorization. Some artifacts had use wear or markings that appeared to be from use wear, but were ultimately indeterminate. Similar identification issues were encountered during groundstone analysis of materials from site CA-FRE-1346 in Los Gatos Canyon (Jenkins 1992:69). Perhaps some of these artifacts were intermittently used or used only once; or they belong to an atypical artifact classification.

An interesting alternative artifact description that may apply to some of the groundstone from CA-FRE-1331 are "netherstones." Netherstones are described as "bottom stones against which something was worked" and were expediently designed, although some were crafted into a desired shape (Adams 2002:143). They varied in size but generally

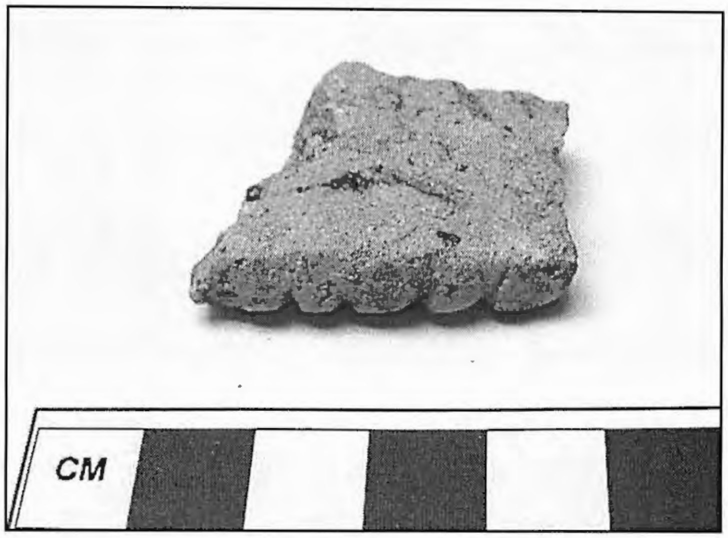

Figure 20. Groundstone steatite bowl rim fragment with patterning from CA-FRE-1331 (Cat. No. 0839).

would have been too large to be handheld. Use wear patterns on the netherstone artifact type include "abrasion, impact fractures, sheen, or a combination of these" (Adams 2002:143). Netherstones could also serve as working surfaces upon which other items were shaped (Adams 2002:143). Some of the groundstone from CA-FRE-1331 may belong to this tool type.

Another applicable artifact type at CA-FRE-1331 might be "lapstones," the handheld version of netherstones that served as "bases upon which other items were shaped or intermediate substances processed with small handstones" (Adams 2002:145). "Lithic anvils" may also account for some of the rock material encountered at CA-FRE-1331. Anvils were distinguishable from netherstones and lapstones because these items were generally set into the ground, versus the portable lapstones (Adams 2002:157). Lastly, another potentially useful artifact concept may be "floor polishers," rounded stones found in the North American Southwest that fit in the palm of a hand and were used to clean/prepare house floors (Adams 2002:94-95).

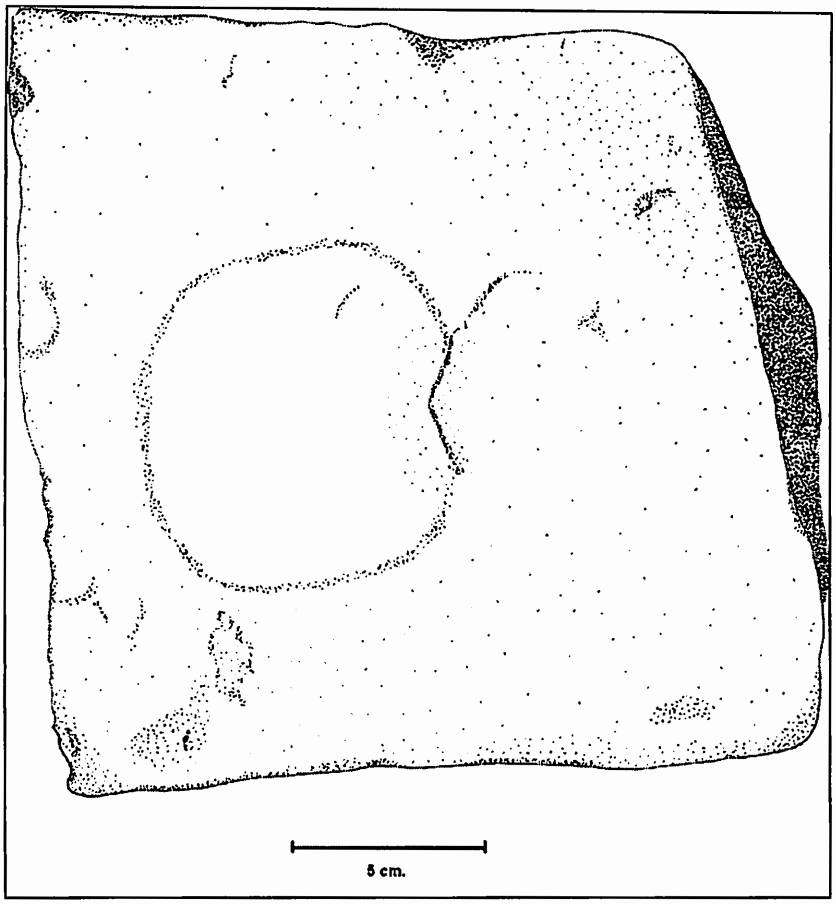

Figure 21. Mortar associated with Feature "B/1" from CA-FRE-1331 (Cat. No. 0711).

It is known archaeologically that groundstone was recycled for "thermal activities" (Adams 2002:232). This behavioral manifestation might account for the rock concentrations found at CA-FRE-1331, in particular Unit A (and to a lesser extent Unit B). Similar "burnt cobble concentrations" were also found at CA-FRE-129, one of the San Luis-Little Panoche chronology type sites. These concentrations were "the most frequent feature type uncovered at the site and in the general area" (Olsen and Payen 1968:63). These features consisted of "small concentrations of fire-fractured cobbles either within the midden or upon or slightly into the sterile base soil" (Olsen and Payen 1968:63). Some of the concentrations exhibited "clear indicators" for use as hearths while others showed no evidence of fire "such as ash or

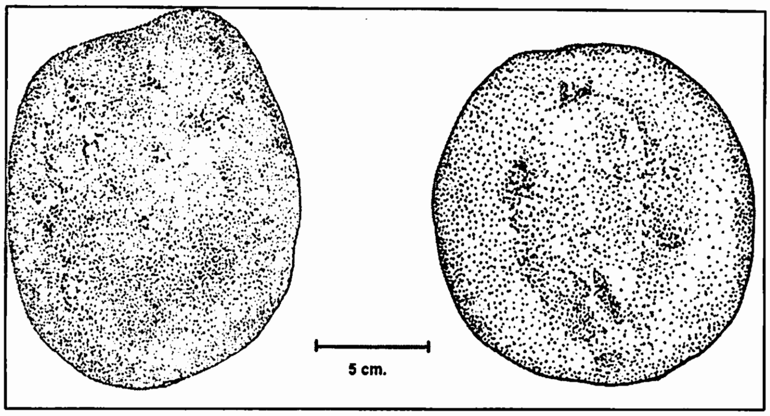

Figure 22. Mano from CA-FRE-1331 (Cat. No. 0187).

charcoal" (Olsen and Payen 1968:60). Similar rock concentration features were identified by Wedel (1941:85) as "fireplaces" during excavations in the southern San Joaquin Valley, hypothesized to perhaps represent a common protohistoric Valley wide tradition (Olsen and Payen 1968:63).

Red Ochre and Sandstone. There was a fair amount of red ochre recovered from CA-FRE-1331 in each unit across the site (Table 10). Included in this category is red sandstone that appears to have been thermally altered by human processes. It is also possible that opportunistic ochre processing occurred on the site.

At San Luis-Little Panoche type-site CA-FRE-128, red pigment was found in the midden and house/structure fill as "small chunks" most of which were approximately "pea-sized" (Olsen and Payen 1968:25). Red ochre was an important ingredient in the creation of red pigment. Similarly, yellow ochre was used for yellow pigment. The small amount of yellow ochre recovered at CA-FRE-1331 (Cat. No. 0026; Unit A, 10 to 20 cm. level) may have been a relic of cross Valley trading, as this pigment was easily "obtained at many places throughout the volcanic regions of the Sierra, both in the northern section and on the desert side in eastern Kern County" (Latta 1949:179).

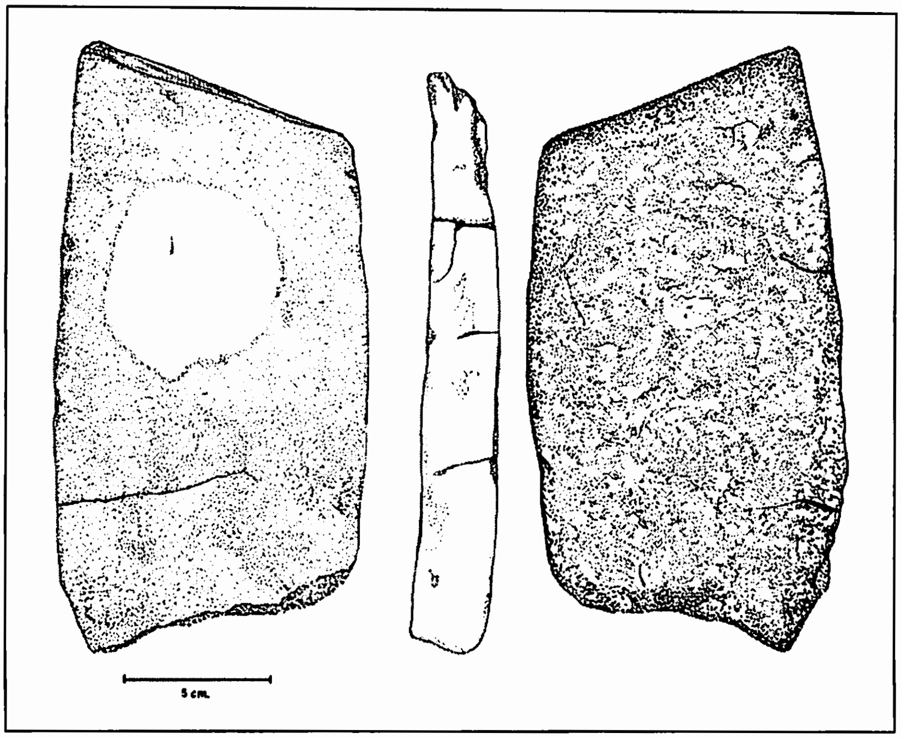

Figure 23. Metate from CA-FRE-1331 (Cat. No. 0563).

Baked Clay. A specimen of baked clay was found at CA-FRE-1331 (Cat. No. 0879): two pieces, reddish brown in color, recovered from Unit C at the 80 to 90 cm level. The pieces are smaller than three centimeters in length and one piece appears to have been modified, as if pressed between a thumb and a forefinger - creating something of a "thumbmark." However, there are no discernable thumbprints or fingerprints on either piece. These clay artifacts may have been casual byproducts of clay material manufacture or they may have been incidentally created by heat from a fire. For example, at site CA-FRE-128 up to 24 baked clay artifacts were recovered. Three pieces came from the midden area and the other 21 pieces came out of the fill in House/Structure 1. It was hypothesized that these artifacts were a byproduct of mud caked around the fire and smoke vent of the house/structure (Olsen and Payen 1968:25).

Table 10
PROVENIENCE OF RED OCHRE AND SANDSTONE AT CA-FRE-1331

Cat. No.	Unit	Level[1]	Quantity	Weight[2]	Comments
0004	A	0-10	7	54.6	- -
0007	A	0-10	1	277.7	flake
0023	A	10-20	6	461.2	modified, heated
0066	A	30-40	3	1056.3	heated (?)
0841	A	30-40	1	56.8	sample tested with Niton Analyzer
0086	A	40-50	5	426.9	- -
0095	A	40-50	3	505.1	- -
0110	A	60-70	1	226	- -
0140	B	0-10	1	75.8	flake
0157	B	10-20	7	434.4	- -
0159	B	10-20	2	91.1	flakes
0212	B	30-40	1	73.5	- -
0213	B	30-40	3	177.3	- -
0583	D	40-50	1	110.5	- -
0605	D	40-50	5	1111	- -
0821	- -	Surface	1	150.1	- -
0822	- -	Surface	1	322.0	material sample

[1] Level is measured in cm.
[2] Weight is measured in g.

Awl. Portions of a bone (or possibly antler) awl and a bone needle fragment were identified during faunal analysis (Fig. 24). The awl fragments were collected all from Unit D, but in different levels. Three pieces refit to form the distal end and midsection of one awl which came from the 0 to 10 cm. level (Cat. No. 0495), and one lone fragment came from the 40 to 50 cm. level (Cat. No. 0604). Experimental refitting of this orphan fragment did not work with the other awl fragments recovered from the upper level. Artifacts resembling this type were also recovered at San Luis-Little Panoche type site CA-FRE-128 (Olsen and Payen 1968:14, 45, Fig. 14g). This artifact type is indicative of the Panoche/Gonzaga Complex, equating to the Late Prehistoric era and dates approximately to A.D. 1500 until the late A.D. 1700s (Olsen and Payen 1968, 1969; Wren 1987:12). The single bone needle end fragment (Cat. No. 0756) was recovered from Unit E, 29 cm. below datum.

Figure 24. Refitted bone awl from CA-FRE-1331 (Cat. Nos. 0495 and 0604).

Actinolite, Pebbles, and Geofacts. During excavations at CA-FRE-1331, many perceivably "noncultural" materials were encountered that may not necessarily have been "noncultural." The variety of exotic materials found within the New Idria serpentine body near CA-FRE-1331 could have provided the source for many of these lithics. Included in this category of nontraditional materials are actinolite, pebbles, and geofacts (e.g., concretions).

Actinolite. From excavations at sites CA-FRE-128 and CA-FRE-129 an odd lithic constituent was noted. The material was identified as actinolite "splinters" and lumps; hypothesized use as a decorative element (Olsen and Payen 1968:55). Actinolite is a soft and fibrous green-colored material that occurs naturally in West Side San Joaquin Valley soils. Items very similar in description and appearance to actinolite splinters and lumps were recovered at CA-FRE-1331 (Fig. 25, Cat. No. 0230), but nowhere did they co occur with any one specific feature or cultural component. This material from CA-FRE-1331 could not be visually speciated as actinolite but is definitely "serpentine derived rock fragments" (T. Moore 2003, personal communication). The only way to identify these specimens

Figure 25. Possible actinolite from CA-FRE-1331 (Cat. No. 0230).

from CA-FRE-1331 as actinolite with any degree of confidence would be via a detailed crystalline analysis (which was beyond the scope of this investigation).

Pebbles. It is known that pebbles "both decorated and undecorated" are often found in prehistoric California archaeological sites, and they are mentioned in some ethnographic records (Parkman 1990:52). A single sandstone pebble painted with red pigment was found in "grave pit fill" at CA-FRE-128; polished pebbles were also recovered from the site (Olsen and Payen 1968:25, 55). Pebbles as an artifact type were addressed during excavations at CA-FRE-1331 primarily on a "presence/absence" basis (for the purposes of identification and classification within this artifact type a generous size definition was applied: "pea" sized to "chicken egg" sized). Pebbles were recovered from across the site in every unit and the surface, but without any specific patterning that would indicate or even intimate cultural use. Moreover, none of the pebbles appeared to have been polished or modified.

Geofacts. Three geofacts in the form of concretions were recovered from San Luis-Little Panoche type site CA-FRE-128 (Olsen and Payen 1968:25). Concretions are hardened, stone-like lumps created by the replacement of organic material through and/or the simple aggregation of chemical or mineral salts. Natural concretions are sometimes modified by people, becoming artifacts. It is difficult to ascertain their utilized nature, as these items were "lightly used or used in activities that cause little use wear" (Adams 2002:193). Some naturally formed spherical shaped concretions were known to have been used as gaming pieces "without further modification" to the geofact (e.g., leather wrapped gaming balls from the Southwest) (Adams 2002:194-195).

Geofact concretions were also found at CA-FRE-1331. An iron rich concretion, probably a fossil root cast, was found at the 50 cm. level of Unit D (Cat. No. 0582). This item was first thought to be a pipe or raw ochre material. Another geofact type found at CA-FRE-1331 were marble sized stone balls (Cat. Nos. 0049, 0373, 0561, 0585, and 0736). These were determined to be naturally occurring iron rich concretions that formed over a single organic constituent (e.g., seed). The best example of this phenomenon is represented in specimen Cat. No. 0736. One last geofact of interest from CA-FRE-1331 was a sandstone block covered with caliche from magnesium rich solutes present in the serpentine (Cat. No. 0087). This item however, along with the other geofacts, was ultimately determined to be noncultural.

Paleontological Remains

Fossil shells had been reported as being "brought" onto site CA-FRE-1331 by the Indians and not through natural geological action (Lipp 1984). Indeed, during the excavations fossil shell material was encountered on the surface of CA-FRE-1331 as well as most every level from every unit (Table 11). Interestingly, Units C and E associated with the housepit feature had relatively little fossil shell materials. This lack of fossil material more than likely speaks to the prepared nature of the housepit.

The purpose of these fossil shells is unknown; they may well be part of the natural

Table 11
PROVENIENCE OF FOSSIL SHELL AT CA-FRE-1331

Cat. No.	Unit	Level[1]	Quantity	Weight[2]
0005	A	0-10	22	6.2
0031	A	10-20	18	4.2
0052	A	20-30	36	11.3
0081	A	30-40	19	4.0
0093	A	40-50	5	2.9
0100	A	40-50	3	0.8
0105	A	50-60	3	0.4
0119	A	60-70	2	0.4
0127	A	70-80	5	0.6
0131	A	70-80	1	0.1
0150	B	0-10	55	9.8
0176	B	10-20	28	4.9
0194	B	20-30	1	23.2
0195	B	20-30	10	1.5
0217	B	30-40	15	3.9
0243	C	10-20	1	0.2
0252	C	20-30	16	3.0
0282	C	30-40	5	1.0
0298	C	30-40	1	4.6
0305	C	30-40	1	1.1
0313	C	40-50	13	17.4
0340	C	50-60	15	17.7
0355	C	60-70	13	2.9
0377	C	70-80	14	3.7
0385	C	70-80	5	1.3
0410	C	80-90	22	8.5
0424	C	80-90	2	7.0
0428	C	80-90	1	0.1
0442	C	90-100	8	3.2
0464	C	100-110	4	0.9
0489	D	0-10	119	84.2
0512	D	10-20	36	38.6
0513	D	10-20	1	4.5
0536	D	20-30	26	6.0
0565	D	30-40	23	35.4
0566	D	30-40	1	4.9
0588	D	40-50	28	6.5
0600	D	40-50	9	1.6
0601	D	40-50	1	8.4
0607	D	40-50	1	35.7
0612	D	40-50	3	0.3
0630	D	50-60	10	3.8
0642	D	60-70	7	4.5
0652	D	70-80	1	386.6
0660	D	80-90	31	15.1

Table 11 continued
PROVENIENCE OF FOSSIL SHELL AT CA-FRE-1331

Cat. No.	Unit	Level[1]	Quantity	Weight[2]
0674	D	90-100	31	19.4
0681	D	100	1	0.2
0691	D	100-110	31	16.5
0698	D	100-110	1	2.3
0708	D	110-120	2	0.2
0718	E	0-10	17	3.6
0739	E	10-20	10	4.8
0750	E	20-30	6	0.4
0766	E	30-40	9	1.2
0784	E	40-50	28	63.3
0789	E	40-50	2	<0.1
0882	- -	Surface	1	188.3

[1] Level is measured in cm.
[2] Weight is measured in g.

soil matrix for the region. One fossil shell recovered from the 30 to 40 cm. level of Unit D appears to have been modified (Cat. No. 0566), but does not reveal any such wear under microscopic analysis. At the San Luis-Little Panoche type site CA-FRE-128, a "small number of fragments of fossilized shell, and one fossil shark tooth" were recovered. It was believed that the fossil shell, with the exception of the shark's tooth, "could be natural to the site area." The shark's tooth was collected from the surface of the site and may not have represented "an aboriginal specimen" (Olsen and Payen 1968:57).

Botanical Remains

Botanical matter was collected at CA-FRE-1331 across the site from each unit, primarily made up of wood, charcoal, or carbonized wood fragments (Table 12 and Table 13). It is important to note that the collection of charcoal material was not uniform throughout the excavation process. The primary intention of collection was to recover and reserve only the larger pieces of carbonized wood and charcoal so that they could be radiocarbon dated (or possibly speciated in future studies).

Table 12
PROVENIENCE OF CHARCOAL MATERIAL AT CA-FRE-1331

Cat. No.	Unit	Level[1]	Quantity	Weight[2]	Comments
0044	A	20-30	18	3.8	- -
0077	A	30-40	65	10.6	- -
0089	A	40-50	9	4.7	- -
0108	A	50-60	11	1.2	- -
0120	A	60-70	5	0.6	- -
0169	B	10-20	43	3.9	- -
0193	B	20-30	135	14.3	- -
0225	C	0-10	1	<0.1	- -
0235	C	10-20	5	0.6	- -
0251	C	20-30	7	0.5	- -
0281	C	30-40	36	2.3	- -
0314	C	40-50	22	2.7	- -
0339	C	50-60	8	1.6	- -
0354	C	60-70	4	3.6	- -
0376	C	70-80	1	225.4	juniper (?)
0853	C	70-80	1	70.9	- -
0443	C	90-100	30	12.9	on top of Floor feature
0490	D	0-10	53	1.9	- -
0514	D	10-20	125	9.5	- -
0537	D	20-30	65	6.8	- -
0602	D	40-50	10	1.2	- -
0613	D	40-50	6	0.7	- -
0631	D	50-60	2	0.2	- -
0661	D	80-90	1	1.0	- -
0692	D	100-110	2	<0.1	- -
0699	D	100-110	9	0.8	possibly associated with feature B/1
0707	D	110-120	4	0.4	- -
0721	E	0-10	7	1.4	juniper (?)
0741	E	10-20	4	1.2	- -
0752	E	20-30	4	2.4	juniper (?); possibly associated with feature P/1
0753	E	20-30	2	5.1	juniper (?); possibly associated with feature P/1
0764	E	30-40	13	9.5	juniper (?); associated with feature P/1 (?)
0785	E	40-50	30	13.3	- -
0804	E	50-60	6	7.9	juniper (?); associated with feature P/1

[1] Level is measured in cm.
[2] Weight is measured in g.

Faunal Assemblage

Of the nearly 7,400 pieces of faunal material collected from CA-FRE-1331, only five hundred twenty-two elements were identifiable to the family level within the Linnaean classification scheme, approximating to seven percent of the collection (Table 14). From

Table 13
PROVENIENCE OF WOOD MATERIAL AT CA-FRE-1331

Cat. No.	Unit	Level[1]	Species	Quantity	Weight[2]	Comments
0722	E	0-10	juniper	13	8.4	Possibly associated with feature P/1
0751	E	20-30	juniper	6	0.4	Associated with feature P/1
0765	E	30-40	juniper (?)	5	0.7	Associated with feature P/1 (?)
0805	E	50-60	juniper (?)	1	271	Feature P/1
0806	E	50-60	juniper (?)	1	108.8	Feature P/1
0810	E	20-30	juniper (?)	1	1838.8	East post feature P/1
0811	E	20-30	juniper (?)	1	1771.7	West post feature P/1

[1] Level is measured in cm.
[2] Weight is measured in g.

those 522 pieces only 84 skeletal elements could be positively identified to the genus and species level classification - a mere 1% of the sampled material (Table 15, Table 16, Table 17, Table 18, and Table 19). Taxonomic classifications of the specimens were made using external morphological attributes. In addition to assigning each specimen to a taxon, an attempt was made to identify to element or portion thereof, symmetry, age and sex. Analysis incorporated the use number of identified specimens (NISP) (Klein and Cruz-Uribe 1984). A total of seven animal species were identified at CA-FRE-1331: deer (*Odocoileus* sp., probably black tailed), cottontail rabbit (*Sylvilagus* sp.), jackrabbit (*Lepus californicus*), California valley quail (*Lophorlyx californicus*), dog and/or coyote (*Canis familiaris* and/or *Canis latrans*), wood rat (*Neotoma* sp.), and pocket gopher (*Thomomys bottae*).

The faunal assemblage from CA-FRE-1331 was similar in character to that of site CA-FRE-1346: only 108 of 1,342 faunal specimens were identified to species (approximately 9%). When sorted into general size categories, over 70% of the CA-FRE-1346 collection was comprised of the remains of medium-large to large mammals (Jenkins 2001:67). Like CA-FRE-1331, most of the faunal material derived from medium to large mammals, but had been pulverized into many smaller fragments. Most of the bone from CA-FRE-1346 was

Table 14
PROVENIENCE OF FAUNAL MATERIAL AT CA-FRE-1331

Cat. No.	Unit	Level[1]	Quantity	Weight[2]	Comments
0013	A	0-10	104	31.6	- -
0034	A	10-20	307	67.2	- -
0035	A	10-20	2	0.2	teeth
0057	A	20-30	503	81.7	- -
0058	A	20-30	10	9.2	one partial element, broken
0061	A	20-30	2	0.2	tooth enamel
0078	A	30-40	361	78.4	- -
0079	A	30-40	5	1.9	teeth and enamel
0080	A	30-40	21	0.4	single element; broken
0094	A	40-50	76	31.2	- -
0099	A	40-50	30	6.2	- -
0106	A	50-60	121	32.0	- -
0107	A	50-60	3	4.3	teeth and enamel; ungulate
0117	A	60-70	134	20.7	- -
0118	A	60-70	2	0.2	- -
0128	A	70-80	100	13.0	- -
0129	A	70-80	1	0.2	tooth
0130	A	70-80	8	0.3	- -
0151	B	0-10	591	93.2	- -
0152	B	0-10	1	5.6	mandibular fragment
0153	B	0-10	1	0.3	tooth fragment
0170	B	10-20	414	72.5	- -
0171	B	10-20	1	3.2	metapodial, large mammal; *in situ*
0172	B	10-20	1	2.6	fragment; *in situ*
0173	B	10-20	8	4.2	fragments; *in situ*
0174	B	10-20	1	1.0	fragment; *in situ*
0175	B	10-20	2	0.3	teeth fragments
0196	B	20-30	330	62.0	- -
0197	B	20-30	1	3.3	*in situ*
0198	B	20-30	1	0.1	tooth fragment
0205	B	20-30	69	7.4	- -
0209	B	20-30	15	2.6	- -
0218	B	30-40	269	42.5	- -
0219	B	30-40	3	0.2	teeth enamel and fragments
0220	B	30-40	1	<0.1	tooth, rodentia
0221	B	30-40	3	0.5	tooth, one element
0859	B	30-40	25	3.3	- -
0237	C	10-20	3	0.8	- -
0253	C	20-30	105	17.5	- -
0283	C	30-40	86	16.6	- -
0299	C	30-40	23	4.2	East wall rodent backdirt
0302	C	30-40	6	0.7	West wall rodent backdirt
0303	C	30-40	1	0.8	ungulate (?) tooth; West wall rodent backdirt
0306	C	30-40	7	0.6	South wall rodent disturbance
0315	C	40-50	135	21.8	- -

Table 14 continued
PROVENIENCE OF FAUNAL MATERIAL AT CA-FRE-1331

Cat. No.	Unit	Level[1]	Quantity	Weight[2]	Comments
0341	C	50-60	1	0.7	molar, canid?
0342	C	50-60	116	27.8	- -
0356	C	60-70	153	20.8	- -
0378	C	70-80	4	4.9	burnt; large mammal, 1 element
0379	C	70-80	148	20.5	- -
0386	C	70-80	32	7.7	- -
0400	C	70-80	14	2.5	rodent backdirt
0409	C	80-90	221	29.9	- -
0423	C	80-90	10	0.6	rodent backdirt
0427	C	80-90	7	1.7	rodent backdirt
0430	C	80-90	3	0.4	rodent backdirt
0438	C	90-100	76	7.6	top of Floor feature
0439	C	90-100	1	1.0	top of Floor feature, molar fragment
0440	C	90-100	1	0.2	top of Floor feature, metapodial (?)
0441	C	90-100	1	1.3	top of Floor feature
0451	C	100-110	2	0.1	Floor feature
0455	C	100-110	2	1.8	rodent backdirt on floor top
0463	C	100-110	82	12.3	Floor feature; rodent backdirt
0491	D	0-10	521	118.5	- -
0492	D	0-10	1	11.7	*in situ*; astragalus (?)
0493	D	0-10	12	9.4	fragment (1 element); *in situ*
0515	D	10-20	206	44.6	- -
0516	D	10-20	1	0.2	tooth fragment
0517	D	10-20	3	2.3	*in situ*; canid skull fragments
0538	D	20-30	130	37.3	- -
0539	D	20-30	1	0.1	tooth fragment
0540	D	20-30	1	7.4	*in situ*; large mammal
0567	D	30-40	146	34.5	- -
0589	D	40-50	298	55.7	- -
0603	D	40-50	18	5.3	- -
0614	D	40-50	28	4.4	- -
0632	D	50-60	307	54.3	- -
0633	D	50-60	5	0.7	teeth fragments, includes 1 rodentia
0643	D	60-70	189	43.6	- -
0644	D	60-70	2	0.1	teeth fragments, includes 1 rodentia (?)
0653	D	70-80	9	1.8	- -
0654	D	70-80	9	1.0	rodent backdirt, 1 element
0662	D	80-90	121	15.7	- -
0665	D	80-90	1	34.4	*in situ*; with soil matrix; feature B/1
0666	D	80-90	20	14.7	feature B/1
0675	D	90-100	116	22.5	- -
0676	D	90-100	1	21.6	*in situ;* with soil matrix; feature B/1
0677	D	90-100	21	24.5	feature B/1
0858	D	90-100	39	331.7	feature B/1
0682	D	100	12	1.9	rodent backdirt

Table 14 continued
PROVENIENCE OF FAUNAL MATERIAL AT CA-FRE-1331

Cat. No.	Unit	Level[1]	Quantity	Weight[2]	Comments
0683	D	100	3	5.9	feature B/1; rodent backdirt
0693	D	100-110	69	11.0	- -
0700	D	100-110	2	5.3	feature B/1
0880	D	100-110	7	3.6	- -
0710	D	110-120	3	0.6	- -
0719	E	0-10	52	10.9	- -
0723	E	0-10	1	1.2	molar
0740	E	10-20	94	17.7	- -
0754	E	20-30	55	9.2	- -
0755	E	20-30	1	0.1	tooth enamel (?)
0756	E	20-30	1	0.2	awl fragment; *in situ*
0767	E	30-40	35	7.8	- -
0786	E	40-50	171	24.8	- -
0787	E	40-50	1	0.4	phalange
0788	E	40-50	1	0.1	tooth fragment
0803	E	50-60	6	5.2	- -

[1] Level is measured in cm.
[2] Weight is measured in g.

burned (about 90%) and mixed in with lots of fire affected rock (Jenkins 2001:67). Again, this description is similar to the CA-FRE-1331 assemblage.

Faunal analysis from Late Period prehistoric site CA-FRE-2366 reached four main conclusions that had similar implications for the results from CA-FRE-1331: 1) there was considerable bioturbation in the deposit; 2) the present day habitat and environs were similar to those during native occupation of the site; 3) rabbit was the main source of game; and 4) there was too little data to establish any seasonality for site occupation (Simons 1996:H-2). Some caution should be exercised with the third conclusion - relative to the primacy of one game species over another - because of the small sample size from CA-FRE-1331, which may bias interpretive results. The presence of adult sized quail bone may indicate a late summer/early fall presence at the site. Evidence for determining seasonal activity at nearby site CA-FRE-1333 was minimal as well. The only faunal material which indicated the part

Table 15
IDENTIFIED FAUNAL MATERIAL FROM UNIT A AT CA-FRE-1331

Cat. No.	Level[1]	Taxon Name	Element	Portion	Age[2]	Wt.[3]
0034	10-20	*Neotoma* sp.	calcaneous	left mid	A	<0.1
0034	10-20	- -	calcaneous	left mid	A	0.1
0034	10-20	*Sylvilagus* sp.	metacarpal	- -	A	<0.1
0034	10-20	*Lophortyx californicus*	tibiotarsus, fragment	left distal	A	0.1
0035	10-20	- -	dental enamel	- -	- -	0.2
0057	20-30	*Lepus* sp.	femur, fragment	right proximal	A	0.3
0057	20-30	*Thomomys bottae*	femur, fragment	left mid	A	0.1
0057	20-30	*Sylvilagus* sp.	femur, fragment	left distal	A	0.3
0057	20-30	*Lepus californicus*	metacarpal	- -	A	0.1
0057	20-30	*Thomomys bottae*	femur, fragment	left proximal	A	0.1
0057	20-30	- -	femur, fragment	right proximal	A	0.2
0061	20-30	- -	dental enamel	- -	- -	0.2
0078	30-40	*Sylvilagus* sp.	cranium, fragment	- -	A	0.7
0094	40-50	*Lophortyx californicus*	femur, fragment	right distal	A	0.1
0094	40-50	*Odocoileus* sp.	metatarsal, fragment	distal	S	8.8
0106	50-60	*Sylvilagus* sp.	femur, fragment	left proximal	S	0.2
0106	50-60	*canis* (?), leporidae (?)	radius, fragment	distal	S (?)	0.7
0117	60-70	*Lepus californicus*	metacarpal	- -	A	0.1
0117	60-70	*Lepus californicus*	metacarpal, fragment	- -	A	<0.1
0117	60-70	*Sylvilagus* sp.	femur, fragment	right proximal	J	0.3
0118	60-70	*Lepus californicus*	humerus, fragment	left distal	A	0.2
0128	70-80	*Sylvilagus* sp.	maxilla, fragment	right mid	A	0.5
0128	70-80	- -	calcaneous	right mid	A (?)	<0.1
0129	70-80	- -	tooth, fragment	proximal	- -	0.2

[1] Level is measured in cm.
[2] Age is measured in Adult (A), Subadult (S), or Juvenile (J)
[3] Weight (Wt.) is measured in g.

of the year when the site was occupied was two deer temporals bearing antler bases "killed during different parts of the year;" between August to December and the other January to March. (Langenwalter 1986:14).

SPECIAL STUDIES

Human Remains

Human remains were recovered from Units C, D, and E at site CA-FRE-1331, each in dramatically different contexts. The human remains from Units C and E were not readily identified in the field during excavation. The materials were discovered during faunal

Table 16
IDENTIFIED FAUNAL MATERIAL FROM UNIT B AT CA-FRE-1331

Cat. No.	Level[1]	Taxon Name	Element	Portion	Age[2]	Wt.[3]
0152	0-10	*Odocoileus* sp.	mandible, fragment	left mid	S	5.6
0153	0-10	- -	dental (?) enamel	- -	- -	0.3
0171	10-20	*Odocoileus* sp.	metacarpal	right mid	S	3.2
0175	10-20	- -	dental enamel	- -	- -	0.3
0196	20-30	*Lepus* sp.	mandible, fragment	left mid	A	0.8
0196	20-30	*Sylvilagus* sp.	mandible, fragment	left mid	A	0.4
0196	20-30	avifauna	tibiotarsus or tarsometatarsus	- -	- -	0.6
0198	20-30	*Canis* sp. (?)	tooth, molar (mandibular?)	left mid	A	0.1
0205	20-30	*Lepus* sp.	metacarpal	- -	A	<0.1
0218	30-40	*Sylvilagus* sp.	metacarpal, fragment	proximal	A	<0.1
0219	30-40	- -	dental enamel (rodentia?)	- -	- -	0.2
0220	30-40	*Neotoma* sp.	tooth (mandibular molar?)	right proximal	A	<0.1
0221	30-40	artiodactyl	dental fragments	- -	- -	0.5

[1] Level is measured in cm.
[2] Age is measured in Adult (A), Subadult (S), and Juvenile (J)
[3] Weight (Wt.) is measured in g.

analysis and separated from the rest of the faunal collection. A total of four elements were recovered: 3 tooth fragments (molars) and a single phalanx, perhaps a thumb. One molar tooth came from the 50 to 60 cm. level of Unit C and another molar came from the 0 to 10 cm. level of Unit E. At the 90 to 100 cm. level of Unit C, the phalanx and the remaining molar fragment were collected.

Only the partial elements of a highly eroded burial feature remained when it was identified at the 80 to 90 cm. level in Unit D. Upon discovery and accordance with California state law, the Fresno County coroner's office was contacted. Dr. Roger LaJeunesse from California State University, Fresno, provided a rudimentary remains analysis for the coroner's office. LaJeunesse concluded that the remains probably belonged to a small individual, subadult or adult. Dr. Robert M. Yohe, II, of California State University, Bakersfield, also performed a human remains analysis on what minimal bone material remained from the feature. Dr. Yohe's conclusions were more detailed: "partial

Table 17
IDENTIFIED FAUNAL MATERIAL FROM UNIT C AT CA-FRE-1331

Cat. No.	Level[1]	Taxon Name	Element	Portion	Age[2]	Wt.[3]
0253	20-30	*Lepus* sp.	metatarsal	mid	S	0.1
0253	20-30	*Neotoma* sp. (?)	tooth	mid	A	<0.1
0253	20-30	- -	calcaneous, fragment	right mid	- -	0.1
0253	20-30	*Neotoma* sp.	mandible, fragment	left mid	J	<0.1
0283	30-40	*Lepus* sp.	femur, fragment	right proximal	A	0.1
0283	30-40	*Lepus* sp.	metatarsal, fragment	distal	A	0.2
0315	40-50	*Lepus* sp.	metacarpal, fragment	proximal	A	0.1
0315	40-50	*Lepus* sp.	metacarpal, fragment	proximal	A	<0.1
0344	50-60	*Sylvilagus* sp. (?)	metacarpal	mid	A	<0.1
0356	60-70	*Sylvilagus* sp. (?)	tibia, fragment	left proximal	A	0.6
0356	60-70	*Sylvilagus* sp.	scapula, fragment	proximal	A	0.2
0379	70-80	- -	radius, fragment	proximal	A	0.4
0379	70-80	*Neotoma* sp.	calcaneous	left mid	A	<0.1
0379	70-80	*Sylvilagus* sp.	tooth, fragment	mid	A	<0.1
0379	70-80	*Sylvilagus* sp.	tooth, fragment	mid	A	0.1
0379	70-80	*Sylvilagus* sp.	mandible, fragment	right mid	J	<0.1
0379	70-80	*Sylvilagus* sp.	metacarpal	mid	A	<0.1
0379	70-80	*Sylvilagus* sp.	metacarpal	mid	A	<0.1
0409	80-90	*Sylvilagus* sp.	mandible, fragment	left distal	S	0.3
0409	80-90	*Sylvilagus* sp.	mandible, fragment	left mid	S	0.3
0409	80-90	*Sylvilagus* sp.	mandible, fragment	right mid	A (?)	0.1
0409	80-90	*Sylvilagus* sp.	humerus, fragment	right distal	S	0.1
0409	80-90	*Sylvilagus* sp.	mandible, fragment	left mid	J	0.2
0409	80-90	*Sylvilagus* sp.	rib, fragment	proximal	A	<0.1
0409	80-90	*Sylvilagus* sp.	metacarpal, fragment	distal	A	<0.1

[1] Level is measured in cm.
[2] Age is measured in Adult (A), Subadult (S), and Juvenile (J)
[3] Weight (Wt.) is measured in g.

femora and tibiae of a small adult, sex indeterminate." Also noted was heavy erosion of the periosteum, and that the proximal and distal ends were absent. Given there was "not much there" to analyze, the best conclusion reached was that the remains were of a small adult, probably a female (or at least a "gracile individual"). It was also determined that osteometrics would probably not be valid as the bone was extremely porous (R. Yohe 2003, personal communication). The individual was later reburied in Yokuts tradition to its nearest location of discovery in Unit D.

Table 18
IDENTIFIED FAUNAL MATERIAL FROM UNIT D AT CA-FRE-1331

Cat. No.	Level[1]	Taxon Name	Element	Portion	Age[2]	Wt.[3]
0491	0-10	- -	humerus, fragment	left distal	A (?)	8.4
0491	0-10	*Odocoileus* sp.	metatarsal, fragment	distal	J	1.5
0491	0-10	*Lepus californicus*	scapula, fragment	right proximal	A	0.2
0491	0-10	*Neotoma* sp.	femur, fragment	left proximal	J (?)	<0.1
0492	0-10	*Odocoileus* sp.	astragalus	right mid	A	11.7
0493	0-10	*Odocoileus* sp.	longbone fragments	- -	- -	9.4
0515	10-20	- -	humerus, fragment	left distal	J (?)	0.2
0515	10-20	*Thomomys* sp.	tooth, fragment	mid	A	0.1
0516	10-20	- -	dental enamel	mid	- -	0.2
0517	10-20	*Canis* sp. (*latrans*?)	cranium, fragment	right? mid	A	2.3
0538	20-30	*Thomomys* sp.	mandible, fragment	left mid	A	0.2
0538	20-30	*Lepus californicus*	metacarpal, fragment	proximal	S	<0.1
0538	20-30	*Thomomys* sp. (?)	mandible, fragment	left mid	S	0.1
0539	20-30	- -	dental enamel	mid	- -	0.1
0540	20-30	*Odocoileus* sp.	astragalus	left (?) mid	A	7.4
0567	30-40	*Odocoileus* sp.	mandible, fragment	left mid	A	1.9
0567	30-40	*Neotoma* sp.	calcaneous, fragment	left mid	A	<0.1
0589	40-50	*Odocoileus* sp.	scapula, fragment	left proximal	A	7.2
0589	40-50	*Neotoma* sp. (?)	vertebrae, fragment	mid	A	<0.1
0632	50-60	*Neotoma* sp.	mandible, fragment	left distal	A	0.2
0632	50-60	*Odocoileus* sp.	phalange, fragment	proximal	A	0.6
0632	50-60	*Canis* sp. (*latrans*)	third phalanx (claw)	mid	A	0.2
0633	50-60	artiodactyl (?)	dental enamel	mid	- -	0.7
0633	50-60	*Lepus* sp.	tooth, fragment	mid	S (?)	<0.1
0643	60-70	*Odocoileus* sp.	astragalus	left mid	A	10.1
0643	60-70	*Odocoileus* sp.	phalange, fragment	mid	J	0.7
0644	60-70	- -	dental enamel	mid	- -	0.1
0644	60-70	*Neotoma* sp.	tooth	left proximal	A	<0.1
0653	70-80	*Lepus californicus*	metacarpal, fragment	proximal	S	0.1
0662	80-90	*Sylvilagus* sp.	mandible, fragment	right mid	A	0.3
0662	80-90	*Odocoileus* sp.	phalange, fragment	proximal	J	0.3
0675	90-100	*Neotoma* sp.	tooth, fragment	mid	A	0.1
0675	90-100	*Lepus californicus*	metacarpal, fragment	proximal	A	<0.1
0700	100-110	*Odocoileus* sp.	metatarsal, fragment	distal	A	3.5

[1] Level is measured in cm.
[2] Age is measured in Adult (A), Subadult (S), Juvenile (J)
[3] Weight (Wt.) is measured in g.

Sandstone X-Ray Fluorescence

As the possibility of CA-FRE-1331 having been an ochre processing site was being considered during excavation, it was decided to examine one of the red colored sandstone rocks in more detail. Procuring and heating the locally available iron-rich sandstone to make

Table 19
IDENTIFIED FAUNAL MATERIAL FROM UNIT E AT CA-FRE-1331

Cat. No.	Level[1]	Taxon Name	Element	Portion	Age[2]	Wt.[3]
0740	10-20	*Lepus* sp.	(upper) maxilla, fragment	left proximal	A	0.3
0740	10-20	*Lepus* sp.	teeth	mid	A	0.2
0755	20-30	- -	dental enamel	mid	- -	0.1
0767	30-40	*Lepus* sp.	metacarpal, fragment	mid	A	0.1
0767	30-40	*Sylvilagus* sp. (?)	radius, fragment	right distal	A	0.1
0786	40-50	*Sylvilagus* sp.	innominate, fragment	left mid	S	0.3
0786	40-50	*Sylvilagus* sp.	mandible, fragment	left mid	S	0.3
0786	40-50	*Sylvilagus* sp.	radius, fragment	left proximal	A	0.1
0787	40-50	*Canis* sp.	metacarpal	left mid	A	0.4
0788	40-50	- -	dental enamel	mid	- -	0.1

[1] Level is measured in cm.
[2] Age is measured in Adult (A), Subadult (S), and Juvenile (J)
[3] Weight (Wt.) is measured in g.

red ochre paint material could explain the preponderance of sandstone blocks and flakes within the midden's occupational levels. A large rock concentration was encountered at the 40 to 50 cm. level in Unit A, of which several of the red-colored sandstone rocks were collected (Fig. 26). One of these rocks (Cat. No. 0841) was selected at random and tested at the BLM Hollister Field Office for iron ore (FeO_2) content using a Niton field portable x-ray fluorescence (XRF) device. The Niton field portable XRF machine offers an "extremely rapid, cost-effective screening of heavy metals" (Shefsky 1997:2). It is versatile enough to provide *ex situ*, prepared-sample analysis with accuracy comparable or superior to standard laboratory analyses (Sackett and Martin 1998:8-10). The sample rock taken from Unit A registered a higher than average value of FeO_2 found in typical sandstones, about 2 to 4% (T. Moore 2001, personal communication).

Obsidian X-Ray Fluorescence and Hydration Rim Analysis

Fifteen obsidian artifacts were identified during the rough sort of lithic materials in the laboratory. Most of these artifacts were small tertiary flakes with one biface. All of the specimens were sent to the Northwest Research Obsidian Laboratory in Corvallis, Oregon,

Figure 26. CA-FRE-1331 Unit A backdirt rock pile, 0 to 50 cm. levels, west half.

for x-ray fluorescence (XRF) material souring and hydration rim dating and calibration (Table 20) (also refer to Appendix B).

The results were interesting, in that the obsidian material at CA-FRE-1331 came from eastern as well as northern California. Typically trade patterning during the Late Period in California trended east to west, with few north to south trade patterns: "obsidian was being traded west across the Sierra Nevada from sources latitudinally parallel to portions of the valley" (Sutton and DesLauriers 2002:2; Davis 1961). The Bodie Hills obsidian source dominates the central San Joaquin Valley, and the Casa Diablo obsidian type dominates the southern San Joaquin Valley, with some significant presence of Queen and Coso obsidian types as well (all of which are sources from east of the Sierra Nevada mountains) (Sutton and DesLauriers 2002:2).

Table 20
OBSIDIAN ARTIFACTS X-RAY FLUORESCENCE (XRF) SOURCING AND HYDRATION RIM DATING RESULTS FROM CA-FRE-1331

Cat. No.	Unit	Level[1]	Description	Source	Hydration Rim[2]
0018	A	0-10	shatter	Napa Valley	3.5+/-0.1
0036	A	10-20	flake	unknown, too small to process	3.6+/-0.1
0060	A	20-30	flake	Casa Diablo	3.9+/-0.1
0167	B	10-20	flake	unknown, identified after testing	- -
0248	C	20-30	flake	Coso Volcanic Field	4.5+/-0.1
0475a	D	0-10	flakes	Casa Diablo	3.5+/-0.1
0475b	D	0-10	flakes	Napa Valley	5.3+/-0.1
0509	D	10-20	flake	Coso Volcanic Field	5.9+/-0.1
0523	D	20-30	flake	Casa Diablo	3.7+/-0.1
0572	D	40-50	flake	Casa Diablo	5.1+/-0.1
0639	D	60-70	flake	Casa Diablo	5.3+/-0.1
0680	D	100	biface	unknown, identified after testing	- -
0730	E	10-20	flake	Annadel	3.0+/-0.1
0771	E	40-50	flake	Coso Volcanic Field	4.3+/-0.1
0799	E	50-60	shatter	Coso Volcanic Field	3.0+/-0.1
0824	- -	Surface	biface	Casa Diablo	5.1+/-0.1
0831	- -	Surface	flake	Casa Diablo	5.3+/-0.1

[1] Level is measured in cm.
[2] Hydration Rim is measured in microns

At CA-FRE-1331, almost 50% of the obsidian material was derived from Casa Diablo (Skinner and Thatcher 2003:2). Nearly another 29% came from Coso, another eastern source, and the remaining 21% came from the north (Annadel and Napa varieties) (Skinner and Thatcher 2003:2). One artifact (Cat. No. 0036) was too small to process for sourcing analysis. As a comparison, a small amount of obsidian material was also recovered at archaeological site CA-FRE-1346 only three miles to the northwest. Unfortunately only a visual analysis for two of the specimens was provided, suggesting that the obsidian was "derived from the Napa Valley source area" (Jenkins 1992:68). Coincidentally, two specimens of obsidian material from CA-FRE-1331 were derived from the Napa Valley source (Cat. Nos. 0018 and 0475a; Skinner and Thatcher 2003).

The hydration values do not appear to hold any immediately revealing patterns, and the small sample size prohibits worthwhile statistical analysis. The values range from 3.0 to 5.9 microns in width (+/- 0.1 micron), and do not correlate between sources or recovered depths from CA-FRE-1331. For example, a flake recovered from the 60 to 70 cm. level in Unit D (Cat. No. 0639) had the same hydration rim width (5.3 microns) as an artifact collected on the surface of the site (Cat. No. 0831). Both artifacts were sourced to the Casa Diablo Lookout Mountain locality.

Obsidian hydration studies have identified the pitfalls in using hydration rim values as age correlates for dating an archaeological site. Hydration rates are dependent on obsidian source type, environmental conditions, and depositional (site formation) processes. In order to address these variables, an effective hydration temperature (EHT) correction value is given for each obsidian source type and study area along with hydration rate formulas, but these values are still being developed for all of California. A hydration rate was developed by Basgall (1990) to address Coso source artifacts in the following equation

$$y = (31.622)\,(x^{2.32})$$

where y is equal to years before present (B.P.) and x is equal to the hydration rim value measured in microns. This equation has been modified and refined over the years as obsidian hydration studies have progressed, and other researchers have proposed modified equations for different regions. For example, the Pearson rate (Gold 2005:95) is expressed as

$$y = x(125 + 25(x))$$

where y is equal to years before present (B.P.) and x is equal to the hydration rim value measured in microns. As a result of recent research in the southern Sierra Nevada region, another rate for Coso based artifact hydration dating was developed, referred to as the Kern Plateau rate expressed as

$$y = x(150 + 60(x))$$

where y is equal to years before present (B.P.) and x is equal to the hydration rim value measured in microns (Gold 2005:96). Other equations have been developed for obsidian hydration dating in different parts of the state, such as one used for artifacts from the lower North Coast ranges expressed as

$$t = kx^2$$

where t is equal to time measured in years before present (B.P.), x is equal to the hydration rim value measured in microns, and k is regional effective hydration temperature (EHT) constant value (Stewart and Praetzellis 2003:91).

The obsidian hydration dates for the Coso Volcanic Field source artifacts, Casa Diablo source artifacts, and the Napa and Annadel source artifacts are presented below in Table 21, Table 22, and Table 23. Overall, it should be understood that the effective hydration temperature (EHT) attempts to adjust for hydration variables but it does not yet take into account microclimatic conditions which can greatly affect the hydration rate for a given artifact (Stewart and Praetzellis 2003:92). In 2005 a study was conducted to rectify the hydration dating rates for Coso and Casa Diablo obsidian artifacts found in central California. The study area included two regions, namely "the central California coast and near coast counties of Monterey, San Benito, San Luis Obispo, and Santa Barbara; and the interior counties of Fresno, Inyo, Kern, Kings, Madera, and Tulare" (Fredrickson et al. 2006:151), which included the CA-FRE-1331 area. Research included induced hydration from four sources: Casa Diablo (Lookout Mountain), Coso (Colossal Quarry and West

Table 21
OBSIDIAN HYDRATION DATES FOR ARTIFACTS FROM CA-FRE-1331 SOURCED TO THE COSO VOLCANIC FIELD

Cat. No.	Unit	Level[1]	Hydration Rim[2]	Basgall Rate[3]	Pearson Rate[3]	Gold Rate[3]
0248	C	20-30	4.5+/-0.1	1,036	1,068	1,890
0509	D	10-20	5.9+/-0.1	1,943	1,608	2,974
0771	E	40-50	4.3+/-0.1	932	1,000	1,754
0799	E	50-60	3.0+/-0.1	404	600	990

[1] Level is measured in cm.
[2] Hydration Rim is measured in microns
[3] Rate values are measured in years before present (B.P.)

Sugarloaf), and Napa Valley "as a control because its hydration rate is well understood" (Fredrickson et al. 2006:155). The study concluded that the rates were variable dependent on depth of artifact burial and local microclimates.

The four Coso specimens that were analyzed "were quite small and very low in sample mass" and thus were assigned to a generalized Coso Volcanic Field source (Skinner and Thatcher 2003:4). Two samples taken from Unit E (Cat. Nos. 0771 and 0799) were from the same Coso Volcanic Field source and separated by only one level (40 to 50 cm. level and 50 to 60 cm. level respectively). However, the hydration value from the lower level had a smaller measurement in comparison to the level above, 4.3 versus 3.1 microns, which is counterintuitive to the law of superposition if the hydration rate is constant. A possible explanation is that the samples were affected by artifact sorting as a result of bioturbation or other site formation processes.

Obsidian hydration values for two of the samples collected on the sites surface (Cat. Nos. 0824 and 0831) were similar (5.1 and 5.3 microns, respectively) and came from the same Casa Diablo Sawmill Ridge source. Only two obsidian samples collected and tested from CA-FRE-1331 could be sourced to the Napa Valley location. Despite the fact that these specimens came from the top 10 cm. level of the site (Cat No. 0018 from Unit A and Cat.

Table 22
OBSIDIAN HYDRATION DATES FOR ARTIFACTS FROM CA-FRE-1331 SOURCED TO CASA DIABLO

Cat. No.	Unit	Level[1]	Hydration Rim[2]	Basgall Rate[3]	Pearson Rate[3]	Gold Rate[3]
0060	A	20-30	3.9+/-0.1	743	868	1,498
0475a	D	0-10	3.5+/-0.1	578	744	1,260
0523	D	20-30	3.7+/-0.1	658	805	1,376
0572	D	40-50	5.1+/-0.1	1,385	1,288	2,326
0639	D	60-70	5.3+/-0.1	1,515	1,365	2,480
0824	- -	Surface	5.1+/-0.1	1,385	1,288	2,326
0831	- -	Surface	5.3+/-0.1	1,515	1,365	2,480

[1] Level is measured in cm.
[2] Hydration Rim is measured in microns
[3] Rate values are measured in years before present (B.P.)

No. 0475b from Unit D), the hydration values are very different: 3.5 microns from the Unit A sample and 5.3 microns from the Unit D sample. This discrepancy could be explained by differential burning over the site surface during previous wildfire events, thereby affecting the hydration rates differently for each artifact.

Of the 14 sourced artifacts, 11 of them were derived from sources east of the site area (Coso and Casa Diablo) constituting 78.6% of the total sample. The remaining 21.4% of the sourced artifacts derived north of the site area (Napa Valley and Annadel). This percentage is roughly consistent with the results from other Central Valley sites confirming a dominant east to west trade pattern in Central California for raw obsidian material and finished artifacts.

Following Sutton and DesLauriers (2002) discussion of obsidian distribution in the Valley, we should expect to find Casa Diablo obsidian predominating at CA-FRE-1331 with some Coso obsidian present. However, less than 50% of the samples sources were derived from Casa Diablo and over 25% were from Coso sources (Skinner and Thatcher 2003). This could indicate that within an east-west trading pattern and flow of obsidian goods, there was

Table 23
OBSIDIAN HYDRATION DATES FOR ARTIFACTS FROM CA-FRE-1331 SOURCED TO NAPA AND ANNADEL

Cat. No.	Unit	Level[1]	Source	Hydration Rim[2]	Stewart and Praetzellis (2003)[3]
0018	A	0-10	Napa Valley	3.5+/-0.1	1,879
0475b	D	0-10	Napa Valley	5.3+/-0.1	4,309
0730	E	10-20	Annadel	3.0+/-0.1	1,661

[1] Level is measured in cm.
[2] Hydration Rim is measured in microns
[3] Stewart and Praetzellis (2003) rate is measured in years before present (B.P.)

still some north to south movement of obsidian yet still within the ethnographic range of one large group (the Southern Valley Yokuts). The Annadel and Napa Valley obsidian has also moved from north to south during its trade lifetime, but could have moved similarly between the Ohlone groups, eventually making its way into an east-west trading pattern or "route" resulting in interethnic exchange.

Overall, the pattern of obsidian source use is very similar to that from other sites in the California central coast region. An aforementioned sample (Cat. No. 0036) was too small for sourcing analysis. Although this flake was actually larger than some of the other artifacts submitted for testing, the trace signatures from the sample were too weak to assign it to a definitive source. However, it was clear that this particular artifact was not the same as any of the previous sources identified with the other samples from CA-FRE-1331 (C. Skinner 2003, personal communication).

Radiocarbon Analysis

While a fair amount of charcoal and wood material was recovered at CA-FRE-1331, very little of it came from one single carbonized element or feature (e.g., hearth). Much of the collected material came from an entire level as an aggregate. Fortunately, one possible carbonized feature was recovered during excavation suitable enough to be submitted for radiometric dating: wood "posts" that may have been associated with the housepit feature in Units C and E. Only one component of the feature was used for dating (Cat. No. 0811) while the other portion was reserved for future studies (Cat. No. 0810). The west "post" of feature P/1 from Unit C was selected (Fig. 13, post in foreground) and sent to BetaAnalytic, Inc., of Miami, Florida for sample processing (refer to Appendix C).

The sample returned a conventional age of 200 +/- 50 B.P. which correlates to approximately A.D. 1750 +/- 50 (Hood 2003: Sample Beta-180709). A 2 Sigma Calibration of the sample returns a calendrical date of A.D. 1635 to 1705. This age and calibrated date meshes well chronologically with most of the artifactual material from CA-FRE-1331.

Protein Residue Analysis

Fifteen groundstone and flaked stone artifacts from CA-FRE-1331 were selected and tested for different protein residues using the crossover immunoelectrophoresis (CIEP) method (Table 24). Three soil samples from the 0 to 10 cm. level of Units A, C and D were also submitted for control analysis. The tests were conducted by Robert Parr of the Center for Archeological Research at California State University, Bakersfield (refer to appendix D). Immunological reaction testing using 1) animal proteins only or 2) both plant and animal proteins were applied to the artifacts on the basis of the artifact's form and presumed function (Parr 2003: sample lot LAS-5). For example, the metate (Cat. No. 0563) was tested for both plant and animal residues while the projectile point fragments (Cat. No. 0021 and Cat. No. 0412) received only animal anitsera during testing.

In order for there to be enough organic material stained on an artifact to be tested for residues, the preburial conditions must be conducive for preservation (e.g., dry) and site formation processes must not be too extreme (e.g., exposure to humidity through rain,

Table 24
PROTEIN RESIDUE RESULTS FROM FLAKED AND GROUNDSTONE ARTIFACTS AT CA-FRE-1331

Cat. No.	Unit	Level[1]	Artifact Description	Result
0001	A	0-10	steatite bowl fragment	negative
0021	A	0-10	projectile point fragment	negative
0022	A	0-10	projectile point	negative
- -	A	0-10	soil sample	negative
0074	A	30-40	biface fragment	negative
0166	B	10-20	edge modified flake	negative
0187	B	20-30	mano	negative
0201	B	20-30	steatite bowl fragment	negative
- -	C	0-10	soil sample	negative
0412	C	80-90	projectile point fragment	negative
0413	C	80-90	biface fragment	negative
0470	D	0-10	flake	positive - rabbit
0476	D	0-10	biface	negative
- -	D	0-10	soil sample	negative
0553	D	30-40	pestle fragment	negative
0563	D	30-40	metate	positive - chicken
0711	D	100-110	hopper mortar	negative
0839	- -	Surface	steatite bowl fragment	positive - chicken

[1] Level is measured in cm.

artifact exposure on the site surface through bioturbation, etc.) (Cattaneo et al. 1993:40). Blood proteins also biodegrade on their own over time, resulting in partial protein residue antisera recognition (Downs and Lowenstein 1995:11, 15).

Of 15 lithic artifacts, only three tested positive - none of the soil samples reacted to the antisera. A utilized flake from the 0 to 10 cm. level of Unit D reacted positively to rabbit antisera, indicating the tool's contact with rabbit proteins - and likely rabbit parts during game processing (Cat. No. 0470, Fig. 18). Both jackrabbits and cottontail rabbits were identified in the faunal assemblage. The metate recovered from Unit D at the 30 to 40 cm. level (Cat. No. 0563, Fig. 23) and a steatite bowl fragment collected from the site's surface (Cat. No. 0839, Fig. 20) both tested positive for chicken. Given that chicken antiserum reacts positively to "chicken, turkey, quail, grouse and related species" (Parr 2003:3), in tandem with the recovery of quail bones in the faunal assemblage, one could conclude that these groundstone artifacts were involved with quail game processing. The lack of chickens during the Late prehistoric era in addition to the fact that the study area environment does not favor turkey or grouse (although the region does support these kinds of fowl) reduces the possibility of these birds' remains being identified on the artifacts. The rim sherd was collected from the surface, but only slightly exposed *in situ*, with the interior portion of the bowl fragment face down unexposed to the elements.

Soil Flotation

Of the three column samples collected at CA-FRE-1331, one was selected for immediate analysis and the remaining two samples reserved for future studies. The column sample taken from Unit C within the housepit feature was selected for immediate analysis. At the suggestion of then California State University, Sonoma, student Alex DeGeorgey, the column sample and feature material from CA-FRE-1331 were sent for paleobotanical analysis to floatation specialist Erin Dwyer of Paradise, California (refer to Appendix E). Dwyer is one of the few people that can visually identify the differenced between charred pine and juniper fragments (E. Dwyer 2003, personal communication). Dwyer's analysis concluded that there was a preponderance of *Pinus* sp. material in comparison to acorn (*Quercus* sp.), which is the more commonly found plant material in the prehistoric archaeological sites of central California (E. Dwyer 2003, personal communication). This observation, however, is not so extraordinary given the rather mesic environment of the study area: blue oak-juniper woodland and mixed chaparral. The presence of Yellow-star thistle in the sample from the 20 to 30 cm. level of Unit E was likely a contamination, probably introduced by the research team during the collection of feature P/1 (a thriving patch of

Yellow-star thistle was located by the access gate leading into the site area). The lack of small taxa in the samples is notable, especially in consideration with groundstone as it relates to seasonal indices: the presence of many small seeds are representative of late spring and early summer (E. Dwyer 2003, personal communication). This paucity of small taxa may indicate activity in the housepit between late summer through winter, or possibly abandonment.

Curation

Cataloged materials from research at CA-FRE-1331 are curated at California State University, Bakersfield. As research was conducted on public Federal lands, the collection must be stored in a proper repository meeting the curatorial requirements for Federal collections (as defined in the Code of Federal Regulations).

CHAPTER 6

CONCLUSIONS

EVALUATION OF RESEARCH GOALS

Goal 1: Time Period and Length of Occupation.

Two periods of occupation occurred at CA-FRE-1331. Archaeological material strongly indicates a Late Period occupation at the site, probably between A.D. 1580 and 1760. This conclusion is supported by the artifact data established from the Central California culture area bead chronologies (King 1978) and point typologies from the San Luis-Little Panoche regional chronology (Olsen and Payen 1968, 1969). The Late Period occupation is further borne out by radiocarbon testing. A date of 200 +/- 50 B.P. (Hood 2003: Sample number Beta-180709) from the probable post feature recovered from Unit E fits within the Late Period of site occupation. A second component of site use appeared to have occurred earlier in time: a single interment, feature B/1 located in Unit D, was found below the upper cultural deposit corresponding with the Late Period occupation. Obsidian hydration data from CA-FRE-1331 was less revealing; with no discernable intrasite relationship between the obsidian sources, their rim values, or the obsidian artifacts' placement throughout the site. Hydration rim values varied between 3.0 and 5.9 (+/- 0.1) microns (Skinner and Thatcher 2003), with corrected hydration dates ranging between 404 and 4,309 B.P. (refer back to Chapter 5 in Table 21, Table 22 and Table 23).

The notion of a regional climatic anomaly that affected settlement and trade patterns in western North America, including the California Culture area, was proposed based upon research that demonstrated "evidence for two intervals of decreased precipitation" occurring between A.D. 900 to 1100 and A.D. 1150 to 1350 (Jones et al. 1999:153). The archaeological materials and dates from CA-FRE-1331 do not necessarily challenge the concept of the Medieval Climatic Anomaly as the final occupation of the site did not appear to begin until after A.D. 1500. In addition, the earlier interment feature from Unit D probably predates this particular anomaly, but this conclusion is speculative at best.

Goal 2: Site Function.

The artifacts found at CA-FRE-1331 reflect a variety of tasks and functions carried out at the site. The presence of broken projectile points and utilized, edge modified flakes indicate some level of resource procurement in the form of game animal hunting and processing. Corroborating protein residue evidence on a utilized cryptocrystalline flake, a steatite bowl fragment, and sandstone metate in combination with the overall faunal record demonstrate that hunting and related activities probably occurred at CA-FRE-1331.

Discovery of the probable housepit feature indicated either residential or ceremonial use of the site. A residential settlement might produce other structures and dwellings, while a ceremonial site may only have a single structure (Latta 1949, 1977). Relying on Olsen and Payen (1968:29-37, 1969), circular structures that could be identified from the Panoche Complex were approximately 75 feet in diameter for group assembly or ceremonial purposes and 30 to 50 feet in diameter for common residential dwellings (there was at least one example of a semi subterranean sweathouse as well) (Wren 1987:11). House floors were typically no deeper than 60 cm. below the surface (Olsen and Payen 1968:29-32, 59). If these observations apply, then the housepit at CA-FRE-1331 may only be a residential dwelling (or a sweathouse): the surface features appear too small to be an assembly structure.

The majority of beads (70 %) recovered at CA-FRE-1331 came from units associated with the housepit feature: Unit C (approximately 56% of total beads recovered) and Unit E (approximately 15% of total beads recovered). Moreover, most of these beads appear to be noneconomic in nature (after King 1978). Also recovered in the housepit units were disassociated human remains. These remains consisted of a single phalanx, molar elements, and molar fragments. Yokuts ethnographic informant Ho-En-Nick (Werlof and Vierhus 1956a:66) reported that most people were cremated instead of being buried when they died, and when someone died in a house the building was burned. The bodies would be buried in an upright position or sometimes lying down, and important personal possessions were placed beside the bodies (Wren 1987:51). Given this archaeological and ethnographic information, it is possible that the housepit feature at CA-FRE-1331 may have been the site of a ceremonial cremation nearly 300 years ago.

The presence of rock concentrations found in the upper sixty centimeters of CA-FRE-1331 does not readily provide an answer as to their function. Primarily composed of sandstone with some mixed metavolcanics, faunal and lithic materials were interspersed between the rocks but with surprisingly little charcoal - typical of hearth type features. The sandstone rocks appeared to be thermally altered: in some instances tan colored sandstone had taken on a reddish hue or even appeared dark gray or black in color (as if the sandstone had been "overcooked"). Hearth features that are primarily rock concentrations with little or no charcoal appear elsewhere in the California culture area, but there has been little discussion on their function beyond that of a fireplace (Wedel 1941). At site CA-VEN-61, both King (1962) and Susia (1962) discussed large rock features approximately 18 inches beneath the surface, varying 12 to 24 inches (similar in depth to CA-FRE-1331). No direct firing was apparent on the rocks, nor were there any charcoal concentrations or tight rock groupings; the features appeared to be circular in shape. Feature 1 at the site was discovered at the 12 to 18 inches level and described as an "unnatural concentration of sandstone cobbles and fragments" (Susia 1962:160). One possible pestle, mano, and scraper plane were also recovered from the feature - no charcoal or other material "gave a clue to the nature of the feature" (Susia 1962:160, 209).

Pocket gophers are known to displace soils through burrowing action, and primarily travel underground in a horizontal fashion. However, they tend to displace objects (including artifacts) in vertical fashion. This vertical movement is usually no greater than 1 m. (Bocek 1986:590-591). Johnson (1989) conducted a study involving the displacement of materials by pocket gophers in southern California, and concluded that the gophers could be a causer for a geological phenomenon referred to as "stone lines" or "stone zones." These features are horizontal layers of stones, usually 5 to 10 cm. in size that create a lens or stones at approximately the same depth below surface. This kind of feature might explain the large quantity of rock found in the 40 to 50 cm. levels of Units A and B, as pocket gopher faunal remains were found at CA-FRE-1331. The rate at which this process might have taken place is unknown, but based on the artifact assemblage it could be as many as 500 years.

Burial feature B/1 from Unit D at CA-FRE-1331 is probably unrelated to the site's upper cultural stratum. The burial's appearance was flexed; but exact orientation, position, and posture were difficult to ascertain due to the extremely poor preservation of the bone material. Representatives from the Santa Rosa Rancheria declined any destructive analyses on the human remains, therefore dating bone material was not an option. The mineralized state of the bone hinted at an old age for the deposit, but the differential preservation and extensive presence of caliche stained soils across the site makes a conclusion of this sort dubious. Artifacts found in closest association with the remains were beads dating to the Early and Middle Periods, a barely used hopper mortar, and cryptocyrstalline projectile points that were atypical variants for the Late Period in the southern San Joaquin Valley or Coast Ranges. The likely conclusion is that CA-FRE-1331 has two defined temporal components: a possible Early or Middle Period (interment) and a probable Late Period occupation (habitation).

Goal 3: Ethnicity.

Assigning an ethnicity to CA-FRE-1331 or any archaeological site can be difficult. In this instance, the site is in an area that could be "part" of Yokuts, Salinan, or Costanoan/Ohlone territory. In balancing the preexcavation data from archaeological, ethnographic, and ethnohistoric sets, perhaps each group had a hand - so to speak - in forming the cultural deposit at CA-FRE-1331. Moreover, because of its remoteness between the San Joaquin Valley floor and coastal populations, site CA-FRE-1331 and the White Creek area may have been one of the last refuges in native California before the socioeconomic and demographic tide of European colonization in Alta California.

The use of archaeological data in conjunction with ethnographic and ethnohistoric data creates the potential to improve the accuracy of the conclusions by utilizing more than one data set. An analysis of ethnohistoric data would physically place CA-FRE-1331 most closely on the ground to rancheria "*Staquel*," belonging to the Migueleño speaking branch of the southern Salinan (Gibson 1983). While Gibson's argument is convincing, that may only be one interpretation of the data: contemporary research into the meaning of Salinan place names has generated the working hypothesis that Salinan settlements referred to as villages or rancherias by researchers may actually be "clusters of these types of small deposits and features" (Jones et al. 2000:10). In essence, the study revealed that ethnographic place names were not just restricted to referencing exact village locations or townsites, but rather general place areas. Review and comparison of Harrington's ethnographic information with archaeological data demonstrated this fact: "Harrington's consultants referred to *traxumec* as a beautiful plain, not as a specific site or settlement" (Jones et al. 2000:10; italics in original).

Very revealing ethnographic data was found in a nontraditional literature source of regional information: the Frank F. Latta papers and memoranda housed at the Yosemite National Park Archives and Research Library. Latta, a well known history researcher and self-trained ethnographer in the San Joaquin Valley, wrote several books and small treatises on Valley history and Indians (principally the Yokuts). One of his unpublished short papers entitled "Minimum List of Village Sites Along the West Side of the San Joaquin Valley Not Mentioned by Publications" offered some interesting insights (Latta MS). Within these few pages Latta made reference to the presence of at least one unrecorded village site, a rancheria, located in "Arroyo Blanco" (Latta MS:2). There is a very good chance that "Arroyo Blanco" is in fact referring to the White Creek drainage (Arroyo Blanco is in the same section of Latta's list with other Los Gatos Creek drainages, and there is no listing for a "White Creek").

More subtle ethnographic data supporting a Late Period Yokuts occupation at CA-FRE-1331 comes from ethnographer C. Hart Merriam's research with the Tachi Yokuts near the turn of the twentieth century. The "Tah'-che Indians" told him that "they used to cook in canteen vessels called ke-wesh, not in baskets" (Wallace 1991:4). While no basketry or related materials were found at the site, the lack of such material may only represent a preservation bias in the material record (e.g., site formation processes and artifact collection/vandalism). It is interesting to note that steatite bowl fragments were recovered from CA-FRE-1331, including a patterned rim sherd stained with animal protein (see Chapter 5 and Appendix D).

Other evidence for ethnicity can be expressed archaeologically in food taboos and preferences. The presence of canid material in the faunal record of CA-FRE-1331 may not be indicative of a cultural culinary preference by itself. However, when that material is found in association with the remains of other edible game species pulverized in a similar manner, it is likely that the canid species was/were being processed and probably consumed along with the other game species. It was known ethnographically that only certain Central California Indian groups ate dogs while the other groups considered that practice taboo for socio-religious reasons: the Salinan and Costanoan/Ohlone generally considered dogs inedible, but the Yokuts had no such restrictions (Kroeber 1925:526). The recovery of canid materials in association with other game kill helps to further an argument for the ethnographic Yokutsian presence at site CA-FRE-1331, although there was no apparent evidence of cultural modification to the canine bones.

Goal 4: Trade.

Throughout California during the Late Period (especially Phase 2) there was a trend toward "village nucleation," accompanied by an increased dispersal of small hamlets over the landscape. Village nucleation was a response to the increased importance of "economic flows" and the potential for local specialization: the dispersal of these communities created an "increasingly thorough exploitation of local environments," resulting from population growth encouraged by a "new" economic system with less political control and providing a more egalitarian social system (King MS:46). The growth of this economic system stimulated increased efforts in bead manufacture and obtaining raw goods that could be "marketed," thereby resulting in every individual doing "more work" (King MS:46). What began as an ecologically adaptive convenience became a "socially catalytic necessity, stimulating the production, exchange, and consumption of economic goods, reinforcing interpersonal and intergroup relationships, and providing the context for political cooperation and integration" (Blackburn 1974:110).

Native trade relationships generally "cut across different environmental zones" because the exchanges between groups with different resource bases were maximized (King MS:41). Correspondingly, the degree of craft and artisan specialization varied from one tribe to another "in direct proportion" to their "ecological advantages and population density" (Bean 1974:27). Obsidian artifacts are good items to study in order to gain perspective on trading relationships: the material allows itself to be sourced to a specific geographic location. In California, the dominant trade pattern for obsidian exchange was primarily east to west "with relatively little obsidian moving north or south" (Sutton and DesLauriers 2002:3), moving across a diversity of ecological zones. As such, the recovery of obsidian artifacts from CA-FRE-13331 sourced to the Coso and Casa Diablo Ranges east of the Sierra Nevada was not unexpected: these materials are commonly found at archaeological sites throughout the Southern San Joaquin Valley once occupied by the Yokuts (Sutton and DesLauriers 2002). The obsidian artifacts from CA-FRE-1331 validate the east to west trade relationships in Late Prehistoric California, but further study into the nature of north to south trade relationships is warranted because of the presence of Napa and Annadel sourced artifacts.

Comments on Ochre and Ochre Processing

From White Creek, one can easily see the exposed serpentine soils of the New Idria Formation to the north. CA-FRE-1331's proximity to this concentration of useful and valuable minerals (like cinnabar) was probably not ignored. It would have been very possible for the local residents to quarry minerals within the New Idria Formation or gather float material from White Creek to make red ochre. Potential sources could have been cinnabar, metacinnabar, or other iron rich lithic material (e.g., sandstone). In order to refine some of these minerals into red ochre, the raw material would first have to be heated to achieve the proper hue (especially true for sandstone, not at all for higher quality cinnabar). Some ethnographic evidence exists of Yokuts heating chunks of ore to obtain useable paint materials. Aida Ícho, a Wukchumne Yokuts woman, explained the process to get black paint from graphite:

> A fire of dry oak wood was burned down to a heap of red coals. Then the graphite was dumped into a hole in the center and covered with hot coals from the rim of the firebed. This was left until the whole bed of coals was reduced to ashes. After the mass had cooled, the burned graphite was uncovered, carefully removed and placed in a bag of tanned deerskin [Latta 1977:299].

Yokuts women and children were known to have been the main procurers of raw material for black paint. Children would look for material opportunistically in known collection areas under the supervision of adult women (Latta 1977:299). Commonly a large, sharpened stick (the same stick for digging basketry roots) was used to dig into soft granite and remove "chunks of a heavy blue-black material" called *kó deen* (Latta 1977:599).

Prepared paints were commonly traded in Yokuts territory and throughout California. One could trade one kind of paint for other kinds of paint or even different types of exotic goods. For example, a ball of white paint could be exchanged for a ball of black paint, provided the balls were of equal size (Latta 1977:305). Red paint, made from ochre, cinnabar, or other materials that could produce red hues (e.g., sandstone) was a special color used in many ceremonial applications. Notable local sources for cinnabar (HgS) near site CA-FRE-1331 are the Archer Mine in upper White Creek canyon and the New Idria mines (e.g., Aurora Mine) (Fowkes 1982:50). If Indians were to quarry for ochre and/or cinnabar, these would have been the most ideal localities.

While there is no current physical evidence of an aboriginal mine site in the immediate region, the landscape has been drastically altered. Historic mining and timber harvesting activities have very likely destroyed these types of sites. However, in Douglas County, Oregon, there is an existing cinnabar mine opening that might approximate the appearance of an Indian cinnabar mine: the Umpqua Mine, also known historically as the Indian Lost Cinnabar Mine (United States Department of the Interior 2002; Oregon Research Treasure Center 2000) (Fig. 27). Prior to the study area's nonnative mining ventures, there may have been mines of this sort near CA-FRE-1331. A second possible source of raw materials for paint could have been derived from loose float mineral nodules generated from the New Idria serpentine body. At present, White Creek still has float material coming down from the New Idria Formation onto its banks and beyond into Los Gatos Creek. A third possibility for raw material paint would be the procurement of iron rich noncinnabar minerals (like sandstone) that could be thermally altered to achieve a similar paint product.

Interesting ochre and ochre related artifacts have been found within the California culture area. One of the more notable items is a red ochre cogged stone recovered from site CA-ORA-1432 in Southern California. The site was occupied during the Early Period Millingstone cultural horizon based upon artifactual remains and charcoal samples dating to

Figure 27. Umpqua cinnabar mine entrance,
Douglas County, Oregon.

6,500 B.P. (Koerper and Mason 1998:60). The cogged stone artifact was composed of "a mixture of iron oxide (the colorant) and clay," softer than talc, and uniformly red in color (Munsell 10YR 4/6) (Koerper and Mason 1998:65). In determining the functional nature of the artifact, assigning the cogged stone to "utilitarian purposes" would probably have been incorrect as the surface of the specimen was "readily scratched using a talc rock such as provided in a mineral hardness test kit" (Koerper and Mason 1998:66). The conscientious choice to fashion this artifact out of red ochre may have been motivated "by an association of the mineral and its color with ritual behavior and mythology" directly related to ritual or ceremonial activities (Koerper and Mason 1998:67).

At a site in the Monterey County interior of Central California, a "fist sized" lump of hematite red ochre was discovered at the rear of a rockshelter. Site CA-MNT-838 was excavated in the 1970s to approximately 360 cm. below surface and a radiocarbon date of 4,850 B.P. was recorded. The function of the ochre was undetermined (Breschini and Haversat 2005:203; G. Breschini 2005, personal communication).

The "Sunnyvale Red" burial is the oldest dated burial with grave goods in the San Francisco Bay Area (5,620 B.P.). Exposed during the construction efforts for a parking lot, the ochre "stained red" skeleton was located 25 feet below the surface. The individual was probably an adult, as the burial was fragmented and the bones were highly mineralized exhibiting a "specific gravity of rock, not bone" (Cartier 2001). Associated burial items were a double perforated *Haliotis* sp. bead and an *Olivella sp.* type A1 bead (cf. Bennyhoff and Hughes 1987).

The relationship between ochre and human use goes back tens of thousands of years, found at the earliest human occupation sites in the world. The discovery of 71 pieces of red ochre and ochre stained tools in Qafzeh Cave, Israel, were dated to more than 90,000 years old. Interestingly, chemical analyses indicated that the ochre had been heated. It has been hypothesized that the inhabitants of the Qafzeh Cave were transporting lumps of ochre to the cave, then heating the ochre to achieve desired hues of red for paint to be used in ceremonies (e.g., burial of the dead) (Bower 2003:277).

It is important that archaeologists and other researchers consider looking at ochre and its uses beyond the mineral's "symbolic value and artistic potential" (Velo 1984:674). Specifically, the iron salts in ochre have astringent effects, as well as antiseptic and deodorizing properties that could have been used for medicine in addition to its use as paint.

For example, some North American Indians have recognized ochre and cinnabar as a cure for certain ailments, like appendicitis, back pain, bladder problems, menstrual cramping and hemorrhaging, hemorrhoids, and poor limb circulation (Rain 1990).

While the above accounts are revealing, overall there is very little information about the procurement, processing, and preparation of red colored ochre into paint in native California. Drawing upon ethnographic analogy, some insight can be gained into this conundrum. Ethnographic data collected from native Tasmanians in A.D. 1830 illustrates how gender played an important role in paint making, as the procurement and preparation of pigments in Tasmanian society were considered women's activities: "the older women gathered wood and prepared charcoal, while presumably the younger and agile women mined and bruised the ochre" (Sagona 1994:21). This ethnographic information also provides an insight into mineral collection areas protocol: "the Tasmanians were covetous of ochre sources, and quarrels could erupt over its exchange or access to them" (Sagona 1994:23). This seems to contradict sharply with the ethnographic information collected by Latta in California (1949; 1977:303) where these types of collection area locations were shared areas between different groups. Aborigines at the Toolumbunner ochre quarry in the Gog Range, part of the 470 million year old Moina Sandstone Formation, were mining rich ferruginous sandstone beds for raw material paint production (Sagona 1994:39). The best quality ochre material from Toolumbunner was sampled for its iron oxide content, reaching approximately 30% iron oxide (Sagona 1994:64).

It appeared that the activities carried out at the Toolumbunner site were limited, mainly associated with the mining and processing of ochre. Within this range of ochre related tasks, the sharpening of digging sticks by the women miners is the task "most likely to have been performed" with crude yet functional flaked stones found at the site. However, the amount of lithic debitage suggests greater industrial activity than was probably required for stick sharpening (Sagona 1994: 114). A lack of animal bones and teeth excludes the butchering of carcasses, but given the diversity of vegetation in the area some of the tools may have been used to process plant foods (Sagona 1994: 114). Finally, there was no clear evidence for ochre roasting having occurred on the Toolumbunner site, probably because the local ochre source has a good red color in as much that "roasting would probably not improve the colour greatly" (Sagona 1994:78).

DIRECTIONS FOR FUTURE RESEARCH

Archaeological Collections

Current and future archaeological collections could be examined for evidence of paint and related activities. Protein residue testing could focus on bowls, bowl fragments, or other groundstone artifacts that may have been used to mix or prepare mineral paints. Yokuts ethnographic informant Ho-En-Nick (Werlof and Vierhus 1956a:66) reported that colored powders were made into paints with "a binder of sap from the common milkweed and oil from crusted seeds" (Wren 1987:51; also see Latta 1977:302). Refining the suite of possible antisera for immunological testing might reveal such residues.

Protein residue should also test for vegetal-based residues on groundstone surfaces from bead manufacturing. Root splinters of the chamise plant (*Adenostema fascilatum*) were fashioned to make drills for steatite and clam shell bead manufacturing (Gavin 1992:13). Protein residue should also focus on testing for *Pinus* sp. to address the presence of a foothill pine (*Pinus sabinana*) population in White Creek Canyon (Fig. 28) and the foothill pine material recovered from CA-FRE-1331 in a cultural context. Finally, mushrooms might also

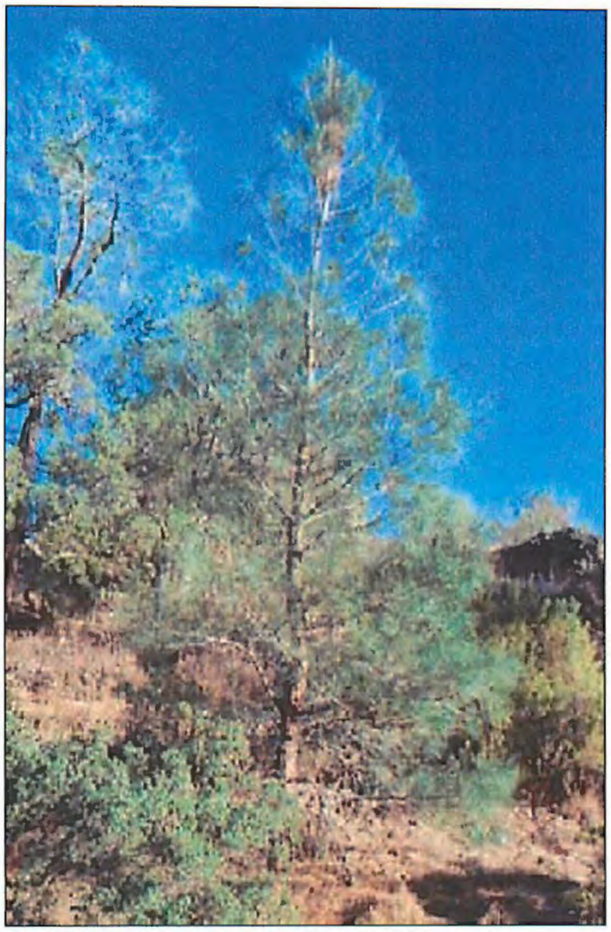

Figure 28. Foothill Pine (*Pinus sabiniana*) in White Creek Canyon near CA-FRE-1331.

be considered in protein residue testing as ethnohistoric reports state that they were not eaten by the Salinan, though they were utilized by the Costanoan and the Yokuts (Mason 1912:121).

Future recovery or a reanalysis of human remains from sites that are indicative of ochre processing or related activities might benefit from Laser Ablation (LA) analysis. By examining the bone, heavy metals uptake, specifically mercury (Hg) can be measured. High levels of mercury may indicate an association or participation in ochre processing. Sourcing ochres offers another research dimension, which could add valuable trade related information. However, efforts in sourcing ochres with x-ray fluorescence (XRF) and proton induced x-ray emissions (PIXE) have really just begun (Erlandson et al. 1999; Popelka et al. 2005).

The discovery of concretions at CA-FRE-1331 has raised a variety of possibilities for future studies: their analysis may yield valuable regional "geochemical and paleoclimatological insight" (Prokopovich et al. 1975:75). Locally most of the concretions are derivates of Cretaceous Era paleontological formations originating from the Panoche-Cantua creek fans along the West Side of the San Joaquin Valley (Prokopovich 1976:273-274). It has been hypothesized that because of their hardness and rounded shapes, concretions could have been "an excellent material for making stone mortars" (Prokopovich 1976:274). A reanalysis of existing archaeological collections in search of "Cretaceous concretions" artifacts from the San Joaquin Valley could contribute "significant data on migration and trade routes of Indian tribes" (Prokopovich 1976:273). Expanding x-ray fluorescence (XRF) to include sourcing iron-rich sandstone artifacts in addition to obsidian might also offer a different insight on trading patterns. Steatite materials (e.g., steatite beads) could be similarly analyzed and sourced to a geographic location through neutron activation analysis (Gillette 1998; Allen et al. 1975).

Concluding Remarks

Further excavation should be undertaken at CA-FRE-1331 to better understand the internal site structure and to further define the temporal phases identified (Late Period and possible Early or Middle Period). Three suggested areas of exploration are: 1) expose the known housepit feature to its full extent; 2) open more test units to probe for other possible structural features; 3) characterize the natural geological matrix with off site test units or trenching. Continued inventory of the surrounding site area would also be beneficial:

systematic survey and recordation of prehistoric sites can provide a better understanding of local human settlement landscape patterning (Lightfoot 1995; Ebert 1992).

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APPENDICES

APPENDIX A

PARTIAL LIST OF PLANTS FOUND IN WHITE CREEK

Provided by Julie Anne Delgado,
Bureau of Land Management,
Hollister Field Office

Partial List of Plants Found in White Creek

FAMILY	SCIENTIFIC NAME	COMMON NAME
Apiaceae	Lomatium dasycarpum	Lace parsnip
Apiaceae	Lomatium utriculatum	Common lomatium
Apiaceae	Perideridia californica	Yampah, Squawroot
Asclepiadaceae	Asclepias facicularis	California milkweed
Asteraceae	Agoseris grandiflora	
Asteraceae	Agoseris heterophylla	
Asteraceae	Agoseris retrorsa	
Asteraceae	Chrysothamnus nauseosus ssp. mohavensis	
Asteraceae	Eriophyllum confertiflorum	
Asteraceae	Filago californica	
Asteraceae	Hesperevax sparsiflora	
Asteraceae	Madia gracilis	
Asteraceae	Malacothrix floccifera	
Asteraceae	Microseris douglasii ssp douglasii	
Asteraceae	Microseris lindleyi (See Uropappus lendleyi)	
Boraginaceae	Amsinckia menziesii var intermedia	
Brassicaceae	Capsella bursa-pastoris*	Shepherd's purse
Brassicaceae	Lepidium nitidum	
Brassicaceae	Thysanocarpus curvipes	Lacepod
Convolvulaceae	Convolvulus malacophyllus (see Calystegia)	
Cuscutaceae	Cuscuta californica	Dodder
Ericaceae	Arctostaphylos glauca	
Fabaceae	Lotus scoparius	
Fabaceae	Lotus wrangelianus	
Fabaceae	Lupinus densiflorus (See microcarpus var densiflorus)	
Fabaceae	Trifolium albopurpureum albopurpureum	
Fabaceae	Lupinus albifrons	
Fabaceae	Lupinus bicolor	
Fagaceae	Quercus berberidifolia	
Fagaceae	Quercus john-tuckeri	Tucker's Oak
Geraniaceae	Erodium cicutarium	
Hydrophyllaceae	Eriodictyon californicum	
Hydrophyllaceae	Phacelia douglasii	
Lamiaceae	Salivia mellifera	
Liliaceae	Allium crispum	Crinkled onion
Liliaceae	Bloomeria crocea	Golden stars
Liliaceae	Calochortus splendens	Splendid mariposa lily
Liliaceae	Calochortus venustus	
Liliaceae	Dichelostemma capitatum	Blue dicks
Liliaceae	Yucca whipplei	Yucca
Oleaceae	Fraxinus dipetala	
Onagraceae	Clarkia purpurea var. purpurea	
Onagraceae	Clarkia purpurea var. quadrivulnera	
Onagraceae	Epilobium brachycarpum	
Papaveraceae	Eschscholzia californica	
Pinaceae	Pinus sabiniana	Foothill Pine
Plantaginaceae	Plantago erecta	Plantain
Poaceae	Bromus diandrus *	Rip gut brome
Poaceae	Bromus hordeaceus*	Soft chess
Poaceae	Elymus elymoides ssp. elymoides	Squirreltail
Poaceae	Elymus multisetus	Big Squirreltail

Prepared by J. Delgado, BLM

Partial List of Plants Found in White Creek

Poaceae	Melica californica	
Poaceae	Melica imperfecta	
Poaceae	Melica stricta	
Poaceae	Poa secunda ssp. secunda	Pine bluegrass
Polemoniaceae	Gilia achillaefolia ssp. achillaefolia	
Polemoniaceae	Linanthus parviflorus	
Polemoniaceae	Linanthus pygmaeus ssp. continentalis	
Polemoniaceae	Phlox gracilis (Microsteris)	
Polygonaceae	Eriogonum fasciculatum var. foliolosum	
Ranunculaceae	Clematis ligusticifolia	
Ranunculaceae	Delphinium parryi ssp. parryi	
Rhamnaceae	Ceanothus cuneatus var. cuneatus	
Rhamnaceae	Rhamnus crocea	Spiney Redberry
Rosaceae	Holodiscus discolor	Ocean spray
Roseaceae	Heteromeles arbutifolia	Toyon
Scrophularaceae	Pedicularis densiflora	
Scrophulariaceae	Castilleja foliolosa	

Prepared by J. Delgado, BLM

APPENDIX B

OBSIDIAN X-RAY FLUORESCENCE AND HYDRATION RIM ANALYSES

Provided by Craig Skinner and Jennifer Thatcher,
Northwest Obsidian Laboratory,
Corvallis, Oregon

X-Ray Fluorescence Analysis and Obsidian Hydration Measurement of Artifact Obsidian from CA-FRE-1331, Fresno County, California

Craig E. Skinner and Jennifer J. Thatcher
Northwest Research Obsidian Studies Laboratory

Fourteen obsidian artifacts from CA-FRE-1331, Fresno County, California, were submitted for energy dispersive X-ray fluorescence trace element provenance analysis. These specimens and an additional artifact that was too small for trace element analysis were also processed for hydration rim measurements. The samples were prepared and analyzed at the Northwest Research Obsidian Studies Laboratory under the accession number 2003-57.

Analytical Methods

X-Ray Fluorescence Analysis. Nondestructive trace element analysis of the samples was completed using a Spectrace 5000 energy dispersive X-ray fluorescence spectrometer. The system is equipped with a Si(Li) detector with a resolution of 155 eV FHWM for 5.9 keV X-rays (at 1000 counts per second) in an area 30 mm^2. Signals from the spectrometer are amplified and filtered by a time variant pulse processor and sent to a 100 MHZ Wilkinson type analog-to-digital converter. The X-ray tube employed is a Bremsstrahlung type, with a rhodium target, and 5 mil Be window. The tube is driven by a 50 kV 1 mA high voltage power supply, providing a voltage range of 4 to 50 kV. For the elements Zn, Ga, Rb, Sr, Y, Zr, Nb, Th, and Pb that are reported in Table A-1, we analyzed the collection with a collimator installed and used a 45 kV tube voltage setting and 0.60 mA tube current setting.

The diagnostic trace element values used to characterize the samples are compared directly to those for known obsidian sources reported in the literature and with unpublished trace element data collected through analysis of geologic source samples (Northwest Research 2003). Artifacts are correlated to a parent obsidian source (or geochemical source group) if diagnostic trace element values fall within about two standard deviations of the analytical uncertainty of the known upper and lower limits of chemical variability recorded for the source. Occasionally, visual attributes are used to corroborate the source assignments although sources are never assigned solely on the basis of megascopic characteristics.

Obsidian Hydration Analysis. An appropriate section of each artifact is selected for hydration slide preparation. Two parallel cuts are made into the edge of the artifact using a lapidary saw equipped with 4-inch diameter diamond-impregnated .004" thick blades. The resultant cross-section of the artifact (approximately one millimeter thick) is removed and mounted on a petrographic microscope slide with Lakeside thermoplastic cement and is then ground to a final thickness of 30-50 microns.

The prepared slide is measured using an Olympus BHT petrographic microscope fitted with a filar screw micrometer eyepiece. When a clearly defined hydration layer is identified, the section is centered in the field of view to minimize parallax effects. Four rim measurements are typically recorded for each artifact or examined surface. Hydration rinds smaller than one micron often cannot be resolved by optical microscopy. Hydration thicknesses are reported to the nearest 0.1 µm and represent the mean value for all readings. Standard deviation values for each measured surface indicate the variability for hydration thickness measurements recorded for each specimen. It is important to note that these values reflect only the reading uncertainty of the rim values and do not take into account the resolution limitations of the microscope or other sources of uncertainty that enter into the formation of hydration rims.

Additional details about specific analytical methods and procedures used for the analysis of the elements reported in Table A-1 and the preparation and measurement of hydration rims are available at the Northwest Research Obsidian Studies Laboratory World Wide Web site at *www.obsidianlab.com.*

Results of Analysis

X-Ray Fluorescence Analysis. Five geochemical obsidian sources or source groups, all of which were correlated with known geologic sources, were identified among the 14 obsidian artifacts that were characterized by X-ray fluorescence analysis. The locations of the site and the identified obsidian sources are shown in Figure 1. Analytical results are presented in Table A-1 in the Appendix and are summarized in Table 1 and Figure 2. Descriptive information about the identified obsidian sources is outlined in Table 2.

Table 1. Summary of results of trace element studies of artifacts.

Geologic Source	N=	Percentage
Annadel	1	7.1
Casa Diablo (Lookout Mountain)	2	14.3
Casa Diablo (Sawmill Ridge)	5	35.7
Coso Volcanic Field	4	28.6
Napa Valley	2	14.3
Total	**14**	**100.0**

Figure 1. Location of CA-FRE-1331 and the sources of the characterized artifacts.

Table 2. Descriptions of the obsidian sources identified in the current investigation. Summaries include results of unpublished field and geochemical source research conducted by Northwest Research. Table is continued on following page.

Geologic Source	Location	Description	References
Annadel	Sonoma County, North Coast Ranges, central western California	The Annadel obsidian source is located within Annadel State Park and consists of a series of obsidian quarries and workshops. Two other geochemically-distinct minor sources of glass, Guilicos A and B, are also known from Annadel State Park, although these sources are only rarely recognized in archaeological contexts. Prehistoric source use of the main Annadel source is documented primarily from the local North Coast Ranges region surrounding the source although artifacts from the source are relatively common at archaeological sites in the central Great Valley and San Francisco Bay region.	Ericson 1981 Ericson et al. 1976 Fox 1983 Frederickson 1989 Heizer and Treganza 1944 Higgins 1983 Jackson 1986, 1989 Origer 1987 Parkman 1983
Casa Diablo	Mono County, Long Valley Caldera, eastern California	The Casa Diablo source complex is located within Long Valley Caldera, a large volcanic depression located at the eastern base of the Sierra Nevada Mountains in eastern California. The source complex is composed of three geochemically distinguishable subgroups – Lookout Mountain, Sawmill Ridge, and Hot Creek. Prehistoric use of obsidian from Casa Diablo, primarily from the Lookout Mountain and Sawmill Ridge sources, was extensive throughout eastern and central California. Evidence of trans-Sierran procurement and exchange of large quantities of glass from the source area is well-documented at many sites located in the west-central Sierra Nevada Mountains, the Central Valley, and the central and south-central coast of California.	Bailey 1989 Bailey et al. 1976 Basgall 1989 Bouey and Basgall 1984 Ericson 1981, 1982 Ericson et al. 1976 Goldberg et al. 1990 Hall and Jackson 1989 Hughes 1994 Jackson 1984 Jackson and Ericson 1994
Coso Volcanic Field	Inyo County, eastern California	First introduced in the archaeological literature by Farmer and later by Heizer and Treganza and Harrington, the Coso obsidian source consists of large deposits of prehistorically-utilized obsidian occurring at several localities throughout the Coso Volcanic Field. During the past 25 years, many different archaeological studies have been carried out in the vicinity of the Coso sources. Recorded archaeological sites within the Coso Volcanic Field include approximately 150 quarry, 300 off-quarry, and 100 segregated reduction sites. Most recently, the results of archaeological investigations of Coso sources and prehistoric quarry sites are summarized and discussed by Gilreath and Hildebrandt (1996, 1997). In early obsidian characterization investigations, the obsidian from this volcanic complex was considered to belong to a single chemical source. Later investigations by Hughes (1988) resulted in the identification of four geochemically distinguishable sources (West Sugarloaf, Sugarloaf Mountain, West Cactus Peak, and Joshua Ridge) within the volcanic field. Among the available sources, deposits from the Sugarloaf and West Sugarloaf sources were the most heavily utilized during the prehistoric period. Thanks to recent interest in both the archaeological and geothermal potential of this area, the geologic setting, age, and chemical composition of obsidian flows from the Coso Volcanic Field are well documented.	Bacon et al. 1980, 1981 Duffield et al. 1980 Elston and Zeier 1984 Ericson 1981, 1989 Farmer 1937 Gilreath and Hildebrandt 1996, 1997 Harrington 1951 Heizer and Treganza 1944 Hughes 1988 Lanphere et al. 1975 Stevenson and Scheetz 1989 Stevenson et al. 1993

Table 2 (continued). Description of obsidian sources identified in the current investigation. Summaries include results of unpublished field and geochemical source research conducted by Northwest Research.

Geologic Source	Location	Description	References
Napa Valley	Napa County, North Coast Ranges, central western California	One of the most well-known prehistoric obsidian sources in central California, the Napa Valley source is located near the town of St. Helena. Also known as the Napa or Napa Glass Mountain source, the dark and often opaque glass from the this source was widely used during the prehistoric period. Obsidian artifacts from the Napa Valley source are found throughout central California's Great Valley and are commonly identified in the western Sierra Nevada Mountains and along the central California coast. Artifacts from this source have been identified as far north as Modoc County, California.	Bouey and Basgall 1984 Ericson et al. 1976 Ericson 1981 Frederickson 1989 Heizer and Treganza 1944 Jackson 1974, 1986, 1989 Jackson and Ericson 1994 Origer 1987 Psota 1994

The four Coso specimens that were analyzed in the current investigation were quite small and very low in sample mass. Because of the possibility of increased analytical uncertainty and the potential for confusion among the four geochemically-similar Coso Volcanic Field sources (Hughes 1988), these four small artifacts from that source area are assigned to a generalized Coso Volcanic Field source.

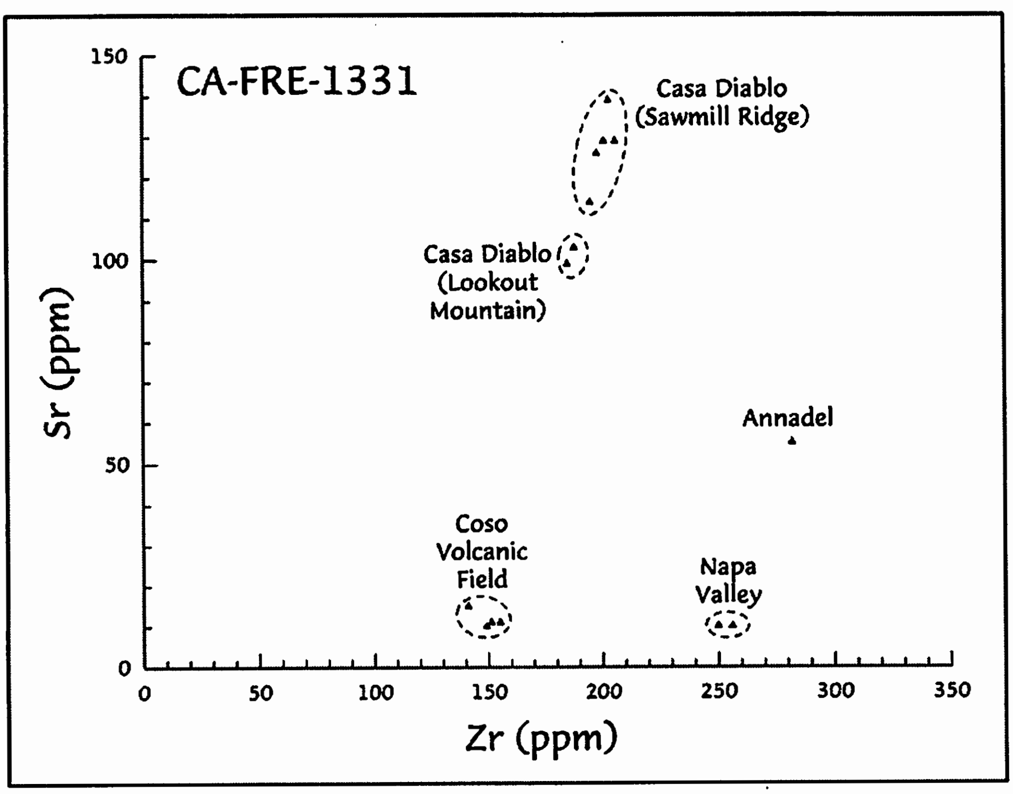

Figure 2. Scatterplot of strontium (Sr) plotted versus zirconium (Zr) for all analyzed artifacts.

Obsidian Hydration Analysis. The 14 artifacts characterized by X-ray fluorescence analysis and a single specimen that was too small for trace element studies were prepared for obsidian hydration analysis. The specimen slides are curated at the Northwest Research Obsidian Studies Laboratory under accession number 2003-57. The results are reported in Table B-1 in the Appendix and are summarized in Table 3. Available hydration rate information for the sources is presented in Table 4.

Table 3. Summary of results of obsidian hydration analysis of artifacts.

Geologic Source	Rim Width (microns)	Total
Annadel	3.0	1
Casa Diablo (Lookout Mountain)	5.3, 5.3	2
Casa Diablo (Sawmill Ridge)	3.5, 3.7, 3.9, 5.1, 5.1	5
Coso Volcanic Field	3.0, 4.3, 4.5, 5.9	4
Napa Valley	3.5, 5.3	2
Too small for XRF analysis	3.6	1
Total	—	**15**

Table 4. Hydration rate information reported in the literature for obsidian sources identified in the current study.

Geologic Source	Comments	References
Annadel	Experimental evidence suggests that obsidian from this source hydrates at a slower rate than obsidian from the Napa Valley source.	Tremaine 1989, 1993 Tremaine and Fredrickson 1988
Casa Diablo	Many different hydration rates have been proposed for obsidian from the Casa Diablo source complex. Induced hydration studies suggest a similar hydration rate as obsidian from the nearby Bodie Hills source.	Ericson 1981, 1982 Hall and Jackson 1989 Jackson 1984 Meighan 1983 Tremaine and Fredrickson 1988
Coso Volcanic Field	Numerous hydration rates have been proposed for obsidian from the Coso Volcanic Field sources.	Ericson 1981, 1989 Gilreath and Hildebrandt 1996, 1997 Stevenson and Scheetz 1989 Stevenson et al. 1993
Napa Valley	Several different hydration rates have been proposed. Experimental evidence suggests that obsidian from this source hydrates at a slower rate than the nearby Borax Lake source.	Meighan 1983 Origer 1987 Pastron and Walsh 1989 Tremaine 1989, 1993 Tremaine and Fredrickson 1988

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Appendix

Results of X-Ray Fluorescence and Obsidian Hydration Analysis

Northwest Research Obsidian Studies Laboratory

Table A-1. Results of XRF Studies: CA-FRE-1331, Fresno County, California

			Trace Element Concentrations											Ratios		
Site	Specimen No.	Catalog No.	Zn	Pb	Rb	Sr	Y	Zr	Nb	Ti	Mn	Ba	$Fe_2O_3^T$	Fe:Mn	Fe:Ti	Artifact Source
CA-FRE-1331	1	18	85	34	223	10	46	250	12	NM	NM	NM	NM	NM	NM	Napa Valley *
			± 9	5	4	9	3	7	1	NM	NM	NM	NM			
CA-FRE-1331	3	248	76	33	304	10	58	149	49	NM	NM	NM	NM	NM	NM	Coso Volcanic Field *
			± 8	5	4	9	3	7	2	NM	NM	NM	NM			
CA-FRE-1331	4	475A	33	31	175	129	19	206	12	NM	NM	NM	NM	NM	NM	Casa Diablo (Sawmill Ridge) *
			± 8	4	4	9	3	7	1	NM	NM	NM	NM			
CA-FRE-1331	5	475B	85	42	241	10	49	256	12	NM	NM	NM	NM	NM	NM	Napa Valley *
			± 7	4	4	9	3	7	1	NM	NM	NM	NM			
CA-FRE-1331	6	509	112	36	322	15	57	141	50	NM	NM	NM	NM	NM	NM	Coso Volcanic Field *
			± 9	5	5	9	3	7	2	NM	NM	NM	NM			
CA-FRE-1331	7	523	57	40	192	139	17	203	14	NM	NM	NM	NM	NM	NM	Casa Diablo (Sawmill Ridge)? *
			± 10	5	4	9	3	7	2	NM	NM	NM	NM			
CA-FRE-1331	8	572	42	30	177	129	18	201	14	NM	NM	NM	NM	NM	NM	Casa Diablo (Sawmill Ridge) *
			± 8	4	4	9	3	7	1	NM	NM	NM	NM			
CA-FRE-1331	9	639	56	30	192	103	18	188	12	NM	NM	NM	NM	NM	NM	Casa Diablo (Lookout Mountain)? *
			± 9	5	4	9	3	7	2	NM	NM	NM	NM			
CA-FRE-1331	10	730	89	41	154	55	52	282	15	NM	NM	NM	NM	NM	NM	Annadel *
			± 9	5	4	9	3	7	2	NM	NM	NM	NM			
CA-FRE-1331	11	771	97	44	349	11	60	155	49	NM	NM	NM	NM	NM	NM	Coso Volcanic Field *
			± 9	5	5	9	3	7	2	NM	NM	NM	NM			
CA-FRE-1331	12	799	44	29	284	11	52	151	50	NM	NM	NM	NM	NM	NM	Coso Volcanic Field *
			± 9	5	4	9	3	7	2	NM	NM	NM	NM			
CA-FRE-1331	13	831	45	32	167	99	18	185	17	NM	NM	NM	NM	52.5	51.3	Casa Diablo (Lookout Mountain) *
			± 7	4	4	9	3	7	1	NM	NM	NM	NM			
CA-FRE-1331	14	60	46	31	164	126	20	198	12	NM	NM	NM	NM	NM	NM	Casa Diablo (Sawmill Ridge) *
			± 8	4	4	9	3	7	1	NM	NM	NM	NM			
CA-FRE-1331	15	824	27	30	149	114	19	195	14	856	229	1015	1.06	48.8	40.4	Casa Diablo (Sawmill Ridge)
			± 8	4	4	9	3	7	1	77	46	31	0.11			
NA	RGM-1	RGM-1	45	22	151	105	25	221	10	1551	333	790	1.79	51.9	36.5	RGM-1 Reference Standard
			± 7	4	4	9	3	7	1	78	46	31	0.11			

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

Northwest Research Obsidian Studies Laboratory

Table B-1. Obsidian Hydration Results and Sample Provenience: CA-FRE-1331, Fresno County, California

Site	Specimen No.	Catalog No.	Unit	Depth (cm)	Artifact Type[A]	Artifact Source	Hydration Rims Rim 1	Hydration Rims Rim 2	Comments[B]
CA-FRE-1331	1	18	A	0-10	DEB	Napa Valley *	3.5 ± 0.1	NM ± NM	–
CA-FRE-1331	2	36	A	10-20	DEB	Too small for XRF	3.6 ± 0.1	NM ± NM	–
CA-FRE-1331	3	248	C	20-30	DEB	Coso Volcanic Field *	4.5 ± 0.1	NM ± NM	–
CA-FRE-1331	4	475A	D	0-10	DEB	Casa Diablo (Sawmill Ridge) *	3.5 ± 0.1	NM ± NM	–
CA-FRE-1331	5	475B	D	0-10	DEB	Napa Valley *	5.3 ± 0.1	NM ± NM	–
CA-FRE-1331	6	509	D	10-20	DEB	Coso Volcanic Field *	5.9 ± 0.1	NM ± NM	DFV
CA-FRE-1331	7	523	D	20-30	DEB	Casa Diablo (Sawmill Ridge)? *	3.7 ± 0.1	NM ± NM	–
CA-FRE-1331	8	572	D	40-50	DEB	Casa Diablo (Sawmill Ridge) *	5.1 ± 0.1	NM ± NM	–
CA-FRE-1331	9	639	D	60-70	DEB	Casa Diablo (Lookout Mountain)? *	5.3 ± 0.1	NM ± NM	–
CA-FRE-1331	10	730	E	10-20	DEB	Annadel *	3.0 ± 0.1	NM ± NM	–
CA-FRE-1331	11	771	E	40-50	DEB	Coso Volcanic Field *	4.3 ± 0.1	NM ± NM	–
CA-FRE-1331	12	799	E	50-60	DEB	Coso Volcanic Field *	3.0 ± 0.1	NM ± NM	–
CA-FRE-1331	13	831	–	Surface	DEB	Casa Diablo (Lookout Mountain) *	5.3 ± 0.1	NM ± NM	–
CA-FRE-1331	14	60	A	20-30	DEB	Casa Diablo (Sawmill Ridge) *	3.9 ± 0.1	NM ± NM	–
CA-FRE-1331	15	824	–	Surface	BIF	Casa Diablo (Sawmill Ridge)	5.1 ± 0.1	NM ± NM	–

[A] BIF = Biface; DEB = Debitage
[B] See text for explanation of comment abbreviations
NA = Not Available; NM = Not Measured; * = Small sample

Abbreviations and Definitions Used in the Comments Column

All hydration rim measurements are recorded in microns.

BEV - (Beveled). Artifact morphology or cut configuration resulted in a beveled thin section edge.

BRE - (BREak). The thin section cut was made across a broken edge of the artifact. Resulting hydration measurements may reveal when the artifact was broken, relative to its time of manufacture.

DES - (DEStroyed). The artifact or flake was destroyed in the process of thin section preparation. This sometimes occurs during the preparation of extremely small items, such as pressure flakes.

DFV - (Diffusion Front Vague). The diffusion front, or the visual boundary between hydrated and unhydrated portions of the specimen, are poorly defined. This can result in less precise measurements than can be obtained from sharply demarcated diffusion fronts. The technician must often estimate the hydration boundary because a vague diffusion front often appears as a relatively thick, dark line or a gradation in color or brightness between hydrated and unhydrated layers.

DIS - (DIScontinuous). A discontinuous or interrupted hydration rind was observed on the thin section.

HV - (Highly Variable). The hydration rind exhibits variable thickness along continuous surfaces. This variability can occur with very well- defined bands as well as those with irregular or vague diffusion fronts.

IRR - (IRRegular). The surfaces of the thin section (the outer surfaces of the artifact) are uneven and measurement is difficult.

1SO - (1 Surface Only). Hydration was observed on only one surface or side of the thin section.

NOT - (NOT obsidian). Petrographic characteristics of the artifact or obsidian specimen indicate that the specimen is not obsidian.

NVH - (No Visible Hydration). No hydration rind was observed on one or more surfaces of the specimen. This does not mean that hydration is absent, only that hydration was not observed. Hydration rinds smaller than one micron often are not birefringent and thus cannot be seen by optical microscopy. "NVH" may be reported for the manufacture surface of a tool while a hydration measurement is reported for another surface, e.g. a remnant ventral flake surface.

OPA - (OPAque). The specimen is too opaque for measurement and cannot be further reduced in thickness.

PAT - (PATinated). This description is usually noted when there is a problem in measuring the thickness of the hydration rind, and refers to the unmagnified surface characteristics of the artifact, possibly indicating the source of the measurement problem. Only extreme patination is normally noted.

REC - (RECut). More than one thin section was prepared from an archaeological specimen. Multiple thin sections are made if preparation quality on the initial specimen is suspect or obviously poor. Additional thin sections may also be prepared if it is perceived that more information concerning an artifact's manufacture or use can be obtained.

UNR - (UNReadable). The optical quality of the hydration rind is so poor that accurate measurement is not possible. Poor thin section preparation is not a cause.

WEA - (WEAthered). The artifact surface appears to be damaged by wind erosion or other mechanical action.

APPENDIX C

RADIOCARBON ANALYSIS

Provided by Darden Hood,
Beta Analytic Laboratory, Inc.
Miami, Florida

FROM: Darden Hood, Director (mailto:mailto:dhood@radiocarbon.com)
(This is a copy of the letter being mailed. Invoices/receipts follow only by mail.)

July 22, 2003

Mr. Erik Zaborsky
USDI
Bureau of Land Management
BLM Holister Field Office
20 Hamilton Court
Hollister, CA 95023
USA

RE: Radiocarbon Dating Result For Sample CAFRE1331

Dear Mr. Zaborsky:

Enclosed is the radiocarbon dating result for one sample recently sent to us. It provided plenty of carbon for an accurate measurement and the analysis went normally. The report sheet contains the method used, material type, applied pretreatments and, where applicable, the two sigma calendar calibration range.

As always, this report has been both mailed and sent electronically. All results (excluding some inappropriate material types) which are less than about 20,000 years BP and more than about ~250 BP include this calendar calibration page (also digitally available in Windows metafile (.wmf) format upon request). Calibration is calculated using the newest (1998) calibration database with references quoted on the bottom of the page. Multiple probability ranges may appear in some cases, due to short-term variations in the atmospheric 14C contents at certain time periods. Examining the calibration graph will help you understand this phenomenon. Don't hesitate to contact us if you have questions about calibration.

We analyzed this sample on a sole priority basis. No students or intern researchers who would necessarily be distracted with other obligations and priorities were used in the analysis. We analyzed it with the combined attention of our entire professional staff.

Information pages are also enclosed with the mailed copy of this report. If you have any specific questions about the analysis, please do not hesitate to contact us.

The cost of the analysis was charged to your MASTERCARD card. A receipt is enclosed. Thank you. As always, if you have any questions or would like to discuss the results, don't hesitate to contact me.

Sincerely,

Darden Hood

Mr. Erik Zaborsky

USDI

Report Date: 7/22/2003

Material Received: 7/9/2003

Sample Data	Measured Radiocarbon Age	13C/12C Ratio	Conventional Radiocarbon Age(*)
Beta - 180709	200 +/- 50 BP	-25.0* o/oo	200 +/- 50* BP

SAMPLE : CAFRE1331
ANALYSIS : Radiometric-Advance delivery
MATERIAL/PRETREATMENT : (wood): acid/alkali/acid
2 SIGMA CALIBRATION : Cal AD 1635 to 1705 (Cal BP 315 to 245) AND Cal AD 1715 to 1885 (Cal BP 235 to 65)
Cal AD 1910 to 1950 (Cal BP 40 to 0)

CALIBRATION OF RADIOCARBON AGE TO CALENDAR YEARS

(Variables: est. C13/C12=-25:lab. mult=1)

Laboratory number: **Beta-180709**

Conventional radiocarbon age[1]: **200±50 BP**

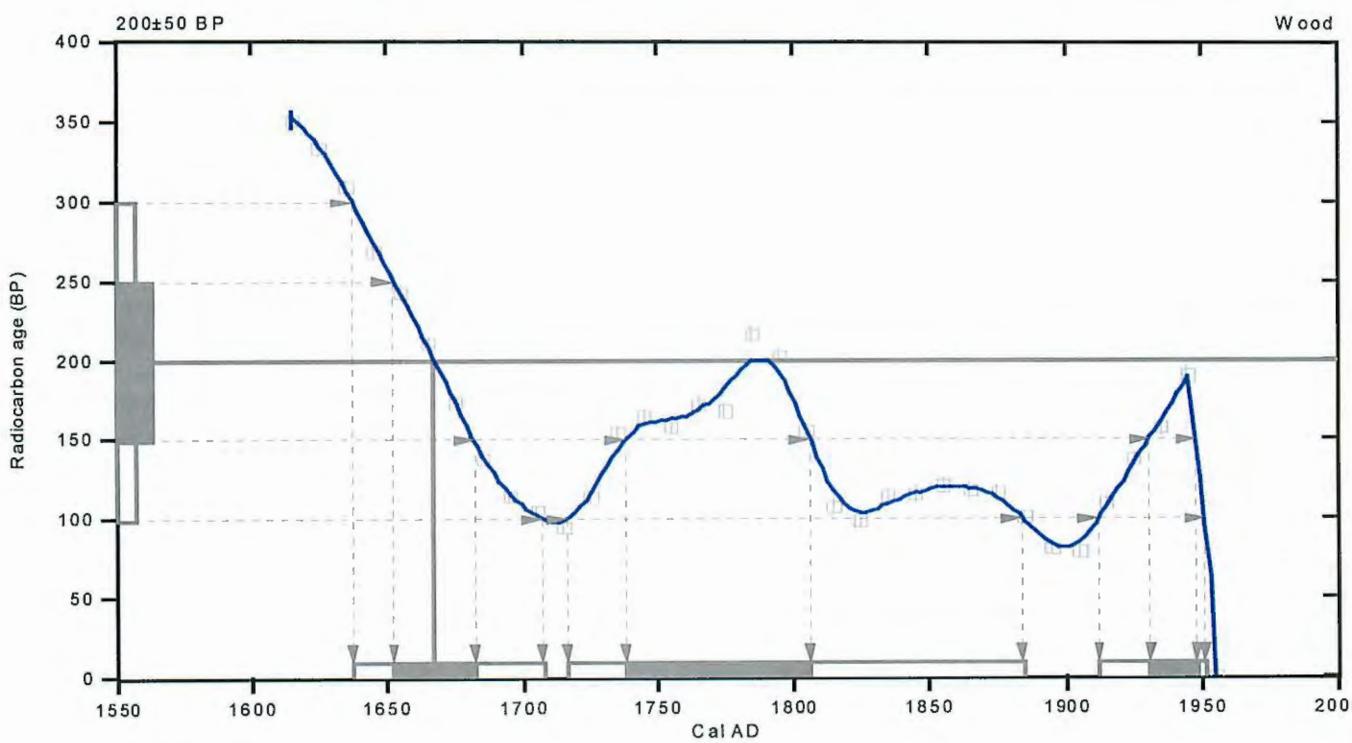
2 Sigma calibrated results: **Cal AD 1635 to 1705 (Cal BP 315 to 245) and**
(95% probability) **Cal AD 1715 to 1885 (Cal BP 235 to 65) and**
Cal AD 1910 to 1950 (Cal BP 40 to 0)

[1] C13/C12 ratio estimated

Intercept data

Intercept of radiocarbon age
with calibration curve: Cal AD 1665 (Cal BP 285)

1 Sigma calibrated results: Cal AD 1650 to 1680 (Cal BP 300 to 270) and
(68% probability) Cal AD 1740 to 1805 (Cal BP 210 to 145) and
Cal AD 1930 to 1950 (Cal BP 20 to 0)



References:
Database used

Calibration Database
Editorial Comment
Stuiver, M., van der Plicht, H., 1998, Radiocarbon 40(3), pxii-xiii
INTCAL98 Radiocarbon Age Calibration
Stuiver, M., et. al., 1998, Radiocarbon 40(3), p1041-1083
Mathematics
A Simplified Approach to Calibrating C14 Dates
Talma, A. S., Vogel, J. C., 1993, Radiocarbon 35(2), p317-322

Beta Analytic Inc.

4985 SW 74 Court, Miami, Florida 33155 USA • Tel: (305) 667 5167 • Fax: (305) 663 0964 • E-Mail: beta@radiocarbon.com

APPENDIX D

PROTEIN RESIDUE ANALYSIS

Provided by Robert E. Parr,
Center for Archaeological Research,
California State University, Bakersfield

Immunological Analysis of Artifacts from Site CA-FRE-1331 Fresno County, California

Prepared for

Erik C. Zaborsky
Bureau of Land Management
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(LAS-5)

July 2003

Introduction

The use of chemical and molecular biological techniques in the analysis of archaeological materials can provide significant new information for the interpretation of their past use. The identification of organic residues from lithic and ceramics artifacts, coprolites and soils have provided archaeologists with specific data regarding prehistoric exploitation of animals and plants. Although ancient protein residues may not be preserved in their original form, linear epitopes are generally conserved which can be identified by immunological methods (Abbas *et al.* 1994).

Immunological methods have been used to identify plant and animal residues on flaked and groundstone lithic artifacts (Allen *et al.* 1995; Gerlach *et al. 1996;* Henrikson *et al.,* 1998; Hyland *et al.* 1990; Kooyman *et al.* 1992; Newman 1990, 1995; Petraglia *et al. 1996;* Shanks *et al.*1999; Yohe *et al.* 1991) and in Chumash paint pigment (Scott *et al.* 1996). Plant remains on artifacts also been identified through chemical (opal phytoliths), and morphological (use-wear), studies (Hardy and Garufi 1998; Jahren *et al.,* 1997, Sobolik 1996). Plant and animal residues on ceramic artifacts have been identified through the use of gas-liquid chromatography, high performance liquid chromatography and mass spectrometry (Bonfield and Heron 1995; Evershed *et al.* 1992*;* Evershed and Tuross, 1996; Heron *et al.* 1991, Patrick *et al.* 1985). Serological methods have been used to determine blood groups in skeletal and soft tissue remains (Heglar 1972; Lee *et al.* 1989) and in the detection of hemoglobin from 4500-year-old bones (Ascenzi *et al.* 1985). Human leukocyte antigen (HLA) and deoxyribonucleic acid (DNA) determinations made on human and animal skeletal and soft tissue remains have demonstrated genetic relationships and molecular evolutionary distances (Hänni *et al.* 1995; Hansen and Gurtler 1983; Lowenstein 1985, 1986; Pääbo 1985, 1986, 1989; Pääbo et al. 1989). Successful identification of residues on stone tools dated between 35-60,000 B.P. have been made by DNA analysis (Hardy *et al.,* 1997, while residues on surgical implements from the American Civil War were recently identified by immunological and DNA analysis (Newman *et al.,* 1998). A recent study demonstrated the viability of identifiable immunoglobulin G in 1.6 million-year-old fossil bones from Venta Micena, Spain (Torres *et al.,* 2002). Horse exploitation was identified by immunological analysis of residues retained on Clovis points dated to ca. 11,200 B.P. (Kooyman *et al.,* 2001).

The use of forensic techniques in the investigation of archaeological materials is appropriate as both disciplines deal with residues that have undergone changes, either deliberate or natural. Criminals habitually endeavor to remove bloodstains by such means as laundering, scrubbing with bleach, etc., yet such degraded samples are still identified by immunological methods (Lee and De Forest 1976; Milgrom and Campbell 1964; Shinomiya *et al.* 1978, among others). Similarly it has been shown that immunological methods can be successfully applied to ancient human cremations (Cattaneo *et al.,* 1994). Forensic wildlife laboratories use immunological techniques in their investigation of hunting violations and illegal trade, often from contaminated evidence (Bartlett and Davidson 1992; Guglich *et al.* 1994; Mardini 1984; McClymont *et* *al.* 1982; among others). Immunological methods are also used to test the purity of food products such as canned luncheon meat and sausage, products which have undergone considerable degradation (Ashoor *et al.* 1988; Berger *et al.* 1988; King 1984). Species identification of cooked meats has also been carried out by DNA hybridization assay (Chikuni *et al.,* 1990). Thus the age and degradation of protein does not preclude detection (Gaensslen 1983:225).

Materials and Methods.

The method of analysis used in this study of archaeological residues is cross-over electrophoresis (CIEP) (Newman 1990). Prior to the introduction of DNA fingerprinting this test was used by forensic laboratories to identify trace residues from crime scenes. Minor adaptations to the original method were made following procedures used by the Royal Canadian Mounted Police Serology Laboratory, Ottawa (1983) and the Centre of Forensic Sciences (Toronto). The solution used to remove possible residues is 5% ammonium hydroxide which is the most effective extractant for old and denatured bloodstains without interfering with subsequent testing (Dorrill and Whitehead 1979; Kind and Cleevely 1969). Artifacts are placed in shallow plastic dishes and 0.5mL of 5% ammonia solution applied directly to each. Initial disaggregation is carried out by floating the dish and contents in an ultrasonic cleaning bath for two to three minutes. Extraction is continued by placing the boat and contents on a rotating mixer for thirty minutes. The resulting ammonia solutions are removed and placed in numbered, sterile, plastic vials and stored at -20C prior to testing. It is important that on-site and off-site soil samples be included in all analyses as contaminants in soils, such as bacteria, tannic acid and iron chlorates, may result in nonspecific precipitation of antisera (Gaensslen 1983). Sterile equipment and techniques are use throughout this analysis.

Fifteen lithic artifacts recovered from Site CA-FRE-1331, located in Fresno County, California, were submitted for immunological analysis of protein residues. Three control soil samples also were submitted for testing. Residues were removed from the artifacts as discussed above. Testing of the artifacts and soil samples was performed against the animal and plant antisera shown in Table 1. Seven of the artifacts and the three soil samples were tested for animal proteins only while eight artifacts were tested for both animal and plant proteins (see Table 3). Animal antisera from Cappel Research, produced for use in forensic medicine, provide family level identification only. The relationship of antisera to possible animal species is shown in Table 2. Plant antisera produced at the University of Calgary also provide family level identification. A flora of the region in question should be consulted for a complete inventory of possible plant genera and species identified within a given family. Immunological relationships do not necessarily bear any relationship to the Linnaean classification scheme although they usually do (Gaensslen 1983).

Results

The results of the analysis are shown in Table 3.

Positive reactions were obtained on three of the artifacts from CA-FRE-1331. Artifact #470, a chert flake, reacted positively to rabbit antiserum. Any species of rabbit, hare, or pika may be represented by the reaction to rabbit antiserum. Artifacts # 563, a metate, and #839, a steatite bowl rim fragment, both reacted positively to chicken. Chicken antiserum will react positively to chicken, turkey, quail, grouse and related species. No positive reactions were obtained on the three control soil samples. The absence of identifiable proteins on artifacts may be due to poor preservation of protein or that they were used on species other than those encompassed by the antisera. It is also possible that the artifacts were not utilized.

TABLE 1: ANTISERA USED IN ANALYSIS

ANTISERA	SOURCE
ANIMALS	
Bear	Cappel Research
Bovine	A
Cat	A
Chicken	A
Deer	A
Dog	A
Guinea-pig	A
Rabbit	A
Sheep	A
PLANTS	
Amaranthaceae	University of Calgary
Capparidaceae	A
Cedar	A
Chenopodiaceae	A
Compositae	A
Gramineae	A
Malvaceae	A
Opuntia	A
Piñon	A
Agave	A

TABLE 2: POSSIBLE SPECIES IDENTIFIED

ANTISERUM TO:	POSSIBLE SPECIES IDENTIFIED
Bear	**black, grizzly**
Bovine	**bison, cow**
Cat	**bobcat, lynx, mountain lion, cat**
Chicken	**chicken, turkey, quail, grouse**
Deer	**deer, elk**
Dog	**coyote, wolf, dog**
Guinea-pig	**porcupine, squirrel, beaver, guinea-pig**
Rabbit	**rabbit, hare, pika**
Sheep	**sheep, goat**
Amaranthaceae	**amaranths**
Capparidaceae	**bladderpod, bee plant, stinkweed**
Cedar	**cedar, juniper, cypress**
Chenopodiaceae	**saltbush, winterfat, greasewood,**
Compositae	**sunflower, rabbitbrush, sagebrush, thistle, bur sage**
Gramineae	**grasses**
Malvaceae	**mallows, hollyhock, cheeseweed**
Opuntia	**prickly pear**
Piñon	**pines, firs, spruces**
Agave	**agave, yucca**

TABLE 3: RESULTS OF ANALYSIS: Site CA-FRE-1331

CATALOG #	ARTIFACT TYPE	RESULT
1	steatite bowl frag.	negative
*21	projectile point frag.	negative
*22	projectile point	negative
*74	biface frag.	negative
166	edge modified flake	negative
187	mano	negative
201	steatite bowl frag.	negative
*412	projectile point frag.	negative
*413	biface frag.	negative
*470	flake	**rabbit**
*476	biface	negative
553	pestle frag.	negative
563	metate	**chicken**
711	hopper mortar	negative
839	steatite bowl frag.	**chicken**
*n/a	soil sample, Unit A	negative
*n/a	soil sample, Unit C	negative
*n/a	soil sample, Unit D	negative

*tested for animal proteins only

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APPENDIX E

FEATURE SAMPLE AND COLUMN SAMPLE FLOTATION ANALYSIS

Provided by Erin Dwyer,
Chico, California

CA-FRE-1331 FLORAL ANALYSIS

PROCESSING METHODS

Several different methods of separating charred seed remains from the soil matrix have been used ranging from manual tub flotation to frothing machines. The common characteristic of all methods is the utilization of the differences in density between organic materials and the water (Struever 1968). When soil is mixed with water, lighter materials, or light fraction, float to the top while the denser materials or heavy fraction will stay on the bottom. The most economical method of processing soil is tub flotation whose mean recovery rate of charred plant remains from the soil matrix ranges from 63 to 93 percent (Wohlgemuth 1991).

Flotation took place in a large tub of water in which the soil was added, and then agitated by stirring. The material, or light fraction, that rose to the top of the water was skimmed off with 40-mesh/inch screen. After the light fraction was removed the middle level fraction was poured through the screen to catch any charred materials. The process was repeated two more times before the heavy fraction was washed through the 40-mesh/inch screen.

The light and mid-level fractions were dried and sorted through graduated screens into four different sizes, 4-mesh/inch, 10-mesh/inch, and 18-mesh/inch. Sizes 4 and 10 were sorted by eye while size 18 was sorted under the microscope using 10X to 30X power. Material from the 64 mesh/inch was not sorted. The heavy fraction was not examined, but studies have shown that mean recovery rate for this type of technique ranges from 63% to 93% (Wohlgemuth 1991). Typically, all seed and fruit remains, including unburned materials, are removed from the sample, with a distinction being made between inedible large seeds such as nutshells and berry pits, and small taxa consisting of seeds that are generally digestible and found whole (Wohlgemuth 1996). Once sorted, seed remains are then combined into taxonomic groups, and all remains were placed in gelatin capsules with acid-free paper tags identifying sample number. Large seed remains are then quantified by weight because of their common fragmentary nature, while small seeds were quantified by count.

Figure 1. CA-Fre-1331 Seed Density Per Liter of Soil - Unit C.

Unit	EU-C					
Level	20-30 cm	40-50 cm	60-70 cm	80-90 cm	90-100 cm	
Liters	5.68	4.26	4.73	5.40	6.15	**Total**
Small Taxa by Count						
Bedstraw (*Galium* sp.)	.18	-	-	-	-	**.18**
Flower Bud (Unknown genus)	.18	-	-	-	-	**.18**
Fabaceae	-	.85	-	-	-	**.85**
Unidentified Small Taxa	.18	-	-	-	-	**.18**
Total Small Taxa	**.54**	**.85**	**-**	**-**	**-**	**1.39**
Large Taxa by Weight (Grams)						
Acorn (*Quercus* sp.)	<.018	-	<.11	<.07	.02	**<.22**
Juniper (*Juniperus* sp.)	<.035	.023	<.11	<.09	<.03	**<.29**
Pine (*Pinus sabiniana*)	-	.047	<.04	.19	-	**<.28**
Unidentified Large Taxa	-	-	<.02	-	-	**<.02**
Total Large Taxa	**<.053**	**<.07**	**<.28**	**<.35**	**<.05**	**<.81**

Figure 2. CA-Fre-1331 Seed Density Per Liter of Soil - Features.

Unit	Features				
	868 Unit C	#856 Unit D	#456 Unit C	Floor Unit C	
Level	20-30 cm	40-50 cm	60-70 cm	80-90 cm	
Liters	2.36	4.26	4.73	5.40	**Total**
Small Taxa by Count (Per Liter)					
Bedstraw (*Galium* sp.)*	.42	-	-	-	**.42**
Goosefoot (*Chenopodium* sp.)	-	.23	-	-	**.23**
Grass Caryopsis (Poaceae)	-	-	.21	-	**.21**
Fabaceae	.42	.23	-	-	**.65**
Poaceae	1.69	-	-	-	**1.69**
Silktassel (*Garrya* sp.)*	.42	-	-	-	**.42**
Starthistle (*Centaurea* sp.)	.42	-	-	-	**.42**
Unidentified Small Taxa	2.11	-	-	.19	**2.3**
Total Small Taxa	**5.06**	**.46**	**.21**	**.19**	**5.92**
Large Taxa by Weight (Per Liter)					
Acorn (*Quercus* sp.)	<.042	<.023	-	-	**.065**
Juniper (*Juniperus* sp.)	<1.3	<.023	<.02	-	**1.4**
Pine (*Pinus sabiniana*)	<.042	.023	.04	-	**.11**
Unidentified Large Taxa	.17	-	-	-	**.17**
Total Large Taxa	**1.56**	**.07**	**.06**	**-**	**1.7**

*Possible

One leaf fragment in *#868

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