CULTURAL RESOURCE OVERVIEW FOR THE MENDOCINO NATIONAL FOREST AND EAST LAKE PLANNING UNIT, BLM, CALIFORNIA

VOLUME I

ETHNOGRAPHY & PREHISTORY

CALIFORNIA ARCHAEOLOGICAL CONSULTANTS, INC.
A Cultural Resource Overview
for the
Mendocino National Forest
and the
East Lake Planning Unit, BLM, California

VOLUME I: ETHNOGRAPHY AND PREHISTORY

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U.S. Forest Service, Mendocino National Forest, and Bureau of Land Management, East Lake Planning Unit.

July 1982
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This Synthetic Cultural Resource Management Overview represents a major research effort to provide an inventory of all known cultural resources, ethnographic, archaeological, and historic, within the U.S. Mendocino National Forest and the East Lake Planning Unit, BLM, integrating them into a framework delineating the distribution, nature, and significance of those cultural resources, and providing management recommendations. This research was carried out by three components, an ethnographic, an archaeological, and an historic component, each employing methodologies appropriate to their field.

The ethnographic component has provided a critical review of the linguistic research in the area, a linguistic model of prehistory, a critical review of the previous ethnographic research in the area, a summary of ethnographic cultures within the project, and an inventory of contemporary Native American concerns and sites in compliance with PL 95-341. Management recommendations were made for those sites identified as significant.

The prehistoric archaeological component also critically reviewed the previous research in the area, examining such crucial issues as chronology and site typology. In order to produce a site typology for the region, prediction of site locations and evaluation of survey strategy, all site records were transferred onto sorting cards and five transects drawn across the project area. Environmental data was carefully analyzed within these transects and compared with survey techniques. Association of variables, artifacts and environment, were sought using the cards. A regional point typology was also developed. All of these findings serve as management tools and were incorporated into the management recommendations.

The historic component divided research into two broad topics. The first was an overview of the regional history to describe the general developments in the project area from 1828-1942. The second involved a detailed study of land entry and use to provide categories of historic frontier activities. Taken together, these provide an evaluative framework for the management of historic resources from both regional and site-specific perspectives.
CHAPTER 1
MANAGEMENT SUMMARY

Purpose and Scope of Research

The purpose of this synthetic Cultural Resource Management Overview is to provide an inventory and evaluation of the cultural resources, those non-renewable and fragile remains of human activities, within an integrated framework delineating the distribution, nature, and significance in the project area which encompasses the U.S. Mendocino National Forest and the East Lake Planning Unit, a portion of the Ukiah District, Bureau of Land Management in northern California. The information and recommendations generated by this project will supply the federal agencies with a management tool which may be applied in the decision-making process involved with the management of public lands in accordance with federal legislation pertaining to the protection of cultural resources such as the Antiquities Act of 1906, the National Environmental Policy Act of 1969, the Federal Land Policy and Management Act of 1976, and PL 95-341, the Native American Religious Freedom Act.

The specific objectives of this research are to: 1) critically review and evaluate the existing archaeological, ethnographic, linguistic, and historic materials pertaining to the project area; 2) synthesize this research, developing an overall cultural resource inventory and evaluation in an integrated, research-oriented framework; 3) identify and generate local and regional research problems, and design a predictive model which will stimulate and structure future research in the area; 4) consult with local Native Americans in order to inventory sites and areas of socio-cultural significance to them; and 5) to provide assessments of significance and recommendations for the management of these identified cultural resources.

Budgetary Considerations

The original contract (59-9A28-0-3325) was negotiated between California Archaeological Consultants, Inc. and the U.S. Forest Service, Mendocino National Forest in cooperation with the Bureau of Land Management, Ukiah Office, East Lake Planning Unit for $28,880. The investigation was to begin in November, 1980 and run into August, 1981. By May, 1981, it was realized that the potential for historical research was far greater than had previously been anticipated. Consequently, a supplement of $8,910 was negotiated to undertake this additional research which was the responsibility of the historical consultants, The Great Valley History Co., and an extension of time was also granted.
Constraints on the Investigation

The major constraints on this research were budgetary, time, and to some small extent, geographical. Since an overview largely involves library research and analysis of information generated by that research, the largest expense is in terms of research time. Further, there is no specifically bounded research unit, such as a survey parcel or excavation unit. Consequently, the research is limited by the number of hours budgeted. It may safely be said that each researcher on this project has contributed many more hours than the budget originally allowed. In each circumstance the researcher attempted to take the problem to its logical conclusion rather than leave it unfinished. The geographical limits played a part only in that research was restricted to northern California.

The Stanford sorting cards, on which all the prehistoric site survey information was recorded, were extremely efficient and satisfactory for a project of this size. The total cost was only $168 which is far less than a computer, and there are some advantages to having your data at hand at all times as well as being able to examine it visually.

Results

The results of this investigation are many-fold and diverse as the project is complex. In brief summary, the ethnographic component produced a linguistic model of prehistory outlining the migrations and distributions through time of the ethnolinguistic groups within the project area. A summary of ethnographic cultures was also developed accompanied by an estimate of the density of population and a projected model of seasonal land use. The ethnographic Native American interviews produced an inventory of sites and a number of related concerns. Evaluations were made of those sites and management recommendations made on the basis of those evaluations.

The prehistoric archaeology produced a critical review of the previous research of the area, and, on the basis of some of the weaknesses in that research examined a number of new areas. A number of hypotheses were tested using the data on the Stanford sorting cards regarding the association of various artifact types with one another and the association of assemblages with environmental contexts. Furthermore, the distribution of vegetation in the project area was examined by taking five transects across the project and analyzing them in detail. Previous surveys within these transects were compared with the environmental data to test the representativeness of those previous surveys. It was found that surveys to date have taken in a fairly representative sample of the
project environments with some skewing toward the forest and some trend away from valleys and chapparal. A model for the prediction of site location was prepared from these analyses.

The historical research has taken two directions. One was to produce a general overview which provides a general framework by which more specific data may be interpreted. Secondly, through research in land entries such as Homestead Entries and Patents, Cash Entry Patents and Mineral Entry Patents, a 4000 card file has been generated thereby producing a data base for the project lands which will, with the accompanying analyses, provide a basis for the evaluation of particular sites.

Recommendations

The cultural resource base in the North Coast Range is fragile. It was estimated in the prehistoric archaeology section that 63% of the sites have been adversely affected with a concomitant loss of information. In light of this the remaining sites become relatively more important. Cultural resources are preserved and protected on the basis of their significance which is largely judged by the amount or kind of information that each is capable of producing. This overview is a management tool for the assessment of that significance. The prehistory and history of the project area are just becoming known, and the cultural resource base has much to contribute yet. The ethnographic and historic sections also generated some new data and sites, and specific recommendations are made in conjunction with those findings.
CHAPTER II
INTRODUCTION

This research was sponsored by the U.S. Forest Service, Mendocino National Forest, in co-operation with the Bureau of Land Management, Ukiah Office, East Lake Planning Unit and carried out by California Archaeological Consultants, Inc., with history consultants, the Great Valley History Company, under Contract No. 59-9A28-0-3325. Research was begun in November 1980 and continued through September 1981.

The project area for this research was defined as the Mendocino National Forest and the East Lake Planning Unit, BLM, which are adjacent to one another and together take up a large portion of the eastern North Coast Range from close to Lake Berryessa on the south nearly to North Yolla Bolly Mountain on the north. This area includes parts of eight counties: Trinity, Mendocino, Lake, Napa, Tehama, Glenn, Colusa, and Yolo (see Map 1).

The purpose of the report was to provide a cultural resource management tool for the sponsoring federal agencies in compliance with such federal legislation as the Antiquities Act of 1906, the National Historic Preservation Act of 1966, the National Environmental Policy Act of 1969, the Federal Land Policy and Management Act of 1976, and PL 95-341, the Native American Religious Freedom Act. The essential objective was to inventory, define and evaluate the cultural resource base within the project area thus delineating the distribution, nature and significance of those cultural resources.

The scope of work required research in ethnography, prehistoric archaeology and history in terms of library research and field work in ethnographic interviews. The history component accomplished a tremendous amount of primary research with the land entry data. The scope of work was innovative in that it did not want a descriptive review of the existing materials but rather a research document that would structure future work so that even small projects would contribute to a maximum degree to the research problems in the area. This goal provided a unique opportunity for overview research, and it is hoped that it is successfully fulfilled.

Acknowledgements

There are a number of people who contributed generously to the completion of this project and their professional efforts have been much appreciated: Ken Whistler, Dave Fredrickson, Dorothy Hill, David Peri, Frank LaPena and John
Parker. Nancy Evans and Ben Delaney of the Native American Heritage Commission were most helpful on a number of occasions. The cultural resource staff at the U.S. Forest Service Office in Willows, Mike Boynton, Charla Meacham and Holly Rodgers and at the Ukiah BLM Office, Dan Larson and Francis Berg were always ready to help. Pamela Roberts did an excellent job of the ethnographic interviews in Round Valley, Valerie Levulett helped get the project off to the right start, and Rob Jackson contributed the research on the obsidian studies. Martin Baumhoff tirelessly gave his expert advice and support. I would also like to thank each Native American consultant for patience and forbearance in the face of endless and apparently repetitive questions. Finally, Gayle Bacon did a terrific job of typing.

In terms of the history component acknowledgement is due the staffs at the following libraries: Forest History Society Library, Santa Cruz; Forestry Library, Mulford Hall and the Water Resources Center Archives, Northgate Hall, U.C. Berkeley; California Department of Water Resources Library and the California State Library, Sacramento; Bancroft Library; Library of the U.S. Bureau of Reclamation, Sacramento; California Division of Mines and Geology Library, Ferry Bldg., San Francisco.

Materials gathered by the county historical societies included in the project area have been of much help, but especially the collections of the Lake County Historical Society and the Mendocino County Historical Society were used. The staffs of the Lands Division and the Office of Public Information, Regional Office, U.S. Forest Service were very helpful.

Two individuals from the California Department of Water Resources provided Docken with some direction for sorting out the difficult and involved history of water resources development in the western part of the Sacramento Valley. James Baughman, Division of Land and Right of Way, Sacramento, and Linton A. Brown, Northern District, Red Bluff, provided reports and advice.

The Bureau of Land Management, Sacramento, has been of immense aid in this involved land entry and use study. The staffs in the Land Status and Use Records and the Survey Plots and Notes sections were exceedingly tolerant of questions and helped resolve many confusing details having to do with the historic records in their care.
CHAPTER III
ENVIRONMENT
by
William R. Hildebrandt
and
Laureen K. Swenson

Introduction

Cultural resources are the products of man's prehistoric and historic activities which, in any given region, are influenced by the environment of that region. In order to adequately assess the range, distribution, and intensity of cultural behavior it is consequently necessary to understand the range and distribution of environmental features to which human activity was responding and with which it was interacting. Several categories of environmental data have been chosen for description here on the basis of their pertinence to the development of prehistoric and historic cultural resources: 1) landform including mountains and rivers, geologic history, mineral resources, and soils; 2) climate including temperature, precipitation, and climatic history; 3) vegetation including communities and distribution; and 4) fauna including mammals, fish, and distributions.

LANDFORMS

Mountains and Rivers

The study area lies within the geomorphic province known as the North Coast Range. San Francisco Bay demarcates the southern limit with the Sacramento Valley and the Pacific Ocean circumscribing the surface geology east and west respectively. The North Coast Range extends into southern Oregon along a narrow coastal belt with the north/northeast boundary being the Klamath Mountains (Irwin 1960).

The North Coast Range is an intricate pattern of rugged, discontinuous ridgelines and small, intermontane valleys that approximately parallel the structure of the region. The predominant trend of the ranges is 30 to 40 degrees west of north. However, within the study area the ridge of greatest length and altitude contrasts with this regional, northwestern trend of the Coast Range. This major ridge trends almost due north from Wilber Springs to the Klamath Mountains and forms the drainage divide: eastward to the Sacramento Valley and west to the Pacific Ocean (Irwin 1960; Oakeshott 1970).

Elevations increase eastwardly from a range of 500 to 1500 feet (150-450 meters) along the seaboard to summit heights of 6500 to over 8000 feet (2000-2400 meters) just west of the
Sacramento Valley (Rice 1961). The rise from the west to the summit is steady and gradual while the drop on the east is quite abrupt. Elevations also decrease steadily from north to south within the Range. Eight thousand foot (2400 meters) peaks in the northern Mendocino National Forest grade uniformly to the low relief of 3000 feet (900 meters) and less in the East Lake Planning District parcels.

The major rivers of the North Coast Range drain to the northwest along the basic structure of the region, however, in approximately the southern third of the region rivers drain southward, e.g., the Russian River. Steep canyons commonly confine the stream courses which generally drain in a trellis pattern. Within the study area the principal drainage system on the west side is the Eel River and its headwaters with its many feeder streams. The Eel River is ranked third among northern California rivers in terms of average annual discharge (5.3 million acre-feet of water), behind only the Sacramento and Klamath Rivers (Kahrl ed. 1978). To the east of the divide the drainages are significantly smaller and the principal ones are Thomes, Stony, Cache and Putah Creeks, each with at least 100,000 acre feet of water in average annual discharge (Durrenberger 1976). Clear Lake is the only large natural lake in the North Coast Range, and it is located immediately on the southwest of the project area. It is a major source for the headwaters of Cache Creek.

The Rocks and Geologic History

Four major units of rock are found in the North Coast Range (Alt and Hyndman 1975; Bailey, Irwin and Jones 1965; Crawford and Brundage 1971; and Rice 1961).

Franciscan sediment, the first major unit, comprises the bulk of material. This is made up of graywacke, muddy sandstone, chert and shale; volcanic deposits and greenstone and basalt; minor amounts of limestone and occasional metamorphics. All these components lie in such a disarray of folds and shear zones that some outcrops "look as though they have been stirred with a stick" (Alt and Hyndman 1975).

The Great Valley Sequence, on the western flank of the Sacramento Valley, is sedimentary sandstone, chert, and some conglomerate. It is very similar to the Franciscan group but without the deformation.

Serpentine and igneous rocks, or ultramafics, lie in a zone approximately one mile wide between the above two categories. The presence of this band of rock at the surface is somewhat of an anomaly due to the origin of serpentine from peridotite in the upper mantle of the earth.
In portions of submerged coastline (e.g. Humboldt Bay), there are small amounts of sandstone and mudstone. These are of more recent deposition than the Franciscan or Great Valley Sequence (i.e. Miocene or Pliocene periods - 20 million years or less as opposed to the Late Mesozoic Era of 150 to 100 million years ago). This rock unit is not pertinent for the study area.

Within the North Coast Range, from the seashore to beyond the summits of the most eastern ranges, the Franciscan sediments are dominant, and the youngest rocks are found in the western tracts. The Great Valley Sequence marks the eastern boundary of the Range and has been dated by a few fossils and radioactive minerals to be contemporaneous with the Franciscan sediments. The thickness of each of these deposits is not known for certain, but they are thought to be at least 50,000 feet (15,000 meters) (Bailey, Irwin and Jones 1964). The Franciscan sediments extend westward below the sea, and the Great Valley Sequence dips eastwardly beneath the alluvium of the Sacramento Valley. Until recently, the problem has been how to explain these two sedimentary deposits of equal age which appear upon the continent in such contrasting conditions, i.e., the Franciscan sediments are crumpled together and the Great Valley Sequence lies in stratigraphic order. Confounding the situation is the band of serpentine which divides the two.

The study of global tectonics has provided explanations for the geologic garble in the North Coast Range. It is recognized that the floor of the sea spreads and stretches from mid-oceanic ridges to marginal trenches at the banks of the continents. At this interface the land mass overrides the ocean floor, which sinks beneath the continent (Alt and Hyndman 1975; Hamilton 1969). This underflow of oceanic mantle along the rim of continental California was an episodic feature of the upper Jurassic to Upper Cretaceous periods of 150-100 million years ago (Late Mesozoic Era). During this time, the Franciscan sediments and the Great Valley Sequence were deposited in geosynclines along the seacoast. The Great Valley Sequence filled a trough on the continental shelf, while the Franciscan sediments were stuffed into an abyssal trench beyond the shelf (Bailey, Blake and Jones 1970). With continued spreading of the sea floor, the projecting edge of the continent scraped slices off the continental shelf and ocean floor, often segmenting along faults. The Great Valley Sequence apparently rode intact above the Franciscan slabs which were smashed against the edge of the continent, folding, deforming, crushing and shearing the rocks. The serpentine from the upper mantle of the sea floor was sliced and tectonically kneaded along a fault between the Franciscan and Great Valley Sequence. As ridge after ridge packed the western continental margin, the slices came from further out to sea, thus resulting in younger rock formations along the current coastal belt.
The last slice of sea floor was crammed against the continental edge about 80 million years ago (Alt and Hyndman 1975; Bailey, Blake and Jones 1970; Hamilton 1969). Extensive uplift occurred in subsequent years that built the mountains of today.

One important feature of the last 10 million years has been the volcanic activity in Sonoma and Napa counties. Surface steam and hot springs result when percolating rainwater meets deeply buried rocks that are still hot.

Mineral Resources

Franciscan sediment, the major component of Mendocino National Forest geology, is not known for rich deposits of minerals, and for this reason mining is not widespread on these lands. Serpentine, on the other hand, does present good potential for mineral wealth, and the East Lake Planning District contains considerable amounts of it. Table 1 is a summary of potential resources.

Soils

Soils correspond generally to physiographic regions, since landform and geomorphic processes, as well as climate and vegetation, influence soil formation, and consequently the soil patterns in the North Coast Range are varied and complex. Mountainous regions typically contain what are known as residual soils which are those developed in place as the bedrock weathers and ages. The predominant soil order (Seventh Approximation) within the study area is known as the Inceptisols which represent early stages of soil formation. There are many series within this order and most tend to be well to excessively drained and shallow. The study area also contains some Entisols which lack genetic horizons and are developed on or of transported material, and some Mollisols which have a dark surface color and develop under grass cover. Each of these orders contains many soils series based on a place-association classification. The variation in soils greatly affects the distribution of vegetation and is, in turn, affected by that vegetation cover (Donley et al. 1979; Durrenberger 1976).

CLIMATE

Introduction

The climate of the study area has been classified as Mediterranean which is characterized by wet winters and dry summers (James 1966). The primary factor affecting this is a
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<tr>
<td>Asbestos Serpentine</td>
<td>Associated with the ultramafic rock</td>
<td>None Prospects possible</td>
</tr>
<tr>
<td>Chromite (chromium) Serpentine</td>
<td>Glenn Co. second largest producer in California</td>
<td>Mined in many counties Very little outside Glenn County Important mines</td>
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<td>Copper Schist</td>
<td>--</td>
<td>Small prospects Colusa County mines</td>
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<tr>
<td>Gemstones (Jadeite, Nephrite, Jasper, Onyx) Ultramafic</td>
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<td>Prospects --</td>
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<tr>
<td>Magnesite Serpentine</td>
<td>--</td>
<td>None Prospects</td>
</tr>
<tr>
<td>Manganese Chert</td>
<td>--</td>
<td>Widely distributed mineral Important mines</td>
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<tr>
<td>Mercury Cinnabar Serpentine</td>
<td>Abbott Mine (B.L.M.) Mined in Lake, Napa, Yolo, Sonoma Small Counties prospects</td>
<td>Important mines</td>
</tr>
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<td>Talc Ultramafic</td>
<td>--</td>
<td>Very little --</td>
</tr>
<tr>
<td>Sand and Gravel All major streams</td>
<td>Important for construction materials -- Important Important</td>
<td></td>
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<tr>
<td>Gold (Primarily in the Klamath Mts.)</td>
<td>Associate with mercury mining No lodes in North Coast Range -- Placer deposits: Knoxville area</td>
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Table 1. Mineral Resource Potential
seasonally shifting high pressure system over the Pacific Ocean. Cool polar air masses are deflected to the north of the state in summer when the high pressure cell is off the coast of Oregon. During the winter the system moves to the south and thus permits the stormy westerlies to cross California.

Temperature

Elevation is the most influential determinant for temperature within the study area. In the northern region the mountains attain greater altitude than the lands in the southern sections. In the extreme north the average number of frost free days is under 120, while the middle area has 120-180 days frost free, and the southern zone averages between 180-240 days without frost (Map 2). The warm summer temperatures do not vary to the same degree north to south, however, variation is evident from east to west. The lower elevations found in the extreme west and east, as well as in the extreme south, lie in a belt that has 60-90 days of temperatures over 90°F (32°C). The majority of the study area, that is, the main mountain range, lies in a belt that has only 30-60 days with maximum temperatures over 90°F (32°C) (Donley et al. 1979).

Precipitation

Precipitation in the study area occurs primarily in the months October to April, with occasional summer thunderstorms in the northernmost mountains. North to south variation in amounts of precipitation is evident, as well as west to east. The most abundant precipitation (60-80 in./150-200 cm.) is in the northern territory, which correlates with the greatest altitude, and a large amount of that precipitation occurs in the form of snow. The study area mid-section contains two zones of differential precipitation due to the rainshadow effect of the mountain ranges. The windward side of the range gets 40-60 in. (100-150 cm.), while the leeward side has only 30-40 in. (75-100 cm.) annually. The latter amount also characterizes the extreme southern portions. The least amount of rain (20-30 in./50-75 cm.) occurs in a broader strip on the western side of the Sacramento Valley (Map 3). It should be noted that the northern two thirds of the study area receive more than .01 in. (25 cm.) of precipitation on 60 to 75 days of the year in contrast to the southern third which receives more than this amount on only 45 to 60 days per year (Donley et al. 1979).

Climatic Change

Recent palynological studies carried out in the Mendocino National Forest have provided a record of vegetational and
climatic changes that have occurred over the last 8000 years. The data suggest a mid-Holocene warming period beginning about 6500 BP followed by a cooling trend beginning 2000 to 2500 BP. These shifts in temperature do not necessarily imply concomitant changes in the amounts of precipitation during those periods. The North Coast Range climatic history correlates well with the larger regional pattern currently being established for California and the Pacific Northwest (West 1981a, 1981b).

VEGETATION

Introduction

The vegetation of a region is strongly influenced by such factors as topography, slope, exposure, soil, temperature, and precipitation, and, given the variability and complexity of these factors in the North Coast Range, it is not surprising that the vegetation within the study area initially appears to present a floral mosaic. However, by utilizing the vegetation communities concept as defined by Kuchler for the North Coast Range (1977a), a clear, regional pattern emerges (see Map 4). (A more specific analysis of vegetation is presented in Chapter VI, Prehistoric Archaeology, in the section which addresses the prediction of site location.)

Vegetation Communities

Four vegetation communities are present in the study area (Map 4). They are: 1) mixed evergreen forest with rhododendron; 2) coast range montane; 3) blue oak-digger pine forest; 4) and chaparral.

Dominants in the mixed evergreen forest with rhododendron are Madrone (Arbutus menziesii), tanbark oak (Lithocarpus densiflora), Douglas fir (Pseudotsuga menziesii), canyon oak (Quercus chrysolepis), California bay rose (Rhododendron macrophyllum) (Kuchler 1977b). The structure is characterized by a tall, dense, needle-leaved and broad-leaved evergreen forest with an admixture of broad-leaved deciduous trees and shrubs (Kuchler 1977b).

The modal mature community has canopies of two heights consisting of both Douglas fir and tanbark oak. Douglas fir forms an irregular upper stratum as tall as 210 feet, while tanbark oak forms a more continuous lower canopy at heights to 115 feet. Madrone and canyon oak are secondary components of the lower level canopy, the former usually found on the south slope and the latter on the north. The shrub layer is dense, being composed of shrubby tanbark oak and a mixture on the north slopes of mountain dogwood, salal, California huckleberry, Oregon grape, California bay rose, and hazelnut. The south slopes are often dominated by wood rose and sumac (Sawyer et al. 1977).
Map 4. Natural Vegetation of the Study Area (after Kuchler 1977b).
Dominants in the coast range montane forest are white fir (Abies concolor), yellow pine (Pinus ponderosa), Douglas fir (Pseudotsuga menziesii), red fir (Abies magnifica) (Kuchler 1977b). The structure is characterized by a tall, dense to moderately open, needled-leaved forest with occasional patches of broad-leaved evergreen shrubs (Kuchler 1977b).

The forest patterns are reasonably predictable if mature, climax forests growing on deep soils are considered. The forests usually form a series of elevationally zoned belts dominated by one or several tree species. Within the study area the forest zonation pattern is roughly one of yellow pine/Douglas fir-dominated forests at low elevations, giving way to Pinus spp/white fir forests, then to white fir/red fir forests at the high elevations. When occurring along stream beds, the forests are often rich in herbs and shrubs but give way to rather barren understories on the dry, exposed slopes (Sawyer and Thornburgh 1977).

Dominants in the blue oak/digger pine forest are digger pine (Pinus sabiniana) and blue oak (Quercus douglasii) (Kuchler 1977b). The structure is characterized by a medium tall, dense to open broad-leaved deciduous forest with an admixture of needle-leaved evergreen trees. Low broad-leaved evergreen trees and/or shrubs are common. Near communities of prairie, the canopy often opens up, allowing the prairie to form a continuous ground cover thus changing the community from a forest to a savanna. Inclusions of chaparral can also be quite frequent (Kuchler 1977b).

Other important species of oak found within the community include California black oak, canyon live oak, and the Oregon white oak. Important shrubs include poison oak, buckthorn, California lilac, and manzanita (Griffin and Critchfield 1972).

Dominants in the chaparral are chamise (Adenostoma fasciculatum), manzanita (Arctostaphylos spp.), and California lilac (Ceanothus spp.) (Kuchler 1977b). The structure is characterized by dense communities of needle-leaved and broad-leaved, evergreen, and sclerophyll shrubs, varying in height from three to nine feet but rarely reaching heights of 15 feet. Understory is usually lacking. Inclusions of the blue oak/digger pine forest are common in canyons and other drainage areas (Kuchler 1977b).

The chaparral community has by far the highest level of species diversity within the study area. Some of the most important secondary species include poison oak, chamise, scrub oak, toyon, and sumac.
Vegetation Distribution

As seen with the general distribution of topography and climate, the vegetation shows clear north-south, east-west patterning (Map 4). When the study area is divided into thirds on the basis of latitude and the relative areas of the four vegetation communities are calculated with the use of a Keuffel and Esser plane planimeter, the following patterns emerge:

Table 2. Distribution of Vegetation Communities

<table>
<thead>
<tr>
<th></th>
<th>northern area</th>
<th>central area</th>
<th>southern area</th>
</tr>
</thead>
<tbody>
<tr>
<td>mixed evergreen</td>
<td>9.4%</td>
<td>9.8%</td>
<td>0.0%</td>
</tr>
<tr>
<td>coast range montane</td>
<td>84.4%</td>
<td>48.8%</td>
<td>7.7%</td>
</tr>
<tr>
<td>blue oak/digger pine</td>
<td>0.0%</td>
<td>7.3%</td>
<td>34.6%</td>
</tr>
<tr>
<td>chaparral</td>
<td>6.3%</td>
<td>34.1%</td>
<td>57.7%</td>
</tr>
<tr>
<td></td>
<td>100.0%</td>
<td>100.0%</td>
<td>100.0%</td>
</tr>
</tbody>
</table>

As is clear from the above data, the northern area is dominated by conifer forest, the central area shows a much reduced presence of the conifer forest with an increase in the oak/pine community and particularly chaparral, while the southern area shows a dominance of the oak/pine and chaparral with almost a complete lack of conifer forest.

The vegetation data also show east-west patterning. Parallel to the distribution of precipitation, along the eastern edge of the mountain range (within the rainshadow) there is a strip of the chaparral community (Maps 3 and 4).

FAUNA

Introduction

The North Coast Range, with its complexity of environmental features, contains a rich diversity of habitats which supports a wide variety of fauna. The most economically important mammals and fish are listed below followed by a brief discussion of the variability in distribution of cervids and salmonids.

Mammals (Ingles 1965)

Artiodactyla

Roosevelt elk (Cervus canadensis roosevelti)
tule elk (Cervus nannodes)
black-tail deer (Odocoileus hemionus columbianus)
pronghorn antelope (Antilocapra americana)

Lagomorpha

black-tailed hare (Lepus californicus)
cottontail rabbit (Sylvilagus spp.)

Rodentia

ground squirrel (Otospermophilus beecheyi)
western gray squirrel (Sciurus griseus)
pocket gopher (Thomomys bottae)
deer mouse (Peromyscus spp.)
kangaroo rat (Dipodomys spp.)
meadow mouse (Microtus californicus)
beaver (Castor canadensis)
wood rat (Neotoma spp.)

Carnivora

gray fox (Urocyon cinereoargenteus)
coyote (Canis latrans)
wolf (Canis lupus)
black bear (Euarctos americanus)
Grizzly bear (Ursus chelan)
raccoon (Procyon lotor)
ringtail (Bassariscus astutus)
marten (Martes americana)
fisher (Martes pennanti)
mink (Mustela vison)
weasel (Mustela frenata)
badger (Taxidae taxus)
striped skunk (Mephitis mephitis)
spotted skunk (Spilogale putorius)
river otter (Lutra canadensis)
mountain lion (Felis concolor)
bobcat (Lynx rufus)

Fish (Moyle 1976)

Salmonidae

king salmon (Oncorhynchus tschawytscha)
silver salmon (Oncorhynchus kisutch)
steelhead trout (Salmo gairdnerii)
rainbow trout (Salmo gairdnerii)

Catostomidae

Sacramento sucker (Catostomus occidentalis)
Cyprinidae

chub (Gila spp.)
squaw fish (Ptychocheilus spp.)

Distribution of Cervids and Salmonids

Probably the four most important economic mammalian species within the study area are the black-tail deer, Roosevelt elk, tule elk, and pronghorn antelope. However, the relative availability of the four species are (and were) not equal throughout the region. Although the black-tail deer ranges throughout the North Coast Range, it favors brushy-ecotonal habitats and reaches its highest densities in the chaparral/oak woodland communities (Taber 1953; Dasmann 1953). Of these four species, blacktail deer are the only one to currently maintain their ancestral distribution. The other three species are presently much reduced from their ancestral distributions. The Roosevelt elk favors habitats characterized by high rainfall and thick timber interspersed with small grassland clearings (Graf 1955; McCullough 1969). Ancestrally, it probably reached its highest densities northwest of the study area in Humboldt and Del Norte Counties. The tule elk favors extensive grasslands as found in the Central Valley and rarely ranged very high into the mountains. Its highest densities were in the bottom lands among the tule marshes. The pronghorn antelope also favors broad, grassy expanses and was ancestrally present in the study area only in the valleys on the east side (Grinnell 1933; McCullough 1969; Ingles 1965).

This information, when viewed in conjunction with the climate/vegetation data, leads to the following suggestions: 1) black-tail deer were probably dominant throughout the study area; 2) large numbers of Roosevelt elk were probably restricted to the northwest corner of the study area; 3) large numbers of tule elk were probably restricted to the southern reaches of the study area; and 4) antelope herds were probably restricted to the eastern valleys of the project area.

The most important fish species were the king salmon, silver salmon, and steelhead trout. The Eel River drainage had abundant runs of all three species. On the other hand, with the exception of a minor run on Thomes Creek, the literature reports that the eastern drainage did not have anadromous fish runs (Baumhoff 1963, Chartkoff and Childress 1966). (However, further research is suggested on this as local sources report a significant run on Stony Creek.)
SUMMARY

Several significant summary statements can be made concerning environmental factors and their relative distribution within the study area: 1) higher elevations are found in the north than in the south; 2) potential mineral resources are more abundant in the south than in the north; 3) temperatures, following elevational patterns, are cooler in the north than in the south; 4) precipitation, following elevation and temperature patterns, is higher in the north than in the south, and in addition, due to the rainshadow effect, precipitation is higher in the west than in the east; 5) river drainages are larger and average annual discharges are greater in the west than the east; 6) vegetation follows a similar pattern: the north is dominated by coniferous forest and the south by chaparral and blue oak/digger pine forest; the blue oak/digger pine communities also extend up the eastern boundary, following the distribution of the rainshadow; and 7) important economic fauna include black-tail deer, Roosevelt elk, tule elk, king salmon, silver salmon, and steelhead trout.
CHAPTER IV
LINGUISTICS AND ITS IMPLICATIONS FOR CALIFORNIA ETHNOGRAPHY AND CULTURE HISTORY
by
Helen McCarthy

Linguistics has contributed essential information to the understanding of the California Indians not only in terms of its own focus of study, language, but also in terms of both the ethnography and prehistory. Since the 1850s when the study of California languages began (omitting the early Spanish efforts), California linguistics has gone through three stages. Shipley defines them as 1) pre-Kroeber (pre-1900) including, for instance, Gibbs, Gatschet, Powers and Powell; 2) Kroeberian (1903-1929) including Kroeber, Dixon and Sapir; and 3) Survey of California Indian Languages (1950s on), with a focus on Mary Haas' and her students' efforts in the Survey of California Indian Languages at the University of California, Berkeley (Shipley 1973:1046). Each of these successive stages has employed refined methodology and produced new syntheses. Most recently, research, which could possibly be identified as a fourth stage, has generated models of prehistoric relationships, homeland origins and postulated subsequent migrations (Whistler, 1977, 1980; Levy 1980). Each of these stages and its results will be reviewed for contributions to the understanding of the culture history and the ethnographic record in the project area.

From the beginning, Stage I, linguistics has provided the criteria by which we have categorized native California groups. California presented early scholars with an astonishingly large number of different languages. Shipley has estimated that there were approximately 75 separate languages being spoken at the time of contact (Shipley 1973:1046). If this 'ancient linguistic particularism' amazed linguists, the ethnographic socio-political scene was even more confusing. Since California Indians recognized virtually no loyalties nor political affinities beyond fairly immediate settlements, they had no names nor neat 'tribal' boundaries defining larger groups; the observer was presented with an untidy and bewildering series of subtle, cultural differences which gradated across the many settlements of the entire state. Consequently, early students created divisions and groupings based on the language differences which could be detected more clearly with the basic, underlying assumptions that a common language implies ongoing communication as well as shared cultural and historical experiences (Powers 1976:15; orig. 1877).

It is worthwhile to consider very generally the several levels of distinction which linguists have used in their efforts to classify languages, since these same distinctions
are variously applied to the social groups. A dialect is a particular, discrete variety of speech, the features of which are shared by a speech community or set of regularly interacting speakers. A language contains one or more dialects which are mutually intelligible. A language family is a grouping of two or more related but not mutually intelligible languages. These related languages, often called sister languages, have developed through time from a single, ancestral language which may be reconstructed as a proto-language through rigorous comparison of its daughter languages. A language stock or phylum is a grouping of families which are hypothesized to be related. While the establishment of a particular family rests on careful documentation, the stock or phylum level of classification is more tenuous (Whistler 1979).

(A caveat on these levels; early researchers did not necessarily use these distinctions uniformly so that, for instance, Barrett (1908) used 'dialect' in place of 'language'.)

The level of frequently considered for a unit of study which has some viability as an interacting unit is a sociocultural group geographically bounded, defined and labeled at the level of a language, for instance, Wintun; often the family affiliation is also noted, as for Wintun, the Wintuan family. A dialect may correspond to a settlement community (a 'tribelet' in ethnographic terms) or encompass two or three such settlements.

During the initial stage of California linguistic research vocabulary lists were collected by Gibbs (1853), Latham (1856) and others (see Schoolcraft, 1851-57) and Gatschet (1877) and some basic comparisons drawn. Stephen Powers' Tribes of California (1877), based on his field observations over a large portion of the state in 1871-72, provided the first comprehensive attempt at California ethnography. While he presented no formal classification, his vocabularies and linguistic observations have proven to be invaluable (Powell 1966: 98; orig. 1891), and many of his names designating groups are those in use today: for the project area he identified Pomo, Yuki, 'Wintoon' and Patwin. (Lake Miwok wasn't discovered until Barrett did work in the early 1900s (1903) and Northeaster Pomo was also identified at this time (1904).) This first phase of research culminated in Powell's important 1891 classification which synthesized all the previous work and established the basic language families in California. While there have been some refinements and the names of some of the groups have been changed, this classification remains the solid cornerstone for current research. Four of his families occupy portions of the project area: Yukian, Kulanapan (Pomoan), Moquelumnan (Miwokan), and Copehan (Wintuan) (see Map 5).

During the second stage of research Dixon, Kroeber and Sapir made efforts to reduce the number of California language families and isolate languages from the 22 as established by
Powell to a smaller number and to relate them to languages beyond California (Dixon and Kroeber 1919:48; Haas 1964:73). In a series of articles from 1903-1919 these scholars postulated the two great language stocks in California, Hokan and Penutian, thus achieving by combination a reduction of 15 of Powell's units to two.

The label 'Hokan', taken from Atsugewi for 'two', 'hoqi', was used by Dixon and Kroeber in 1913 for a group of five Northern Californian languages in which they included Pomo, Shasta (combined with Atsugewi and Achomawi), Chimariko, Karok, and Yana (1913a) and in Southern California Esselen and Yuman (1913b). Sapir in 1917 extended this grouping in Southern California to Salinan and Chumash and beyond California with Seri and Chontal, and, according to Dixon and Kroeber, presented sufficient evidence to substantiate Hokan as a stock (Dixon and Kroeber 1919:104).

The term 'Penutian' was also coined by Dixon and Kroeber from the combination of the member families' words for 'two': 'pen' in Wintun, Maidu and Yokuts and 'uti' in Miwok and Costanoan (1913a,b). In 1919 Dixon and Kroeber presented in detail their evidence for Penutian which included both lexical and structural analyses and a summary of their classification. Although Sapir continued to seek relations beyond California, particularly in Oregon (1920; 1921; 1929), no serious attempts have been made to reduce the number of California languages since 1919 (Haas 1964:74).

The significance of this research was, first of all, that the picture of California as comprised of many, small, unrelated groups was broken down. For the project area in particular, there are several immediate conclusions: for instance, Wintuan was related to a larger grouping which held the entire Central Valley and a large portion of the Coast, and was thereby related to Lake Miwok; Pomo was related to a large number of more scattered groups which were peripheral to the Penutian block. Equally important was the fact that Yukian was not found to be related to other languages, although a number of attempts had been made to do so (Dixon and Kroeber 1919:115). These formulations of the Penutian and Hokan hypotheses provided the first clues to the prehistoric relations among these groups and have guided subsequent research in linguistics and in archaeology and ethnology as well.

Secondly, this research established ties beyond California which broke down the picture of California as an isolated and unique island.

The research in the third stage, undertaken mainly in the Survey of California Indian Languages under the direction of Mary Haas, focused on the careful, systematic description and analysis of particular languages and on the comparative
methods which aimed at the reconstruction of proto-languages (although others not associated with SCIL such as Olmsted, Halpern, Beeler and Elmendorf were also carrying on similar work). The purpose was to document the genetic relationships between the sister languages and eventually, on the bases of these findings, to validate the Penutian and Hokan hypotheses. Linguists have achieved considerable success with the first objective utilizing the principle that sound change in language is regular, recurrent and predictable (Shipley 1978:80). On the basis of this research there is good evidence for the internal relationships for most of the languages and language families in the project area.

There are eight languages representing four language families within the project. The Wintuan Family, located in the Sacramento Valley west of the River and into the Coast Range, contains three languages: Wintu, the northernmost and north of the project, with nine known dialects; Central Wintun, largely within the project, with two known but possibly six dialects; and Patwin, the largest of these languages with many dialects but only eight known; the northern dialects which fall into the project are among those best known. Wintu and Wintun are more closely related to each other than to Patwin (Shipley 1978:82-89). Wintuan is one of the four Penutian stock families.

The Lake Miwok language, located on the south end of the project, is the only representative of its family in the project area. It is a single dialect language which, along with Coast Miwok, belongs to the Western division of the Miwokan subfamily of Utian. Utian is a well established grouping of the Costanoan and Miwokan families, and the 15 Utian languages were spread from the Bay south along the Coast to Monterey (the Costanoans) and east from Marin through the Valley and into the Sierra (the Miwok) (Shipley 1978). Lake Miwok was geographically separated from other Miwokan languages and is unique in its complex phonology which is probably borrowed from Patwin, Pomo and Wappo neighbors (Callaghan 1964:47-49). Proto-Miwok has been reconstructed by Callaghan (1972), and like Wintuan it is of Penutian Stock.

The Pomoan Family, of Hokan Stock affiliation, is spread in a large swath from Clear Lake to the Coast, and contains seven languages, three of which fall into the southwest portion of the project: Eastern, Southeastern and Northern Pomo. A fourth, Northeastern or Salt Pomo, is an enclave among the Wintuan speakers to the east. The internal relationships are well established in Pomo. Oswalt and Halpern agree that there is great divergence between the Eastern and Southeastern languages, and Oswalt formulates a Western branch of Northern plus Central, Southern and Kashaya which form a more closely related sub-grouping (Oswalt 1964, 1975; Halpern 1964; McLendon 1973; McLendon and Oswalt 1978). Salt Pomo is the most different
of the Pomo languages, but it has certain features in common with Northern Pomo (Halpern 1964). Salt Pomo is less well-known than the other Pomo languages which accounts for these uncertainties in its family relationships. Proto-Pomo has been reconstructed by McLendon (1973).

The Yukian Family is a small, two language family which occupied the northwestern portion of the project area. Yuki with the three dialects of Yuki, Huchnom and Coast Yuki held a mountainous area of Mendocino County from the crest of the Coast Range to the Coast. Wappo language speakers held a territory to the south in Napa and Lake Counties, however, it is only distantly related, if at all, to Yuki (Shipley 1978:87).

By the early 1970s the linguistic picture of California was significantly more complete and refined than previously, although the basic view was little changed from Dixon's and Kroeber's: there was still confidence that, while the Hokan and Penutian hypotheses had not yet been validated, further research would reveal the genetic relationships within the stocks. The model presented for prehistory was a general one: Hokan relationships were very deep in time, and this language group was apparently the oldest in California; Penutian relations were also deep but probably not so deep as Hokan; Penutian had entered California early and spread throughout the Valley, pushing the Hokan peoples to the peripheries; Penutian language families formed a 'kernel', which research would someday demonstrate to have a treelike, genetic structure revealing the relations and divergence from a single ancestral tongue whose Urheimat (homeland) was presumed to be in Central California (although there was increasing frustration at the inability to discover and define these Penutian genetic relationships in spite of numerous attempts to do so); the position of Yukian was not well understood, but possibly it was even older in California than Hokan (Shipley 1978:81-82; Kroeber 1925:347-50).

Recently, a new areal synthesis has been developed which significantly changes the previous model of culture history, and which emphasizes the fact that the Hokan and Penutian hypotheses are as yet undemonstrated. (In fact, some linguists would like to do away with the terms Hokan and Penutian as they mislead other scholars into thinking that the postulated genetic relationships are well founded.) The new model is the product of many research efforts, particularly in the Penutian languages by Callaghan (1972, 1977), Whistler (1977, 1980) and Shipley and Smith (1979). This new synthesis is, on one hand, an extension of phase three research in that it builds on and incorporates some of the important results from that phase, but, on the other hand, it may be considered a new phase since an essential element of the previous model, the 'Penutian kernel', has been destroyed largely by means of newly emphasized methods designed to determine the Urheimat of particular groups.
These methods are aimed at the reconstruction of the vocabularies of critical domains such as flora and fauna. Lexical items that can be reconstructed (positive evidence) are genetic and therefore assumed to be old, while items which cannot be reconstructed (negative evidence) are assumed to be inventions or borrowings, i.e. newer. Negative evidence, however, offers weaker support for an argument in this case since items may not exist in the data nor reconstruct for a variety of reasons. (The source for certain borrowed items may sometimes be established.) The reconstructed domain is then compared to the configuration of the actual environments and the Urheimat identified as the one which matches the reconstructed domain. California is felt to be particularly susceptible to this kind of analysis since it has a very characteristic inventory of endemic vegetation. This methodology has previously been successfully employed in Indo-European studies, and, for the American continent, for the Algonquians by Siebert (1967), for Numic by Fowler (1972), and notably in California for Palaihnihan by Baumhoff and Olmsted (1963, 1964).

Glottochronology, or lexicostatistics, is frequently employed in conjunction with the above mentioned methods and provides an estimate of the range of time depth of the internal divergence within a language family. It is particularly useful since these dates are projected entirely independently of the archaeological data, however, it must be emphasized that these dates cannot be considered with the same confidence as radio-carbon dates.

The new model emphasizes the dynamics of prehistory - the divergences, migrations and changes; California can no longer be viewed as having been locked in cultural and historical stasis as Kroeber had suggested (1925:vii, 926). The following outline is presented here with an effort to explain some of the basic assumptions being made concerning the several ethnolinguistic groups in the project area and to state the propositions in archaeological terms.

The Yukians are now felt to be the "truly autochthonous" family in Northern California (Kroeber 1925; Whistler 1977, 1980; Elmendorf 1980). A basic component of this proposition is the linguistic fact that Yukian seems unrelated to any other known language, and thus it cannot be linked to any other geographical area. Elmendorf estimates that Yuki-Wappo divergence occurred about 1500 BC (3500 BP). Prior to that time, he suggests that Proto-Yukian was a dialect continuum stretching from just south of Humboldt Bay down to the lower Russian River (see Map 6). Yuki shows a few lexical sharings with the Ritwan languages (Wiyot and Yurok) on Humboldt Bay indicating an early contact with these Ritwan speakers, although Athapaskan has since intervened between these groups, probably pushing the Yuki south about 900-1000 AD. Apparently
Map 6. Linguistic distribution pre @ 3000 BP.
the Yuki did not pick up any Athapaskan. Pomo expansion around 500 BC separated the Yuki and Wappo groups (Elmendorf 1980: 7-8). Sawyer, however, on the basis of his analysis of Wappo suggests that the similarities between Yuki and Wappo are not genetic in nature but due to a complex borrowing relationship (Sawyer 1980; p.c.). If Sawyer's hypothesis is validated, it significantly increases the complexity of the prehistory in the area.

Whistler (1980) has suggested that Pre-Proto-Yukian is correlated with the Post Pattern manifestation of the paleo-Indian Period of 6,000-10,000 BC. However, since the linguistic situation is so poorly known for this time depth and the archaeology of this time period quite weak, any linguistic-pattern correlation must be regarded as extremely conjectural. Only after stronger propositions are made for the more recent periods can we begin to make statements about such distant relationships. We can hypothesize, nonetheless, that the Yuki are associated with a dominant and persistent use of chert, and that they are early associated with large side notched and large concave base points such as those in Meighan's Mendocino complex at Willits (Men-500), and early at Warm Springs, and in the later periods with small concave points in the Eel River drainage (Jackson 1976).

Hokan is also felt to be old in the North Coast Range, perhaps even as old as Yukian, and to be correlated with the Millingstone Horizon appearance at approximately 5000 BC. Whistler suggests that the Pre-Proto-Pomo entered the Clear Lake vicinity via the Putah and Cache Creek corridors about that time (1980:16). While the archaeological evidence is still scant for this, researchers have recently identified an early millingstone-cobble tool assemblage at Oakshores on Lake Berryessa (True, Baumhoff, and Hellen 1979). This kind of assemblage is also reported along the west side of the Sacramento Valley at Thomas Creek (Edwards 1968), Funk Creek (Chartkoff 1969; West, Levulett and True 1975) and Oat Creek (True and West 1977); Baumhoff attributes it to the activities of early Hokan peoples thus supporting Whistler's notion of Hokan areal spread though not necessarily direction of migration (Baumhoff p.c.).

McLendon's reconstruction of Proto-Pomo strongly supports the generally accepted proposition that the Pomo Urheimat was in basically the same area inhabited by the Pomo at the time of contact: reconstructed plant terms are consistent with this environment (McLendon 1973:61-63). Oswalt's lexicostatistical studies indicate that the divergence between the Eastern Pomo languages (Eastern, Southeastern and Northeastern) and the Western branch is more than Romance languages but less than Indo-European (1964:421) which Whistler translates as 4000 ± 1000 years (1980:22). Based on the principle that the
geographical area of a language family's greatest diversity indicates the point of dispersion, Clear Lake has been targeted by Oswalt (1964) and Halpern (1964) as the most likely origin of the Pomo, while Webb suggests that it was the Russian River Valley (1971). These two areas are too close (only 40 miles or so) for a significant difference in vegetation so that reconstruction of plant terms is not revealing. However, Whistler has attempted the same method with fish terms, since there are considerable differences in the species found on the River versus the Lake (1980). Whistler's interpretation of the material suggests the Clear Lake area, but his evidence is slender at best and may be refuted from other perspectives. Olmsted examines the early Pomo migrations in Appendix B.

Regardless of the fine points of the Urheimat argument, Pomo expansion probably began about 3000 years ago (see Map 7). In 1976 Baumhoff equated this expansion with Late Borax Lake, however, after considerably more work on Dry Creek, he has asked if it is represented by the Houx aspect (Excelsior points) which appears on Dry Creek about 500 BC (Baumhoff p.c.). It is possible that the Pomo also spread east into the valleys inhabited ethnographically by the Wintun/Patwin peoples. The enclave of Salt Pomo lends support to this. It should also be noted here that the sites on the north end of Clear Lake are very different from those on the south end, i.e. Houx (Fredrickson, Baumhoff p.c.), suggesting that perhaps the Pomo did not spread into this area until fairly late.

It is, nonetheless, the revolution in the ideas about Penutian language relations that has made the most sweeping change in the linguistic model of California prehistory. Instead of the four families developing and diverging from a Central California locale, there were apparently four separate waves of Penutian intrusion, each possibly with multiple pulses (Whistler 1977; Shipley and Smith 1979). According to these schemes, Utian is the first of these families to have entered California, and divergence is estimated to have taken place in Central California approximately 4000 BP. These Miwok-Costanoans are thought to have brought the mortar and pestle into California and are correlated with the Berkeley Pattern focused initially on the San Francisco Bay, later spreading south, east and north. Fredrickson correlates the Lake Miwok arm of this expansion with the Houx assemblage at LAK-261 (Fredrickson 1973; Bennyhoff p.c.; Whistler 1980). This proposition potentially conflicts with Baumhoff's Pomo proposition; however, several points must be made which are pertinent in general for all "linguistic archaeology" and must be examined in this case.

First, Fredrickson's caveat must be considered that, while the first appearance of an aspect/pattern may be attributed to an incoming ethnolinguistic group, it does not necessarily follow that all other manifestations of that aspect/
Map 7. Beginnings of Pomo expansion @ 3000/2500 BP.
pattern are to be attributed to that same group; technologies and styles are well known to diffuse (Fredrickson p.c.).

Secondly, the archaeology of this area is extremely complicated, and in the light of the tremendous volume of work that has been done recently both Fredrickson and Baumhoff agree that the concepts of Borax Lake and Houx must be rethought and better temporal control achieved. Essentially there are at least two scenarios to work with: 1) Porno spread east and west from Clear Lake occupying the Russian River drainage at least as far as Dry Creek by 500 BC; the Lake Miwok may have moved into the Lake area during this time; or 2) Miwok spread much farther north into Sonoma County than they were in the contact period; Miwok also spread into hill valleys later held by the Patwin; the Pomo only pushed these Miwok to the west out about 1400-1600 AD. However, linguistic divergence dates for the Pomo do not agree very well with such a late expansion. The linguistic and archaeological data don't seem to match up very well at the moment in this area (Hokan/Penutian Conference discussion, 1981).

The remaining three "Penutian" families entered California, probably from the Plateau/Basin areas, separately; the Yokuts apparently first and the Maidu and Wintun in roughly contemporaneous though independent migrations. Whistler sets Wintun internal divergence at about 2000-2500 BP with Wintun/Wintu forming a branch in relation to the more distant Patwin. The Patwin, bringing Gunther barbs, the bow and arrow, harpoon and collared pipe, moved south through the western Sacramento Valley and settled in the Carquinez/Suisun area about 500 AD, thus pushing the Miwok out (Bennyhoff p.c.). There are three possibilities concerning subsequent moves that created the eventual configuration of Wintuan positions at the time of contact: 1) groups expanded back north from the Patwin base on the plains; 2) groups dropped off along the way as part of a single migration; 3) Patwin migrated south first and Wintun/Wintu followed later in separate pulses. These groups moved into the foothill valleys replacing or incorporating the Miwok and/or Pomo peoples. The Patwin proper spread from a base on the Sacramento River near the Sutter Buttes up into the hills via Putah and Cache Creeks and continued into Indian Valley from Bear Creek. The Wintun/Wintu spread from a base on Cottonwood Creek at the Sacramento River up various drainages, including Stony Creek, and into Indian Valley. Both these groups seem to have been encroaching on the Salt Pomo (see Map 8). The Patwin village of Chuhelmemsel was apparently once a Pomo village, and the village of Bakha was a mixed Pomo and Patwin village (Whistler, p.c.).

Whistler has demonstrated through the reconstruction of plant terms that the Urheimat of these peoples was to the north, in northeastern California or southern Oregon. It was this important discovery that sounded the death knell for the
Map 9. Wintuan intrusion from the northeast 1500 BP.
notion of the California Penutian kernel (Whistler 1980; Shipley and Smith 1979). Shipley's and Smith's recent work on Maidu indicates three pulses of Maiduan waves into California, thus supporting Whistler's general proposition of extra-California origins of these families (1979).

In concluding, efforts towards 'linguistic archaeology', as Whistler calls it, contribute significantly to our knowledge of prehistory; however, it is not a panacea for all the gaps that exist therein. It is, first of all, dependent on more of the careful linguistic work which is indeed being produced; ideally, language divergence estimates are stated separately from the archaeology so that researchers can independently judge the fit of evidence. It is also heavily dependent on good temporal control, well developed typologies and careful description of areal spreads for the archaeological materials. The archaeology of the North Coast Range is becoming better known, but there are still many gaps (Baumhoff, Fredrickson, True, p.c.).

Finally, 'linguistic archaeology' rests on the assumption that it is possible to correlate an ethnolinguistic group with an archaeological pattern/aspect. In the case that it is fairly certain that a group is entering a new environment (e.g. California) with a distinctive technology within the relatively recent past (81500 BP), such as the Athapascans and Alogonquins to the north and the Wintuans in the Valley, the correlations may be made with fair confidence. However, when ethnolinguistic groups are evolving within the same region and are in contact over long periods of time, such as the Yuki, Pomo, and Miwok, the problem becomes enormously more complicated. That is not to say 'linguistic archaeology' is not worthwhile in this context, only more challenging.

The propositions for the project area may be summarized as follows:

1. The Yuki were spread, prior to 3000 BP, from near Humboldt Bay to the lower Russian River Valley and are marked by dominant and persistent use of chert and by large side notched and large concave base points, e.g., the Mendocino complex; later they are marked by the small concave base points.

2. There are several alternative and connected scenarios for the Pomo and Miwok in the Clear Lake and adjacent areas.

   a) The Pomo Urheimat is at Clear Lake, and their expansion began from that area approximately 3,000 BP. They pushed both east and west from this point into the Northern Russian River Valley and into Indian Valley. They either
displaced the Yuki to the north or incorporated them, and eventually separated the Yuki and the Wappo with this expansion. A basic problem currently is to establish a reliable archaeological marker for the Pomo so as to determine the direction and extent of this expansion.

b) The Miwok expanded into a significant portion of the territory held ethnographically by the Pomo and the Hill Patwin. They are marked by the Excelsior point (the Houx). The Lake Miwok moved into their ethnographic area at this time (3000 BP). The Pomo on the west and the Hill Patwin on the east did not encroach on the Miwok until fairly late. The late break in the record at Dry Creek (Healdsburg) is approximately 500 BP.

c) Alternatively, the Pomo expanded at least as far south as Dry Creek by 500 BC (2500 BP). They share with the Miwok in a widespread pattern/aspect which includes the Excelsior point and reworked bifaces.

3. The Wintuans migrated from the Rogue River area south through the Sacramento Valley and reached the Carquinez/Suisun area about 1500 BP; subsequently they replaced Pomo and/or Miwok peoples in the foothill valleys west of the Sacramento Valley; these movements are marked by the Gunther barb point, bow and arrow, harpoons, and collared pipe.
CHAPTER V
ETHNOGRAPHY
by
Helen McCarthy

Introduction

The following section presents a summary of the several Native American cultures in the project area as they are described in the ethnographic literature that has been developed over the past 100 years or so. The project area has been divided into three regions since the differences between the many groups are too great to compress satisfactorily into a single, useful statement. While the precise cultural boundaries between these three areas are somewhat arbitrary in that they shade into one another at the edges, each of the regions has an integrity of its own and is fundamentally distinct from the others on a number of accounts; they exhibit a convincing series of cultural groupings within the broader context of Central California Indian culture. These three areas are: 1) the eastern portion of the North Coast Range, including Hill Wintun, Hill Patwin, and Salt Pomo peoples; 2) the northwestern portion of the North Coast Range, including the Yuki and Huchnom peoples; and 3) the Clear Lake area, including Northern, Eastern, and Southeastern Pomo, and Lake Miwok peoples.

The information incorporated into these summaries is highly selective as it is aimed at the identification and explanation of the cultural remains which are likely to be discovered. Group boundaries, population, density, and subsistence and land use patterns are consequently dealt with in detail. Social organization and ceremonial activities are also included since these related behaviors and beliefs motivate, direct, and are inexorably interlaced with the activities which produce the physical evidence of culture. Each summary has been developed in a parallel sequence so that comparisons may easily be drawn; however, precisely the same information is not necessarily available for each region.

A brief section on the ethnohistory and another on the evaluation of the sources along with recommendations for future work follow the summaries. Every effort has been made to produce information which would be useful both to persons not intimately familiar with California as well as those professionals closely involved in the project area. Finally, an attempt has been made to produce an ethnographic background which goes beyond those available in the Handbook of North American Indians, Vol. 8, California (Heizer, ed. 1978) and, hopefully, the uniform approach to each of these sections from an archaeologically oriented perspective has achieved this end.
Boundaries, Tribelets, and Population

The eastern section of the project area was inhabited by Wintuan language family speakers who held virtually the entire western portion of the Sacramento drainage system from its upper reaches on the Sacramento and McCloud Rivers, south to the Carquinez straits, and east from the crest of the North Coast Range to the Sacramento River. The three major divisions of these peoples are the Wintu, or Northern Wintun, the Central Wintun, and the Patwin. A group of Pomoan speakers, the Salt or Northeastern Pomo, held a small but valuable territory near Stonyford within this otherwise Wintuan area.

The Hill Wintun controlled the northeastern section of the project area. The Wintu-Wintun boundary ran west from a point five or six miles south of Cottonwood Creek on the Sacramento River, along the Middle Fork of that creek, and then up Beegum Creek to the crest of the North Coast Range, thus placing the Wintu entirely north of the project (Kroeber 1932:266; Dubois 1935:1-2; Goldschmidt 1951:315) (see Maps 9 & 10). The Hill Wintun extended south from this line to the confluence of Big and Little Stony Creeks just north of Stonyford from where this southern boundary ran east to just above Princeton on the River (Barrett 1908:289; Merriam 1967:55). The several divisions of Hill Wintun held from their western boundary along the crest of the North Coast Range east to a "hunting line" which ran north and south along the edge of the lower foothills through Henleyville separating them from the River Wintun groups (Goldschmidt 1951:314).

Patwin groups, who were also divided into Hill and River sections, held a large area from the Wintun boundary on the north down to San Pablo and Suisum bays. The Hill Patwin occupied the foothill valleys which comprise a major portion of the southeastern section of the project area: Indian, Bear, Little Indian, Long, Morgan and Cache Creek Valley*. Their northwestern boundary ran along the divide of the Eel and Sacramento drainages from approximately Goat Mountain to the range east of Clear Lake, south to Cache Creek, which it crossed, and continued southeasterly along the ridge between Morgan and Jerusalem Valleys; it then crossed Putah Creek, ran south across Butts and Pope Creeks and continued south well beyond the project, finally taking in lower Napa Valley (Merriam 1955:46; Barrett 1908:286). The River Patwin groups occupied the areas along the Sacramento River, though little is known about them south of Knights Landing (Kroeber 1932:261).

In this otherwise Wintuan territory the Salt Pomo held a small area on the headwaters of (Big) Stony Creek near
Map 9. The Patwin and Their Neighbors (Kroeber 1932).
Map 10. The Wintun (Barrett 1908).
Stonyford where they bordered both the Patwin and Nomlaki. This Pomo boundary ran from the crest of the Coast Range between Sheet Iron and St. John Mountains down the divide between Brisco Creek and North Fork Stony Creek, included Salt Spring Valley, crossed Stony Creek just west of its confluence with Little Stony Creek, followed the ridge south between these two creeks for about four miles, and then turned westward and ran up the divide to the south of Stony Creek valley to the head of South Fork Stony Creek on the crest of the Coast Range, which formed the western line (Barrett 1908: 239-40).

Kroeber has described the Patwin as being "essentially lowlanders," with different segments occupying three habitation zones, all below the 1200 foot elevation: 1) the foothill valleys (our basic concern here), 2) the first range of the foothills, and 3) the Sacramento River banks (no villages on the plains of the Valley) (Kroeber 1932:254-55). An examination of the existing ethnographic record confirms these habitation zones and allows extension of the generalization to the Hill Wintun as well. With the exception of two small rancherias in the Cook's Springs area near the head of Indian Creek, all the recorded habitations for these groups fall below 1200 feet (Merriam 1967:266-270, 1977:160-192; Barrett 1908; Kroeber 1932). However, this may not make them lowlanders to any greater degree than any other group. It is a factor of the topography that the suitable valleys on the eastern side of the Ranges are lower in elevation than on the western side or in the Clear Lake area, and that the mountains rise more steeply from these valleys on the east, thus presenting a more rugged terrain than elsewhere. Some of the Salt Pomo villages are recorded at higher elevations on this eastern side, but the Stony Creek drainage seems to contain more suitable flats than for instance, Grindstone or Thames Creek drainages (see also Barrett on Pomo living in valley regions 1908:25). Due at least in part to the virtually identical nature of their ecological zones, the Hill Patwin and Hill Wintun share a number of cultural similarities, although each is linguistically closer to its River counterpart, and the Wintun is also linguistically more similar to the more northerly Wintu.

There are a number of sub-groupings within both the Hill Wintun and Hill Patwin, but the Salt Pomo represents a single group. The confusion of group definitions and local territory boundaries created by the decimation, disruption and amalgamation of these peoples during the contact period is compounded by the process of native designation for one another. Like many other Central California peoples, the Wintun and Patwin name others according to their geographic relationship to themselves, hence noi muk, or south people, and nom laki, or west tongue; identities of this sort tend to be endlessly overlapping and to incorporate larger or smaller groupings. Nonetheless, certain agreement emerges from the records.
Starting in the north and working south down to Indian Valley along the creek drainages were the following seven Wintun groups (tribelets): S.F. Cottonwood Creek, Chuida (Kroeber 1932:266); Redbanks Creek, Waikwel; between Redbanks and Elder Creeks, Waltoikewel: major villages of Noitikel, Kenkopel, and Saipanti; Elder to Thomas Creek, Nomlaka: major village Lopom; Newville to Grindstone Creek, Noikewel: major villages of Kalaikel, Pontididi (Eltoi) (Kroeber 1932:265-266; Goldschmidt 1951:314; Merriam 1977:191); south of this, Goldschmidt's informants called everyone noimuk regardless of language or village association (1951:314), but Merriam, Barrett, and Kroeber confirm major settlements at Elk Creek, Tolokai (Doloke), and at Brisco Creek, Dahchimchini associated with the large satellite village Caipetel (Barrett 1908:289-290; Kroeber 1932:265; Merriam 1977:191-192). (These villages are adjacent to the project area; there are no ethnographically recorded Nomlaki settlements within the Mendocino National Forest.) It should be noted that the bases of these units are not equivalent in that Goldschmidt's are dialects and the others' are settlement oriented (see Maps 9 and 10).

Merriam has recorded 46 village settlements for his 'Nomlakke' between Elder and Salt Creeks (Newville) (1977:160-164) and Kroeber 36 for a similar area (1932:363) which gives some indication of how heavily this rich valley was populated. However, population figures by Goldschmidt's estimate are 2000 plus (1951:303), and by Cook's estimate 3000 (1976:14-15) (both are including the foothill zone). These figures produce rather low densities for the area, 1.02 per square mile and 1.5 respectively, both of which are lower than density estimates for the Hill Patwin, 2.5, Pomc proper, 6.4, and Yuki/Northeast Pomo, 5.3 (Cook 1976:13). The magnitude of this difference does not seem logical, however, the population figures in this area have never been given the close attention that some other areas have received (cf. Baumhoff 1963; Cook 1955, 1956). The estimated average population for a tribelet is 200-250 (Kroeber 1962:30; Cook 1976:13), which would produce a range from 1400-1750 for the Indian Valley/Paskenta area alone.

The Salt Pomo to the immediate south of the Hill Wintun were called the Shotah by the Potter Valley Pomo, Torodehe by their Hill Patwin neighbors, and sometimes called themselves Shamen (Merriam 1977:84). Their main village was Bahkamtâtì near Stonyford (Kroeber 1932:264). Merriam and Barrett agree on three satellite villages though they each list several more so that in actuality there were probably more than three (Merriam 1977; Barrett 1908). Cook estimates a population of 350 for the Salt Pomo (1956:119).

Where the Merriam, Barrett, and Kroeber information on the Hill Patwin is fuller, it is in somewhat less agreement than for the Hill Wintun. Merriam delineates five "tribes"
for the Hill Patwin which upon inspection seem to hold over
large territories\(^2\) for Central California: 1) Choohelmemme\, in the southern end of Indian Valley, from Wintun and Pomo
borders south to Leesville and Venado, and east to Sites;
2) Kletwin, from Cortina Ridge east, and south almost to
Rumsey; 3) Kopa, in the Capay Valley from Rumsey south, and
including the Knoxville area to the west; 4) Chenposel in
Bear Valley, Little Indian Valley, and including the Long
Valley Lolsel; and 5) the Napa beyond the project in the Napa
Valley (Merriam 1967:262-263) (see Map 11). (These areas
fall within the BLM project boundaries.)

Neither Barrett's nor Kroeber's ethnographic data suggest
such groupings, but rather their focus is on settlements.
Kroeber and Barrett are in fair agreement for the area, and a
synthesis of their data shows nine major village settlements
(triblets) for the project. Again, starting north near Stony
ford and working south and then west was Pakalabe on Little
Stony Creek; Edilabe (?black gnat) and Tcuhelmeme\, (from
tcuhel, swordgrass) on Indian Creek;\(^3\) a number of satellite
villages are also reported in this region. Bear Valley held
Suku, probably associated with the village of Yowelabe at
Wilbur Springs (Merriam 1977:186);\(^4\) Tebti at the confluence
of Bear and Cache Creeks; also a Tebti (Lolsel) at the conflu­
ence of Long Valley and North Fork Cache Creeks; Kroeber
lists Kuikui for upper Cache Creek near the confluence with
North Fork Cache Creek while Barrett places an unnamed village
there; Kroeber also names Tlotli in Little Indian Valley; and
Waitaluk in Morgan Valley; Let (Squirrel) was just east of the
project on Cortina Ridge and Topaidihi to the west in Berryessa
Valley (Barrett 1908:290-300; Kroeber 1932:262-264). In addi­
tion to these major village settlements, the data indicates a
number of smaller, satellite settlements (see Maps 9 & 10).

Cook estimates Hill Patwin population at 4000 with a
density per square mile of 2.5 persons. Since there are no
Mission records or early traveler reports for this area, Cook
has used an area-density method of calculation supported by
Kroeber's village data figuring an average of 200 per village.
Cook suggests that this eastern Coast Range area is more arid
and its stream valleys narrower than the western area and
thus supported a smaller population (Cook 1976:13-14).

Socio-Political Relations

The political unit of the Hill Patwin and Hill Wintun,
as of most Central California peoples, was what Kroeber defined
as the "tribelet". The tribelet was the "basic, politically
independent land holding group" (Kroeber 1962:30); and held a
defined territory, often a drainage, had a principal settlement
with a dance house and a chief recognized by the whole group,
was known by a name, usually that of the principal settlement,
often had associated minor settlements that acted together in ceremonies, land ownership, trespass, and war (Kroeber 1932: 257-259). Tribelet populations ranged from less than 100 up to 500 with an estimated average of 250, and the territories held ranged from 100 to 500 square miles, depending upon the richness of the area (Kroeber 1962:30-37). (The relationship is often inverse as a rich territory could support many in a small area.)

Each Hill Patwin and Hill Wintun tribelet had a chief who inherited his position patrilineally, although approval by the group was also required (McKern 1922:242-243; Goldschmidt 1951:325). The chief directed daily activities, announced duties such as where and what to gather, sanctioned ceremonies, and arbitrated disputes. He was usually the richest man and was responsible for providing food for ceremonies as well as the fair distribution of food during the year (Goldschmidt 1951:323-324, 365; Kroeber 1932:291). Other official positions do not seem to be formalized for these groups.

The basic socio-political unit within the tribelet structure was the patrilineal family called the sere by the Patwin and the olkapna by the Nomlaki (information on Hill Wintun comes from Goldschmidt's work with one tribelet, the Nomlaki). Each of these kin groups was individually named (McKern 1922; Goldschmidt 1951), and, according to Goldschmidt, the Nomlaki olkapna each formed its own exogamous village (1951:319). There is no evidence of this settlement pattern for the Patwin. The head of the patrilineal family had considerable authority over this male focused nucleus which included a man and all his agnatic kin, i.e., his brothers, sons, brothers' sons and uncles, as well as the unmarried women related through these males; married women belonged to their father's olkapna but lived with their husbands. Among the River Patwin, these families owned special functions such as salmon fishing or particular ceremonial roles as song leader, and, while these familial specializations may have extended to the Hill Patwin, Kroeber could not find any evidence for them (McKern 1922; Kroeber 1932:273).

Goldschmidt states that each olkapna owned a territory, although certain favorable resources such as fishing places and trees might be owned by individuals (households?). He suggests that the olkapna was essentially a clan, and some of his data indicate that this unit may be politically the functional equivalent of the tribelet (Goldschmidt 1951:317-322, 347), which, if true, would change tribelet derived ideas about the relationships between villages in this area. Nevertheless, Goldschmidt estimates that some smaller olkapna villages held only 25 persons or so, and it seems unlikely that a village of this size could function efficiently on their own so it seems safe to assume that many of these villages were linked at least through the Huta. The Huta was a secret society which cut across spatial kin groupings and was over and above the village/olkapna affiliation. Selected males were initiated into this society, and thereby gained esoteric knowledge and
control of special craft skills and professions as well as wealth through the trade of prestige items. Social status was thus linked to society membership and wealth (Goldschmidt 1951:326-328).

Nomlaki village organization focused on the chief's house where sweating, gambling, smoking, and storytelling took place; it was essentially a "men's house". It was a substantial semisubterranean structure with centerpost and rafters supporting a roof of bark, twigs, and earth. A space comparable to a village square was kept open in front for gatherings. The individual family dwellings, which formed a semi-circle around the chief's house, were 10-12 feet in diameter and 6-8 feet in height and made of saplings lashed with grapevine and thatched with wormwood. This type of "wickiup" was used in the summer camps as well. A major village also contained a ceremonial or dance house which was constructed like the chief's house only larger. A menstrual hut was established at the village periphery away from the water source. It was similar to the family dwelling in construction (Goldschmidt 1951:318-19, 422-23).

Kroeber notes three kinds of structures for the Hill Patwin village: 1) the dance house which was constructed much like the Nomlaki's; 2) the family dwelling which was more substantial than the Nomlaki, being semisubterranean and earth covered (it could be used for sweating); and 3) the thatch or bark hut used for the menstrual hut or for camping (Kroeber 1932:293-294).

Intergroup relations were marked by both friendship and hostility. Close neighbors were invited to dances and ceremonies (Goldschmidt 1951:365), and three or more tribelets might visit a given event (Kroeber 1932:345). Feasting, games, and gambling also accompanied these "Big Times". Trade was a vital intergroup activity, but it was not always amicable. Barter, or direct exchange, between neighbors for everyday items was controlled by the chief. An east/west exchange system existed between the hills and river based on the variation of resources between those ecological zones. Pine nuts, acorns, mountain seeds, foothill and mountain game, as well as shell beads moved east to the river while salmon, river animals, yellowhammer headbands, woodpecker scalps, and cordage moved west. Salt was available throughout the area, though the Salt Porno controlled the best source, this salt was a valuable trade item. Obsidian came from both the east and west,6 and magnesite from the Pomo. Trade was often carried on by the use of shell money (Goldschmidt 1951:336; Kroeber 1932:273-274). There was also a profitable north/south trade in which clamshell disk beads moved north from the central California coast through the Nomlaki middlemen, and pelts, bows, and flint and obsidian blades moved south from the Shasta area (Goldschmidt 1951:336-337).
Hostilities manifested themselves in feuds and warfare. A feud was fairly limited, being fought between groups within a tribelet as a result of a murder, conflict over a woman, or gambling dispute. Vengeance, likely in the form of murder, would be taken by the victimized person/family on the offending person/family. The chief would harangue the disputants, and sometimes a peaceful settlement could be arranged in the form of payment of a proper burial with a black bearhide and the exchange of other goods (Goldschmidt 1951:341-345).

Poaching was the main cause of war, which might take three forms: an attack on the poachers; a surprise attack on a sleeping village with the intent to destroy the village, its stores, and to kill the inhabitants; or, a formal pitched battle (Kroeber 1932:297-298). The hill peoples wore elkhide armor in a battle. The chief was not the warleader nor was there a warrior class, but a formal battle might end in a peaceful exchange of gifts brought about by the chiefs (Kroeber 1932:298; Goldschmidt 1951:342-343). The number of war stories belies the myth that California Indians were peaceful. Nine wars are reported between the Nomlaki and their traditional enemy, the Yuki (which means "enemy") (Goldschmidt, Foster, and Essene 1939), and others are reported between the Hill and River divisions as well as between Hill divisions (Kroeber 1932:300-303; Goldschmidt 1951:341-347; Johnson 1978:353).

Subsistence and Technology

The subsistence pattern of the Hill Wintun and Hill Patwin is similar to that of other Central California peoples. The resources that they utilized are well known, but the seasonal cycle is only described in general, with many details lacking. The major activities were gathering, hunting, and fishing, probably in that order of importance.

Although salmon did run up Stony Creek as far as Salt Pomo territory, they apparently were not plentiful, and fishing activities were on a smaller scale in the hill zone than on the Sacramento River. Other fish such as perch, trout, suckers, pike, and hardhead were caught by diving for them with a hand net, by hands alone, or by poisoning the water with turkey mullen and soaproot (Kroeber 1932:295; Goldschmidt 1951:406-407).

Hunting was important, the major game animals being deer and rabbit, with elk, antelope, quail, and bear desirable, and smaller game such as squirrel, kangaroo rat, turtle, dove, duck, and goose also being taken. Men hunted in groups or alone, and some were specialists. Chiefs and doctors, who were exempt from hunting responsibilities, were supplied by others, but they had hunting ability nonetheless.

Deer, rabbit, and quail were driven by a community effort into nets and then clubbed. This was an effective and
productive method of procuring quantities of meat. Another form of co-operative hunting involved running down deer or especially elk in a relay whereby the hunters, predetermining the direction of the elk, staked themselves along the route and took turns running and wounding the animals until they were exhausted and could be killed. Deer and antelope were stalked and shot with bow and arrow and smaller animals clubbed with a mahogany stick or trapped or snared. Game taken by a co-operative effort was always shared, and large game usually shared even when obtained by an individual. Meat could be dried or smoked for storage. Bear was hunted, more for its valuable pelt than its meat, which was eaten however. Grizzly bears were avoided because they were especially dangerous. Bears were generally of great interest and concern and figure strongly in tales and myths (Kroeber 1932:294-295; Goldschmidt 1951: 401-408).

In spite of the importance of hunting, it was the gathering of plant foods that provided the mainstay of the diet, and the seasonal availability of the plant foods dictated the seasonal activities and movements of these peoples. While some kind of game was nearly always available in a given vicinity (deer especially abound in this region), particular plants have a more limited range and very specific production cycles.

The lean winter months, during which little was available, were spent in the permanent village, living on the stores of the previous season. With the coming of spring and the growth of greens such as clovers, the gathering cycle began. In summer groups of people moved up into the mountains to gather for the year, possibly moving five or six times and spending only a few weeks at each temporary camp. Those foods which could be stored were brought back to the main village where a few old people usually stayed for the summer. The temporary camps were no more than three to four days travel from the main village (DuBois 1935:28-29). Each olkapna owned an area in the mountains, and several families camped together, often within shouting distance of others from the village. People returned to the winter village with the first cold weather (Goldschmidt 1951:318, 332, 384).

To speculate for a moment in terms of archaeological resources, a main village of 225 persons which broke into summer groups of three families each, averaging five persons per family for a total of 15 persons per group, would form 15 summer camping units, and, if each moved five times during the season, this would produce 75 summer camp sites. One might arrive at a minimal estimate by using the number of olkapnas in an area and limiting the number of moves to two per summer. Goldschmidt gives us a figure of 19 such patrilineal groups for the Newville/Paskenta area. If each of these olkapnas moved to the mountains without splitting up, and moved twice, 38 summer camp sites would be produced. However, we know that
at least some olkapnas were too large to camp together in the
summer, and two moves is probably too few so that this figure
is undoubtedly too small. Since these were owned tracts,
family groups would return to many of these sites year after
year so that grinding stones would be likely to be left for
the following year's use, and considerable debris would ac­
cumulate. These sites would be found near springs or other
sources of summer water and in conjunction with such resources
as black oak, mountain oak (? canyon live oak), sugar pine,
and manzanita.

The gathering season began with clovers and greens which
were the first available plants of the season. These were
eaten raw and not stored. Indian potatoes (Brodiaea spp and
others) became available in the spring also, and some tubers
may have continued at higher elevations well into the summer;
these were not stored. Seeds of grasses and wild flowers began
to be available in early summer, and varieties continued
throughout summer; these were an important storage item, and,
when parched, were known as "pinole". Several varieties of
manzanita berries were gathered, available mid-summer; mashed
berries produced a drink, while others were dried and stored.
A number of berries were picked towards the end of summer:
elderberries, blackberries, juniperberries, and wild grapes.
Buckeye was gathered in early fall.

Two of the most important crops became available in the
fall: pinenuts, both digger9 and sugar pine, and acorns.
Gathering pinenuts required special skills, and this was the
only gathering in which men took an active part; they climbed
the tall trees to knock the cones off which was a dangerous
job.

Acorns were the staple food, and there was a separate
name and preferred use for each variety. Acorns were stored
in large quantities, both in granaries and storage baskets,
for winter use. As is well recorded, acorns were ground and
leached, and then boiled into gruel or soup or baked into
bread. The soup was cooked in large baskets with the use of
hot "boiling" stones. The bread was baked in pit ovens, two
feet in diameter, lined with leaf or grass covered stones.
This soup or bread was a daily item in the diet. Oak patches
and individual trees were sometimes owned, indicating the
vital importance of the acorn crop. Both Hill Wintun and
Hill Patwin used a slab mortar, a hard, flat river stone, and
a basket hopper to grind the acorns in and a river cobble,
which was sometimes shaped, as a pestle. No mention is made
of metate/mano use for the preparation of any of the foods

The basketry industry supported the gathering system by
supplying most of the necessary burden baskets and cooking
and eating utensils; a wide variety of sizes and shapes were
produced. Coiling was used for most while carrying baskets were twined. Willow, basketroot (sedge), wild rose, redbud, and pine roots were the basic materials. Basket weaving, a women's craft, was a highly developed skill, and expert weavers were much admired and their baskets highly valued. North, beyond Wintun boundaries, baskets were twined, and Wintun weavers were apparently not as expert as their southern neighbors. Pouches and bags of skins as well as fine meshed netting also served for storage and carrying purposes (Goldschmidt 1951:427-428).

Men's craft specialties supported their hunting activities, i.e., the production of bows, arrows, clubs or throwing sticks, nets, and flint and obsidian points. There were craftsmen who produced these tools, each specializing in just one kind of tool so that the arrowmaker would not also chip the point. Particular care had to be taken in working obsidian, which came chiefly from the Shasta region, as it had "poisoning power" and a cut could be fatal. Women were not allowed to handle the material (Goldschmidt 1951:419).

Clothing was of skins or bark; men might go naked or wear a loin cloth of buckskin. Women wore skirts; wealthier women wore deerskin decorated with abalone shells and polished pinenuts for display at dances or ceremonies. Ordinary skirts were of the inner bark of maple or cottonwood trees. Rabbit-skin blankets were used for bedding and occasionally worn for warmth. Basketry hats were not worn this far south (Kroeber 1932:289-290; Goldschmidt 1951:424-425).

Religion, Life Cycle, and Ceremonies

While the Hill Wintun and Hill Patwin were culturally similar in many ways, as noted above, they were quite different ceremonially and also perhaps in their individual religious practices. Unfortunately, little is recorded for the Patwin concerning individual attitudes and practices of religious behavior, but Goldschmidt records for the Nomlaki that "most religious activity was individual" and closely tied to the life cycle or crises (1951:364). The world in general was populated with spirits, both benevolent and malevolent, and springs, called sawel, in particular were inhabited by these spirits. Each spring had a spirit with a specific power which might be approached by persons wishing that power. For instance, the afterbirth and naval cord were buried at a spring inhabited by a desirable spirit such as a hunting spirit for a boy (Goldschmidt 1951:364).

At a girl's first menses she was confined to a distant hut, and, after her confinement of some days, a dance and feast were held; neighboring villages might be invited to share in the occasion. A menstruant woman was dangerous and
the source of numerous, strong taboos (Goldschmidt 1951:373-376). (This was typical of much of California.) A boy's puberty was not similarly marked, although initiation into the Huta was somewhat comparable, however, initiates ranged between 16 and 30 years of age (Goldschmidt 1951:326-327).

Illness was caused by a "pain" due to a breach of conduct or by a poisoner. The shaman, a man or woman, who usually inherited the curing ability and skills, treated the sick by sucking out the "pain" (Goldschmidt 1951:355-359). A shaman could also throw pains into his enemies. When a death occurred, the body was flexed and tied right away. A Patwin body was wrapped in a rabbit net and a Nomlaki body in a bearskin (Kroeber 1932:290; Goldschmidt 1951:378). Burial was accomplished as soon as possible, and goods, especially beads, were interred with the body. Mourners sang and wailed all night, and the dead's property burned. Women cut and tarred their hair though men did not. Goldschmidt reports a second burning a year later for the Nomlaki which was apparently not practiced by the Patwin (1951:379), while Loeb and Kroeber report cremation of the dead among the western Hill Patwin (Cortina, Rumsey, and Long Valley) (Kroeber 1932:291; Loeb 1933:219, 222, 226).

The Hill Wintun ceremonial system was far less complex than the rich Patwin tradition. The Nomlaki held ceremonies/dances for the Huta and girl's puberty, as already mentioned, and also held a scalp dance for a successful war (Patwin did not (Kroeber 1932:297)). They held a spring dance as a celebration and first fruits rite in which both men and women sang and danced, and apparently there were not spirit impersonations. During historic times, the Bole and Hesi ceremonies were introduced; these will be discussed in the ethnohistory section (Goldschmidt 1951:364-366).

The Patwin had an intricate series of ceremonies which were powerful and dangerous, held in the semi-subterranean dance house and involved spirit impersonations and initiation by ritual death and rebirth. One was the ghost initiation in which all the boys of the village were initiated by the ghosts; no women participated. The Kuksu was also an initiation of selected males and females. It went on for four days and nights and involved a variety of separate dances and spirit impersonations as well as clowns. The initiates were shot or speared in the stomach. These two ceremonies were dangerous, but the Hesi was gentle (Kroeber 1932:329). The Hesi also lasted for four days and was held in May (Loeb 1933:217). Different Patwin communities each had their own variation of the ceremonies, but the complex was most elaborate on the River where these were three very separate ceremonies. A simpler version occurred in the hills where, for instance, the Stony Creek people incorporated all the elements into one ceremony. The Kuksu was widespread in central California.
from Yuki and Pomo through Patwin, Maidu and Miwok, but it did not extend to Nomlaki (see Map 12). Kroeber (1925, 1932), Loeb (1932, 1933) and others give this complex considerable attention, but historical revivalistic innovations have obscured the traditional picture.

It is the ceremonial differences between the Hill Patwin and Nomlaki that bring into focus the awareness that, while these two peoples were very similar in some regards, they were fundamentally different in other, important ways. Their subsistence systems were similar, and the patrilineal basis of their social structures was comparable, but there the likeness ends. The Nomlaki lived in scattered settlements tied together with a fairly secular secret society, while the Patwin seemed to live in more amalgamated villages and had a strong, cross-cutting ceremonial system. These characteristics fit with the hypothesis that the Hill Patwin were moving from an established center of Patwin on the River, while the Hill Wintun were radiating from a somewhat more recent influx of Wintuans farther north on the River by Cottonwood Creek (see Linguistic chapter). The Nomlaki were intermediate between these groups. They were patrilineal, had begun a secret society, and learned basketry coiling techniques like the Patwin, but, like the Wintu, they preferred a scattered village settlement pattern, had scalp dances, and did not have Kuksu type ceremonies. It should be mentioned, however, that the degree of difference may be a product of the ethnographers: Kroeber is weak on social structure, and Goldschmidt is weak on ceremony.

**Salt Pomo**

Unfortunately, very little is recorded on the Salt Pomo beyond their territorial description. They were friendly with both the Hill Patwin and Hill Wintun, and may safely be assumed to be like those two groups in many respects. Since, however, Pomo peoples do not have clearly defined patrilineages such as the sere or olkapna, the Salt Pomo social units were probably more like extended families based on both patrilineal and matrilineal lines. Like other Pomo and their Patwin neighbors, they were involved with the Kuksu ceremony. The most notable fact about the Salt Pomo is that they held a fine salt deposit, Cheetido, just above the present town of Stonyford. Peoples came from as far away as Potter Valley and Clear Lake to trade for this salt. It was also the cause of several wars. A trail ran from Potter Valley over Horse Mountain, across Rice Fork of the South Eel to Snow Mountain and down to the salt bed (Barrett 1908:244). Unlike the Nomlaki, the Salt Pomo were on good terms with the Yuki (Kroeber 1925, 1932; Barrett 1908).
Map 12. Distribution of the Kuksu Cult (Loeb 1933).
Boundaries, Tribelets, and Population

The northwestern section of the project area was inhabited by Yukian language family speakers who held the upper drainages of the Eel River. The four main divisions of these peoples were the Yuki proper and the Huchnom, who occupied the area of concern here, the Coast Yuki, who lived on the coast west of the Yuki proper, and the Wappo, who were discontinuous from the others, holding land in the Napa Valley region.

The eastern boundary of the Yuki ran south along the crest of the North Coast Ranges from the ridge separating the headwaters of the South Fork Trinity River and the Middle Fork Eel River, over Anthony Peak, Black Butte Peak, Sheetiron Mountain, and then southwesterly along Snow Mountain to just northwest of Horse Mountain, thus separating them from the Nomlaki, Salt Pomo and Hill Patwin to the east, and Eastern Pomo on the south (see Map 13). From near Horse Mountain the boundary line turned north to cross the South Eel River west of Hullville and ran along the Sanhedrin range, again crossed the South Eel and ran toward Laytonville to finally turn north along the divide between the South Eel and the South Fork Eel River. It turned east to form the north boundary at the headwaters of Blue Rock Creek, crossed the Eel and ran east and then north to encompass the drainage of the Middle Fork Eel (Barrett 1908: 248; Kroeber 1925:160-162; Foster 1944:154-157). To the north and west were the Athapaskan speaking Wailaki and Kato, and to the west and south their own kin, the Coast Yuki and Huchnom.

The Huchnom held an elliptically shaped territory, basically the valley of the South Eel River, on the southwest, adjacent to the Yuki. They shared the boundary from Horse Mountain to near Laytonville. From this latter point the Huchnom boundary ran south across Outlet Creek, encompassed the headwaters of Tomki Creek, and turned east across the top of Potter Valley and then down towards Horse Mountain (Barrett 1908:256-257; Kroeber 1925:202-203, 1958:227-228). Barrett's and Kroeber's easterly line encompasses the Eel entirely, however, Foster and Stewart show this boundary cutting across the Eel, thus giving the big bend to the Pomo (Foster 1944:154; Stewart 1943:32) (see Maps 13 & 14). This southern boundary was shared with the Northern Pomo.

Yuki territory is mountainous, ranging in elevation from below 1000 feet to more than 7000 feet. Their major subdivisions and foci of residence were based on the drainage system of the Eel, its tributaries and attendant valleys, where the favored site for a village was at the edge of the valley near a stream (Powers 1976:128; Foster 1944:157). Three of the six
Map 13. The Yuki and Huchnom (Foster 1944).
major subdivisions, which were marked by minor dialect va­
riations, were just west of the project area in Round Valley,
the "center" of Yuki culture, Eden Valley, and down stream on
the Middle Eel. These three subdivisions were known respec­
tively as the Ukomo'm (valley people) in Round Valley, the
Witukomno'm or Ùksismulhatno'm in Eden Valley, and the Ta'no'm
(slope people), who were close to the Wailaki. No'm is a
suffix added to a place name meaning 'a person of ', and
was used as a regular means of identification (Foster 1944:
157). There were, as well, in Round Valley at least two other
identifiable groups which could not be definitely assigned to
these major subdivisions (Foster 1944:160; Kroeber 1925:161-
166).

The remaining three subdivisions resided within the Mendo­
cino National Forest boundaries. The Suksaltamno'm (nicely
shaped pine tree people) held the upper Middle Fork Eel, from
the ranger station up, including all the headwaters. Foster
reports that inhabitants of this area were long dead when he
did his field work in 1937 (Foster 1944:156, 160). This is
a rugged, mountainous area, and Foster feels it was always
sparsely populated. Only one rancheria was remembered for the
area, Mulcal (creek white), some 15 miles up stream from the
ranger station, and known as a good fishing spot (Foster
1944:160).

The Huititno'm (middle ridge people) held the Black
Butte River drainage which was comparable to the Suksaltamno'm
area and contained an abundance of deer. Four rancherias were
scattered along the east side of Black Butte River: 1) Huitit
(middle ridge), a no'hot or major village which was below
Black Butte; 2) Suk'hui (fir thicket), a ways upstream south
of Cold Creek; 3) Pilil (snow rock), further upstream; and
4) Titam (mountain), another no'hot and the farthest upstream
(Foster 1944:160).

The Onkolukomno'm (ground (?land) in another valley
people) held Gravelly Valley (Lake Pillsubry) and the surround­
ing drainage of the South Eel River including the Rice Fork.
This was apparently a favorable location, but there are no
survivors of the group and consequently little information on
rancherias in the vicinity (Foster 1944:160). Barrett re­
ports that this area was also known as nutc-ukom, gravel-
valley, and by the Eastern Porno as "starvation valley". He
lists two villages for the area (Barrett 1908:254-255).

The Huchnom (outside the valley (Powers 1976:126)) were
very similar to the Yuki, although they were on good terms with
the Northern Pomo. Barrett lists 10 villages along the South
Eel as well as two on Tomki Creek and one at the northern end
of Potter Valley for a total of 13. These all lie beyond the
project (Barrett 1908:258-260).
Kroeber had not yet finalized his definition of tribelet when he did his Yuki fieldwork on which his Handbook (1925) article is based, so we do not have as clear an idea of the number of Yuki tribelets as some other areas (e.g. Pomo). However, he counted six 'political units' for the Ta'no'm and three for the Ukombo'm (1925:165, 1932:374). The mountain divisions were probably only one, or at the most, two small tribelets each, and the Gravelly Valley may have had several as did the Huchnom. According to Kroeber, a dance house did not necessarily indicate a tribelet center for Yuki as it did in Pomo and Patwin territory (1932:373).

Kroeber estimated population for Yuki at 2000, although he felt that was a fairly conservative number, and 500 for the Huchnom (Kroeber 1925:168, 203). Cook reassessed this number on the basis of reported villages. His estimates greatly increase the population to 6880 for Yuki and 2100 for Huchnom. He suggested that the Huittitno'm on the Middle Eel and the Suksaltatamno'm on Black Butte River were probably equivalent and assigned to each 400 persons, but only 600 for the Onkokomno'm (Cook 1956:106-108).

Socio-Political Relations

The political unit of the Yuki, like the Wintun and other Central California Indians, was the tribelet. (The "tribelet" differs slightly for each ethnolinguistic group, however.) For the Yuki it consisted of a large rancheria, a no'hot, which might have 25 individual family dwellings. The chief, ti'ol, and other officials resided at the no'hot, and the dance house was located here also (cf. Kroeber, above). A number of smaller villages were allied with this central town. The number of secondary or satellite villages fluctuated from time to time according to the chief's popularity, i.e., the bond was not very stable. Each of these smaller villages also had a head man or captain, who was the head of the major family or lineage in that village; the larger villages contained several family groups or lineages. These family groups of blood kin were not formed on a strict basis such as the patrilineages of the Nomlaki and Patwin but were apparently a more flexible unit (Barrett 1908:249-251; Kroeber 1925:161; Foster 1944:176).

The chieftainship was, in general, inherited patrilineally, but this line of succession was not strict. Ideally the selection of the chief occurred while the potential chief was still a boy so that he could be specially prepared particularly in the art of oratory or harangue. All the important men participated in the selection process, but the residing chief's preference was the deciding factor (Foster 1944:177-178). A new dance house was constructed when a new chief took office. A special oak was selected for the centerpost, and the new chief "rode it" down as it was cut and then carried into the village
The duties and responsibilities of the Yuki chief were much like the Patwin/Nomlaki. A main function was to harangue the people daily to be good, respect each other and carry out their chores. If the chief was a woman (and though this was not the norm, it was possible), she named a man to carry out this duty. The chief had to set an example of good behavior or he might be asked to resign. The chief decided when festivities and rituals should be held, arbitrated disputes, and generally saw to it that things went properly. The chief often wore a bearskin robe, beads and other items of wealth and status. He was not required to do the usual work such as hunting and fishing but was brought gifts by his villagers. He might have several wives (Foster 1944:177). The Huchnom chief did hunt and fish but accumulated wealth from gifts (Foster 1944:227).

The individual houses in the village were made of bark leaned against poles (Powers 1976:128), about 10 feet in diameter and eight feet high with the floor dug out about one foot. The dirt was packed around the outside to keep out water and wind. Up to eight people (possibly two families) might live in one of these houses. A few other houses, the chief's and other rich men's, were larger and built like a small dance house. This latter house type was probably found only in the Gravelly Valley and Eden Valley areas, and in Huchnom territory where the Pomo influence was strongest. Most houses also had a small, rough, lean-to structure attached to the back for acorn preparation in the winter (Essene 1942:10-11; Foster 1944:176). The houses were clumped in irregular groups within the village. Only villages with a main chief had a dance house which was also apparently used for sweating (Kroeber 1925:164). It was similar in design to the Patwin/Nomlaki structure. A special menstrual hut was not used except for the observance of the first menses. Summer houses in the mountains were made of brush (Foster 1944:184). For the Yuki as for the Hill Patwin and Nomlaki, "Big Times" and trade were important to external relations. In a time of abundant food, a chief would decide to hold a "Big Time" and invite neighboring peoples. Groups as distant as the Salt Pomo are reported to have attended some Yuki "Big Times". Different groups performed common dances accompanied by singing and a foot drum. (The sacred dances were not usually part of these activities.) Feasting, gambling, and games such as shinny (a hockey type game with sticks and wooden ball) were essential parts of a "Big Time" (Foster 1944:190-197).

Trade was principally with groups to the south, and particularly the Huchnom were intermediaries for the Yuki. Foster feels that the Wailaki were relatively poorer and so offered nothing of value or interest to the Yuki. Clamshell disk beads came from Bodega Bay in both finished and unfinished form.
through the Huchnom and Sherwood Pomo. They had a fairly standard value and were used as money. Valuable magnesite cylinders or "Indian gold" (always in finished form) came from Southeastern Pomo. Thick clamshell disk beads were worth $2 per 100 while magnesite cylinders were worth from $5 to $20 each. Dentalia shells, also from the south, were owned only by the wealthiest families. Other items obtained through trade were mussels, surf fish, kelp, and seaweed from the coast, and salt from the Salt Pomo. Dried venison, fish, skins and rope were the major items traded in return (Kroeber 1925:166, 175, 176; Foster 1944:164, 167, 173-174).

Interestingly enough, obsidian was also traded in but was so rare that it had no fixed value, although it was considered a "treasure" (Essene 1942:23). The Yuki were apparently unaware of its source, and though they called Mt. Sanhedrin wai'lil, obsidian rock, it has not been identified as a real quarry. No regular trade for this important substance was evidently ever established by the Yuki (Foster 1944:174).

Warfare was the third facet of external relations, and the Yuki were notorious as the most ferocious and warlike people in northern California (Powers 1976:125, 128; Kroeber 1925; 167, 175; Foster 1944:188). The causes of war were similar to those for the Nomlaki and Hill Patwin: murder by an outsider, suspected witchcraft or poisoning, molesting or kidnapping women, and poaching. Any of these circumstances could potentially be satisfied through arbitration and payment, but these were not always accepted by the injured party. Besides the readying of weapons, war preparation included, a dance held by the war chief, who was specially prepared for his position. (He was not the tribelet chief.) Men dressed for battle, and both men and women danced this terrifying dance. Those who remained at home continued to dance so that the warriors would not tire (Foster 1944:188-189).

A war might be a surprise attack or a formal battle, but in either case, no enemy was spared, neither male or female, young or old; prisoners were rarely taken except for an occasional woman or child. A victory dance was held upon return to the village. Enemy scalps and even heads were the foci of this celebration. Wars are reported between the Yuki and virtually all of their neighbors (Foster 1944:188-190).

Subsistence and Technology

Like the Hill Patwin and Nomlaki, the Yuki and Huchnom had a gathering, hunting, and fishing economy. The principal difference between these groups was that the Yuki/Huchnom had plentiful salmon so that fishing was far more important for them than their neighbors to the east. Three yearly runs of
salmon, fall, winter, and spring occurred, trout and steelhead were available in the summer, and the large, black lamprey eel was also taken. The Yuki gigged and netted the fish, and trapped them in wiers. Salmon were preserved by drying in the sun; netted fish were preferred for preservation as gigging damaged the flesh making it more likely to spoil. Guts and bones were either burned up or thrown back in the water. Fishing was important socially as well, for several families went together for some days at a time and shared the catch. The Yuki considered the Wailaki to be better fishermen, particularly for their skilled use of the gig (Foster 1944:163-165).

With a few exceptions, hunting techniques and game animals were identical to the Hill Patwin and Nomlaki. Antelope are not mentioned in Yuki territory, rabbits were not taken in communal drives, and quail fences were not used. Deer were abundant and a main quarry. Deer meat was cut in strips and dried in the sun (jerked) and then stored (Foster 1944:161-163).

In spite of the significantly emphasized use of fish among the Yuki, gathering was still probably the dominant facet of the subsistence system, and undoubtedly the movement into the summer mountain camps was dictated by this gathering cycle. Given the lack of further data, the model of summer encampments developed in the Hill Patwin/Nomlaki section is considered applicable for Yuki also.

The gathering and the preparation of plants was also similar to Hill Patwin and Nomlaki for it is a typical Central California gathering system. At least six kinds of acorns were used, including tan oak, valley oak, and black oak; a basket hopper and slab mortar were used in the grinding, and the meal was boiled into soup or baked into bread. A special kind of red earth was added to the bread dough to act as a kind of "leavening". A large loaf of bread, a foot and a half in diameter and one foot thick, would last six people for four days accompanied by the usual other foods. The acorn supply was insured by a special four day winter ceremony. Pine nuts, both sugar and digger pine, buckeyes and peppernuts were important as well. The appearance of the army worm every three or four years was the cause of great rejoicing. It was a sign that Taikomol, their god, was pleased with them. The worms were cooked and eaten in a communal ritual (Foster 1944:165-167; Chestnut 1902).

Yuki baskets were both coiled and twined, though the best ones were coiled. Yuki mark the northern most extension of coiling in California; the Wailaki do not practice this technique at all. Yuki used dogwood, or sometimes hazel for foundation, and mainly redbud, though sometimes digger pine root, for the sewing. Sedge was not used. According to Kroeber, Yuki basketry is of good quality but not as fine as Pomo, and it is easily distinguished from other peoples'
work (Kroeber 1925:169-172; Kelly 1930).

Women produced the baskets, the tools of their gathering responsibilities, while men produced their hunting and fishing implements. Craft and activity specialization was not well developed, and, although there were some recognized experts, Foster feels they were not true professionals since they also had to fulfill the usual, full requirement of daily and seasonal activities. Ownership was also limited. A man owned his weapons and religious paraphernalia, a woman her baskets and pestles, and together they owned their house, but beyond this very basic level, everything was communally held by the village. Neither oak trees, seed patches, nor fishing spots were owned by an individual or family (Foster 1944:172-173).

Religion, Life Cycle, and Ceremonies

For the Yuki, the soul was equated with the breath, and, when the breath went out of a person, he died. The soul then visited each spot the person had ever been before it went to the sky. Ideas were vague about this sky "heaven", but souls could return to earth, although they were not feared (Foster 1944:206-207).

Taikomol (he who walks alone) was the creator of the world and supreme being whose voice was the thunder. This concept was very similar to the Christian concept of God being anthropomorphic, omniscient, omnipotent, and omnipresent, but seems to have been genuinely indigenous (Foster 1944:223). There were other lesser spirits as well: mumolno'm, dwarf men who gave power to doctors and who controlled the spirits of the deer; sut'omol, deer mistresses who were small females (though not the wives of the mumolno'm) and who could bring hunting luck; Pal or Mitlili, a giant eagle who guarded the obsidian rock; and uksa who controlled fish spirits and was a dangerous siren (Foster 1944:204-209). The Yuki also believed that a deer or fish soul was immortal, and for every one that was killed, another replaced it so that the supply could never be depleted (Foster 1944:162, 164). Nevertheless, human reincarnation was apparently not considered (Foster 1944:207). In general, the Yuki seem to have been more pragmatic about the spirits in their environment than the Hill Nomlaki and Patwin.

Birth took place in the regular dwelling where a woman was attended by her mother and perhaps a midwife. A doctor or shaman was never called to assist. The afterbirth was buried in a deep pit outside, but the navel cord was carefully saved to be used as a medicine if the child sickened. Both mother and father observed restrictions for three months following the birth; the mother's was considerably stricter (Foster 1944:178-179).
A girl's first menses were very important, not only for her, but for the whole group. The restrictions and ceremonies were closely tied to the acorn ceremony and the assurance of a bountiful acorn, berry, and nut crop. The girl was secluded in a brush hut, and there were dances and singing. She stayed secluded for a month, until her next menses, which was accompanied by another four days of dances and songs and finally followed by a feast. The whole community as well as neighbors participated in this event (Kroeber 1925:195-196; Foster 1944:182-183).

Illness could be one of two types as a consequence of the cause: it could be a minor ache or pain from a natural cause, or it could be a more serious illness stemming from a magical cause. "Natural" diseases were treated by home remedies such as herbal teas made from angelica, pepperwood, or wormwood (Foster 1944:174-175). Serious problems were the result of an intruded disease object, poisoning, fright, breach of taboo, or rattlesnake bite. These required the services of a doctor, and there were several kinds of doctors, some of whom specialized in the treatment of particular problems such as snakebite (Foster 1944:212-219). Shamans could be men or women, but the men were considered to be the more powerful. They received their powers both through divine selection and instruction from another doctor (Foster 1944:212).

Upon death, the body was washed and then folded, knees to chin, and bound tightly in a deer skin or burial basket. Burial was usually accomplished the next day in the graveyard several hundred yards from the village. The grave was dug five to six feet deep, and the body faced to the east accompanied by favorite possessions. A burning of the remainder of the dead's possessions took place within the month. Relatives and friends contributed to the pyre and sometimes the dead person's house was burned as well. Mourning lasted about one year (Foster 1944:186-187). The Huchnom cremated the dead along with their possessions, and placed the ashes in a basket for burial (Foster 1944:232).

The Yuki had two kinds of initiation or schooling ceremonies, and there is some confusion between the two due to contradictory evidence being given. (The ceremonies had not been given for a long time, and all rituals were banned by the Pentecostal Church which had numerous Yuki members (Foster 1944:209)). The hulk'ilal-woknam or ghost initiation, took place every several years and only included boys and men. No woman was even supposed to know about it. Tai-komol gave his people this ceremony in which the initiates fasted for four days in the dance house and were scared by the "ghosts" through dances, songs and wild behavior. This is similar to the Kuksu of the Patwin and the Pomo ghost initiations (Kroeber 1925:185-191; Foster 1944:209; Loeb 1932).
The Taikomol-woknom is called the "boys' high school". It was a period of ritualistic instruction whereby all the boys and apparently some girls learned the mythology and esoteric knowledge of the group. It too took place in the dance house but was not accompanied by dancing or ghost impersonations. Rather, it began with a four day fast followed by a period of story-telling of the myths and other instruction. At the finish of the school the graduates were thrown out through the smoke hole in the roof (Kroeber 1925:184-190; Foster 1944:210-211).

Kroeber feels that the Huchnom culture was more closely affiliated with the Pomo, although he acknowledges that ceremonially they were virtually identical to the Yuki (Kroeber 1925:203). Foster feels that the Huchnom resembled the Yuki more strongly than the Pomo. However, he points out that "it should be remembered that cultural similarities between the Yuki, Huchnom, Kato, and Pomo were more marked than the differences, and it is only when dealing with comparative minutiae that tribal peculiarities become clear" (Foster 1944:225).
Boundaries, Tribelets, and Population

The southwestern corner of the project area in the Clear Lake vicinity was controlled by speakers of the Pomoan language family. The three of the seven divisions of Pomo who had lake frontage were the Northern Pomo, Eastern Pomo, and Southeastern Pomo, and there was one group of Miwokan language family speakers, the Lake Miwok, who also fronted the lake and were geographically distant from other Miwokan speakers. The proportion of project area involved by these several groups is considerably smaller than by the Yuki and Hill Patwin/Noalaki, but the Clear Lake area was a center of cultural focus in the North Coast Range, greatly influencing especially the neighboring Yuki and Hill Patwin, and consequently of greater importance here than the amount of controlled land would imply.

The north boundary of the Northern Pomo extended east from the coast near Cleone Beach to north Sherwood where it met Huchnom territory, and they shared this boundary to Horse Mountain. There is some disagreement between Barrett, Kroeber, and Merriam on one hand and Stewart and Foster on the other hand concerning the portion of boundary at the head of Potter Valley. The former three show the line encompassing the bend of the South Eel and the north tip of the Valley, including a village (Ukumna or Kaleda) on the East Fork Russian River (Barrett 1908:120, 257, 259; Merriam 1910-1929; Kroeber 1925:203, 1958:227-228). The latter show the Pomo holding the bend of the South Eel north of Potter Valley (Foster 1944:154; Stewart 1943:32) (see Maps 13 & 14). This area was apparently in dispute over the hunting rights as it was an excellent elk hunting ground (Stewart 1943:40) and over the fishing rights at the head of the East Fork Russian River (Loeb 1926:210). 12

In either case, the boundary ran around the north of Horse Mountain, down the ridge between Middle Creek and Rice Fork, down Middle Mountain west of Middle Creek, and finally reached the lake passing east of Tule Lake and just west of Upper Lake. The Northern Pomo held lake frontage on the northwest shore of the lake down nearly to Lakeport, including Scott's Valley, and on across the Russian River Valley to the coast near Navarro (Barrett 1908:125). Stewart shows the line east of Potter Valley extending east across the Rice Fork to Snow Mountain thus claiming Yuki territory and creating a mountainous corridor to the Salt Pomo (1943:32, 41). However, such areas far removed from major settlements could not be tightly controlled so that ownership was fairly tenuous. (Stewart agrees with the remainder of Barrett's boundaries (Map 14).)
The Eastern Pomo held lands spanning Clear Lake proper. They shared their western boundary with the Northern Pomo along Middle Mountain and west past Upper Lake. They were separated from the Hill Patwin in Long Valley by a boundary following the Long Valley Ridge and from the Southeastern Pomo by a boundary from the ridge southwesterly to just north of the Narrows. On the other side of the lake they held Big Valley and Kelseyville. The Lake Wappo, or Lileek, held a small area adjacent to the Soda Bay-Mt. Konocti area (Barrett 1908:182-183).

The Southeastern Pomo held an area spanning the East Lake and Lower Lake portions of Clear Lake. From the Eastern Pomo line on Long Valley Ridge their boundary continued on down the ridge of Cache Creek to a point about four miles from its source in Lower Lake. The line ran up Cache Creek, across the tip of the Lake and towards the head waters of Cole Creek on the west side of the Lake, where they also abutted the Lake Wappo (Barrett 1908:204-205).

The Lake Miwok were the southernmost people on the Lake, holding only the end tip of Lower Lake. From the Cache Creek boundary they were separated from the Hill Patwin by a line which ran southeasterly down the ridge between Jerusalem Valley and Morgan Valley and down to Putah Creek somewhat east of Snell Peak. The boundary then swung around towards Mt. St. Helena, passed over Pine Mountain, Cobb Mountain, and turned back towards Lower Lake at Mt. Hannah. Merriam shows the territory taking in a good sized piece south of Middletown (Merriam 1955:46; Barrett 1908:314-315) (see Map 14). However, this southwestern boundary between the Lake Miwok and the Wappo has never been definitively ascertained by ethnographers (Cook 1956:122).

The Northern Pomo held a large territory from the Pacific Coast to Clear Lake, so only a few of their tribelets and settlements held lands in or adjacent to the project area. Although Potter Valley, known as Balo Kai or Oat Valley (Powers 1976:156) is small, seven miles long, it held three tribelets together maintaining at least 14 villages (Merriam 1977:5-32; Stewart 1943:39). The northern tribelet, which was the most populous and the dominant one, was Sanel (at the dancehouse) named for the principal village, though not the most populous one, which was Yamo. Sedam (trail past the brush) was the central group which claimed the mountain area across to Snow Mountain. The village of Sanekai (sweathouse valley) six to seven miles east of Centerville was associated with Sedam (Barrett 1908:140-143; Stewart 1943:40; McLendon and Oswant 1978:284). The Pomo (at the red earth hole, probably the red earth used for baking acorn bread) was the southernmost tribelet and was apparently once allied with the Matuku on Cold Creek. The Potter Valley tribelets co-operated
with each other and gathered together on some occasions for ceremonies (Stewart 1943:40-41). Kunkel lumps the Potter Valley and Coyote Valley groups into one "federated" tribelet (Kunkel 1962:318-326).

Bachelor Valley and Tule Lake were held by another tribelet which was an amalgamation of Northern and Eastern Pomo. It was called Sinal by the Northern and Kaiyao by the Eastern; both names mean "at the head", i.e., at the head of the big Lake. The Northern people, in particular the Matuku, were moving into this area (Stewart 1943:41; McLendon and Oswalt 1978:285-286). Barrett (1908), Kroeber (1925) and Kniffen (1939) mention Yobutui as a separate Eastern Pomo tribelet on the west side of Upper Lake, and Kunkel suggests it was absorbed into Sinal (1962:269). A fifth Northern Pomo tribelet, Yimaba, held Scott's Valley and was also moving into this general area (Kniffen 1939:368-369; Stewart 1943:41-42).

Stewart estimates the Potter Valley population at 1000 (1943:39), Cook at 1120 (1956:113), and Kunkel, including the Coyote Valley group, at 1520, producing a minimum density of 4.17 persons per square mile and a maximum of 6.33 (1962:326). For the Sinal Kunkel gives a minimum population of 270 based on Palmer (1881), producing a density figure of 6.75 persons per square mile and a maximum population estimate of 405 based on Cook (1956), producing a density of 10.13 per square mile (1962:271).

There were three Eastern Pomo tribelets for which 20-30 villages and camps are listed on the northeastern side of Clear Lake (Barrett 1908:185-191; Merriam 1977:102-106). The Xowalek (?city of fire) held the Middle Creek drainage, bordering Sinal and Sedam, from the northernmost marshy tip of Upper Lake up to the Eel divide. Danoxa (mountain water) held the rich eastern shore of Upper Lake, including Bloody Island, Clover Creek and into the mountains (Kniffen 1939:367; Stewart 1943:42-43; McLendon and Lowy 1978:306). The main village of Danoxa was on a hill about two miles northeast of Upper Lake town (Barrett 1908:188; Merriam 1977:102). Cigom held about eight miles of the narrow lakefront plain with the main village of Cigom (blanket standing) at Lucerne (Kniffen 1939:367; McLendon and Lowy 1978:306). Two additional Eastern Pomo tribelets, the Kulanapo and the Habenapo, occupied Big Valley on the opposite shore of Clear Lake.

Palmer's informant gave figures of 100 and 120 respectively for Danoxa and Xowalek (Palmer 1881:34) which Cook increases to 150 and 225 respectively (Cook 1956:112). These figures produce minimum densities of 1.67 and 2.4 persons per square mile respectively, or combined 2 per square mile, and maximum densities of 2.5 and 4.5 respectively, or a combined density of 3.41 per square mile (Kunkel 1962:274). However, these densities are significantly lower than others in the
area, and, given the number of villages/sites listed by Barrett and Merriam, these population figures are suspect.

The figures for Cigom present a unique situation as Gifford collected a complete village census on the basis of his informant's excellent memory. It pertains to approximately 1850 at which time Cigom held 235 persons (Gifford 1926:292-295). The density of this tribelet at this time was 5.86 persons per square mile (Kunkel 1962:250).

The Southeastern Pomo, or 'Hamfo, consist of three island communities which are usually considered to be separate tribelets, but Kunkel treats them as a 'federated' tribelet due to the ceremonial co-operation between them (Kunkel 1962:252-253). Each of these tribelets had a main village based on an island with associated settlements on the mainland. Kamdot was on Anderson Island and owned mainland areas on the north of the Lake adjacent to Cigom, including the western half of High Valley, and on the south the peninsula projecting from Mt. Konocti (Gifford 1923:87). Elem was on Rattlesnake Island on East Lake, just off the shore of Sulphur Bank; Elem owned the mainland on three sides of the island, including Borax Lake and the east side of High Valley (Gifford 1923:87; Kniffen 1939:371). The Koi lived on Lower Lake Island at the end of Lower Lake near the outlet to Cache Creek. They owned lands on both sides of the lake, including the magnesite deposit several miles down Cache Creek. Gifford's and Kniffen's maps show Koi rather than Lake Miwok controlling the entire Lower Lake shoreline (Gifford 1923:90; Kniffen 1939:371).

The minimum and maximum population estimates for these groups show, even at the minimum level, high density for the Southeastern Pomo. Estimated population for Koi is: minimum, 120; maximum, 230; projected respective densities are 6 and 11.5 persons per square mile. Estimated figures for Kamdot are: minimum, 140; maximum, 340; projected respective densities are 5.83 and 14.17 persons per square mile. Elem figures show: minimum, 130; maximum, 500; respective densities are 4.33 and 16.67 persons per square mile (Palmer 1881:34; Cook 1956:112; Kunkel 1962:257).

In sum, of the Pomo peoples involved with use of the project area, we have a minimum, estimated population figure of 2,115 with a density of 4.62 persons per square mile; adjusting this by eliminating the suspiciously low figures for Danxoa and Xowalek, we reach a minimum density of 5.49 persons per square mile. For a maximum estimated population we have 3205 with a density of 10.77 persons per square mile; again, adjusting this for the low numbers and by eliminating the high figure for Elem, we reach a maximum density of 9.7 persons per square mile.

The Lake Miwok contained two or possibly three tribelets (Kroeber 1932:366). Tuleyomi (deep place) was a large, old
center two miles south of the town of Lower Lake (Barrett 1908: 318; Merriam 1977:134), and is mythologically the home of Old Man Coyote (Callaghan 1978:264). This territory basically encompassed the valley at the end of Lower Lake (Excelsior Valley) and the Cache Creek area, including the town of Kawiyome about one and a half miles down Cache Creek (Barrett 1908:315-317). Coyote Valley to the south on Putah Creek held another center, Oleyomi (coyote place) (Kroeber 1932: 366; Barrett 1908:315-317; Merriam 1977:131). Each of these centers had a dancehouse (Kroeber 1932:367). Barrett, Merriam and Kroeber agree on these two divisions but do not try to draw any definite boundaries between them. Kroeber says that Lakahyomi (dry town), a mile or so from Middletown, also had a dancehouse (1932:367) and a village in Pope Valley which had a similar name may have been a third tribelet division (Kroeber 1925:273). However, there is some confusion, not only between names of these villages, but also as to affiliation with Lake Miwok or Wappo (Cook 1956:123).

Kroeber estimates Lake Miwok population at 500 (1925: 275), and Cook derives a number from village lists for combined Lake Miwok and Northern Wappo at 1800 (1956:124); probably at least half of this figure may safely be considered Lake Miwok.

Socio-Political Relations

The tribelet was the basic political unit for the Pomo, although there were some differences in structure between various Pomo groups as well as differences from their neighbors. Kunkel suggests, for instance, that the Potter Valley groups of Sanel, Sedam, and Pomo formed a "federated" tribelet which also included Matuku, and that the three Southeastern groups of Koi, Kamdot, and Elem formed a "federated" tribelet as well (1962:318, 126, 252-253). While these groups undoubtedly were allied and co-operated ceremonially, nonetheless, each was apparently able to function independently from the others, and consequently it seems sounder to think of them as separate units (tribelets) which sometimes co-operated in joint ventures.16

In most Clear Lake Pomo major villages there were several contemporaneous chiefs of equal rank, with one of them acting as the official, overall chief. Each of these chiefs was the head of one of the several kin groups in that village. His position was based on heredity with the matrilineal line, from mother's brother to sister's son, being favored. Other blood ties, however, e.g., father to son, might be used, and group approval was also a requirement (Gifford 1926:333-345; Gifford and Kroeber 1939:154, 196-197; Kunkel 1962:197-198). Unlike the Patwin and Nomlaki whose kin groups were strongly patri-lineal, Clear Lake Pomo kin groups were based on either matri-
or patrilineal ties, although matrilineal relations predominated (Gifford 1926:344; Loeb 1926:235-245; Kunkel 1962:218). However, the Northern Porno at Sanel in Potter Valley had a more patrilineally oriented organization: the chief, or the multiple but equal chiefs (conflicting evidence on this) inherited the position through patrilineal lines, and residence patterns were apparently patrilineal (Gifford and Kroeber 1939:149, 154; Stewart 1943:40; Kunkel 1962:321-322). Lake Miwok chiefs inherited the position through matrilineally oriented ties, and there was only one chief per village (Gifford and Kroeber 1939:154).

Porno chiefs' responsibilities were similar to those previously described such as setting a good example, exhorting his people to behave well, acting as village host, settling quarrels, etc. In multi-chief villages each chief had responsibility for his own kin group and conferred with his fellow chiefs on village wide matters (Gifford 1926:333-342; Loeb 1926:235-248; Kunkel 1962:191-205). This organization, of a chief's representing a residential, composite kin group, was cross cut by both the sudatory and ceremonial organizations which were highly developed in Porno society.

At about age 14 or 15 a boy was taken into the men's sweathouse by a sponsor, who was usually his maternal uncle. The membership was divided into two sides, and the new inductee took his sponsor's side. These two sides regularly engaged in competitive sweating to see which could take the most heat, and they also formed the basis of competition and organization for other games and festive activities beyond the sweathouse (Loeb 1926:160, 217, 222).

The secret society members, known as matutsi in Eastern Porno, managed the rituals and ceremonies. A child was marked at an early age for membership and specially trained until initiation, which was probably at puberty. In the village of Cigom approximately one third of the able bodied adults were members of the society with males predominating three or four to one. The secular chiefs were usually but not always members. The society was headed by a leader, who was not the village chief, known in many locations as the yonta, who was a powerful man in the community due to this position (Gifford 1926:347-362; Loeb 1926:364-369; Gifford and Kroeber 1939:160-162). Lake Miwok also had a secret society whose members were known as walintem. Both men and women joined through an admission fee of bead money for the initiation and training (Loeb 1932:116).

A principal village contained a dance or assembly house, at least one sweathouse, and a number of dwellings. In Cigom, a principal village with a population of 235, there were 20 houses, 18 of them holding two or more families or hearth groups. Each family had its own entrance and fire, which
was close to their entrance. A typical house might measure 20 by 40 feet in which from two to five hearth groups lived. Each hearth group consisted of two to seven related persons who were likely to be a several generation extended family formed around the nucleus of a married couple. The hearth groups within the dwelling were related, often through matrilineal ties. Each group ate and slept around its own hearth but shared a single, large, centrally located baking pit and possibly shared a mortar with the other groups. These dwellings were framed with poles and thatched with brush or tule (Barrett 1916; Gifford 1926:219-295). Gibbs reported these houses were burned every spring (1972:9). Lake Miwok houses were also multi-family and of similar construction to the Pomo houses (Gifford and Kroeber 1939:143-144). There was no particular village plan in the Clear Lake area; the village was often a scatter of houses on a flat or creek course with up to several hundred yards between houses (Loeb 1926:234).

Private ownership of land is well recorded for Southeastern Pomo, and Gifford strongly suspects it was true for the Eastern Pomo as well. For instance, named tracts were listed for Elem, each of which was owned jointly by a patrilineal family, passing from fathers to sons. The plant resources were the exclusive right of the owners, but others could hunt deer across the territory. Usually a family owned both a lakefront tract and a hill or mountain tract. The village of Elem and Rattlesnake Island were communal property as were the fishing rights on the Lake (Gifford 1923:80-89). Stewart reports that the Northern Pomo in Potter Valley individually owned trees, seed tracts, and other vegetal resources which were inherited patrilineally (Stewart 1943:40), but Gifford's (Cultural Element Distribution (CED) list denies private ownership for the Sanel (1939:155).

Intergroup relations between Pomo tribelets were complex, involving alliances, trade, and warfare. Kunkel suggests that both the three Southeastern Pomo island communities and the several Potter Valley village communities were "federated", i.e., were not politically autonomous. The federation is evidenced among the Southeastern Pomo in part by the reported absence of warfare between the three groups (Gifford 1923:81), but, most importantly, by their ceremonial co-operation for the Kuksu cult which Kunkel feels is tantamount to a political structure (Kunkel 1962:262-255). It should be noted, however, that the Lake Miwok also participated in the Kuksu ceremonies with the Southeastern Pomo by sending their boys to Sulphur Bank to be initiated (Loeb 1932:123), and it is quite unlikely that the Lake Miwok were politically subsumed by the Pomo group. The Potter Valley people shared hunting privileges, aided each other in war, and gathered together for Big Times and ceremonies (Stewart 1943:40). While these activities clearly demonstrate alliance, they do not necessitate a single, overall political structure.
The Pomo were particularly active traders. Iris fiber cord for snares, arrows and sinew-backed yew bows came in from the north; seaweed, mussels, haliotis shells, and sea mammal furs came from the coast. The Clear Lake peoples traded fish, acorns, skins, magnesite and obsidian in return (Kroeber 1925:257). Obsidian from Lower Lake was preferred for making arrow points and obsidian for cutting and shaving came from Cole Creek (Loeb 1926:179). Other goods included basketry materials, belts, robes, salt cakes, and feathers (Loeb 1926:192-196; McLendon and Lowy 1978:311). When a trading session was to be held, the chief of the host village would invite another village to a feast, letting them know what was to be traded, e.g., fish. The guest village brought strings of beads (clam shell disk beads), and the chiefs decided on the rate of exchange for that particular event (Loeb 1926:192-196).

Most notably, however, the Pomo were the master bead-makers in Northern California, and, as previously mentioned, the clam shell disk beads and magnesite cylinders produced by the Pomo were used as the major medium of exchange throughout the North Coast Range and Sacramento Valley (Barrett 1952 (2):284). The clam shells were obtained from Bodega Bay, often via a trip to that area rather than by trade (Stewart 1943), and a major magnesite quarry was located in Southeastern Pomo territory (Loeb 1926:178). The Eastern and Southeastern Pomo also held excellent obsidian quarries around Mt. Konocti and Borax Lake (Gifford 1923:80; Loeb 1926:179). Probably in response to their extensive trading activities and their wealth, the Pomo had a well developed counting system in which tally sticks were used to keep track of very large numbers, e.g., 40,000 (Kroeber 1925:256-257; Barrett 1952, 2:290-291).

In spite of the fact that the Pomo are described as peaceful and uninterested in war for its own sake, there are clearly identified causes of war, a number of specific instances of war cited, and armor developed expressly for engaging in battle (Barrett 1952, 2:192-193). Wars were fought over poaching and boundary disputes, but the most common cause for a Pomo war was revenge of a "poisoning". Sickness and death were thought to be caused by an enemy's poisoning activities, and consequently suspicion between villages sometimes ran high, escalating into war. The fighting was actually fairly cautious, with two lines of warriors shooting arrows or throwing stones at one another; rarely did they come into hand to hand combat, and usually only two to three at most were killed. Victory scalps were taken by the Northern Pomo, and a victory dance performed. The chief of the victors initiated a peace settlement by making gifts of beads to the defeated village (Loeb 1926:200-205; Barrett 1952, 2:192-193; Kroeber 1925: 235-236). Wars were remembered, for example, between the Potter Valley people and the Huchnom, between Elem and the Hill Patwin, between the Northern Pomo moving into Scott's
Valley (on the northwest of Clear Lake) and the Eastern Pomo at Upper Lake, and several "salt wars" between various groups and the Salt Pomo (Barrett 1908:240-244, 1952, 2:192-193; Gifford 1923:80; Loeb 1926:205-212; Stewart 1943:40).

Subsistence and Technology

The Pomo peoples occupied three environmental zones: the coastal strip, the Russian River Valley, and the Clear Lake basin. The differences between the resources in these zones affected the subsistence practices of the resident groups, and the latter two zones are represented in or adjacent to the project area. The Northern Pomo in Potter Valley on the East Fork Russian River belong to the River Valley zone. Their resources and subsistence practices were very similar to those described for the Yuki and Huchnom on the Eel, except that their proximity to Clear Lake afforded greater access to some of the resources available there. The Clear Lake zone is of particular interest here since it dominates this portion of the project and involves Northern, Eastern, Southeastern Pomo as well as Lake Miwok peoples. A significant portion of Lake Miwok territory lies down the Putah and Pope Creek drainages, however, and they were, consequently, similar to the Hill Patwin in many regards.

The Clear Lake basin offered a particularly abundant and unique set of resources in the North Coast Range. Besides the typical Central California range of game and food plants, it supplied numerous fish and waterfowl, and exploitation of which produced a somewhat different seasonal cycle than for previously described groups. Kniffen lists 18 varieties of fish recognized by the Pomo, plus freshwater clams (1939: 356-357). Fishing activities focused on the spawning season, although some fishing could be practiced throughout the year. Several varieties ran up the creeks to spawn and were trapped from February through April or early May. The hitch and chay were particularly numerous. Fish baskets, dams, gill nets and gigs were used in stream fishing. In March and April other varieties of fish spawned in the tule swamps along the edges of the Lake, and Eastern Pomo moved to fish camps along the lakeshores at this time. The slough to the east of Bloody Island in Danoxa territory was especially rich in blackfish and trout. Fresh fish were prepared for immediate eating by roasting or baking in a pit oven, but many fish were dried or smoked for storage. Baskets, gill nets, dip nets and spears were used in Lake fishing. Tule boats were a special development in the Lake area and were used extensively for fishing and lake travel, particularly by the Southeastern island people (Barrett 1952, 1:103-104; Kniffen 1939:356-357, 362-371; McLendon and Lowy 1978:309-310).
The Lake also offered abundant waterfowl of which Kniffen lists 25 varieties recognized by Eastern Pomo (1939:357). These birds were extremely important as they were available during the otherwise lean winter months from November through mid February (Kniffen 1939:366). The birds were taken with a variety of specialized devices: three types of nets, fence snares, mud ball slings, and gorge hooks (Barrett 1952, 1:99-101).

Hunting land mammals, especially deer and rabbit, was also very important. Deer were often taken in communal hunts in which a number of men co-operated to drive deer into a brush fence and corral where the deer were caught in snares or killed by other waiting hunters. A deer mask disguise was also used to lure deer, either by a single hunter, or by the disguise wearer working with several drivers. An individual hunter might also lie in wait in a blind near a trail or salt lick. A bow and arrow were used to kill the deer in these latter two strategies. Other large game mammals such as elk and bear were also shot with bow and arrow (Barrett 1952, 1:122-129; Loeb 1926:170-171; Kniffen 1939:365). Rabbits were driven into fences with snares set into them at frequent intervals or into long low nets which entangled them. Quail were taken with similar low nets and with a variety of clever snares (Barrett 1952, 1:129-139). Small game was eaten right away, but deer was dried for storage (Kniffen 1939:365).

Men produced their weapons and tools for hunting and fishing, and there were specialists in a number of areas. Knowledge of a particular craft was handed down matrilineally from a man to his sister's son. Some specialties included the making of drills, ornamental hairnets, fish nets, duck nets, and obsidian implements. 'Hunter' and 'fisherman' were also said to be professions. A promising young boy was given careful instruction as well as secret songs, charms and other sacred equipment of the profession. While all men hunted and fished, only those possessing an inherited "outfit" were considered professional (Loeb 1926:179-181).

As previously noted, gathering the vegetal resources was the women's responsibility, and these activities were, in general, much the same as for the Yuki, Nomlaki and Patwin women. The acorn was the "staff of life", the preferred varieties being the tan oak and black oak acorns. Acorns were stored in large amounts in above ground caches or granaries. A floor was supported some distance above the ground on poles over which a dome shaped thatch roof was erected (Barrett 1916). Pepper-nuts, buckeye, pinenuts, hazelnuts, manzanita berries, greens, grass and weed seeds, and roots and tubers rounded out the list of vegetal foods. Digging sticks, seed beaters, and a variety of baskets were used in the procurement processes (Barrett 1952, 1:59-95).
The seasonal cycle was determined by the fish spawning periods and the availability of vegetal resources. The main village was occupied during the winter months, probably from November to February. Then, in the spring, people would move to fishing camps on streams or the lakeshore, depending on which fish spawned in that territory. In early summer (June) families scattered, seeking roots and seeds in the hills. The harvest was returned to the main village, and trips to the coast for seafood and seaweed might be made at this time. Seeds and berries were gathered through late summer and early fall, and residence might be in camps or the main village. October was the season for the acorn harvest in camps in the hills, and the final return to the main village came in November (Loeb 1926:199; Kniffen 1939:366). In sum, this cycle requires at least one main village, a fishing camp, and three mountain/hill gathering camps. Loeb asserts that the same acorn gathering camp was used year after year (Loeb 1926:199).

Assuming that the population and household figures for Cigom are average (235 population, 20 households) and that the households each made their summer camps as a group, the following sites would be produced by a Clear Lake tribelet: 1) main village; 2) at least one or two fishing camps along a stream and/or on the lakeshore; possibly the entire village moved to the same camp as spawning runs required co-operative fishing efforts; 3) at least three mountain/hill gathering sites per household, i.e., a total of 60, located near springs (or permanent streams) and black oaks, tan oaks, manzanita, pepperwood, etc. (It should be noted that the number of sites is comparable to that reached for the Nomlaki.)

As in other Central California cultures, gathering was supported by the basket industry, which reached unexcelled heights among the Pomo. Besides the many varieties of utilitarian baskets, such as hopper mortar baskets, parching trays, cooking baskets, etc., which were twined or coiled, the Pomo and Lake Miwok produced exceptionally fine coiled baskets which were decorated with woven-in designs, feathers of many colors, and bead and shell ornaments. The fineness of these baskets is illustrated by the fact that 30 coiling stitches to the inch regularly created an excellent basket, whereas with the Pomo, this number was common and 60 stitches or more might frequently be found. These fine baskets were used as gifts or kept as treasures, and were particularly used as grave gifts to be destroyed in honor of the dead. The utilitarian baskets were also of excellent quality, and the Pomo were expert twiners, employing several methods which were not used elsewhere, e.g., lattice twining and wickerwork. Men usually made the rough, open work twined articles such as cradles and the fish weirs and traps (Barrett 1908a; Kroeber 1925:244-248).

Everyday dress for the Pomo was quite simple. Men might wear a mantle of skins or shredded tule in cold or wet weather,
but otherwise were likely to wear nothing. Women in the Lake region regularly wore tule skirts. Rabbitskin blankets or a special blanket made of goose feathers were also worn (Loeb 1926:154; Barrett 1957, 2:292-296). Ceremonial dress was elaborate and extensive use was made of feathers as well as bead and shell ornaments and body painting (Barrett 1952, 2:304-313).

Religion, Life Cycle and Ceremony

According to the Eastern Porno, the flat earth floated on water and had been made by Marumda, the creator and Kuksu, the first man. Six main spirits, including Kuksu and Marumda, were associated with six cardinal points, i.e., the four compass points plus sky or zenith and earth. Thunderman was also an important spirit and wore a coat of abalone shells which made the thunder when he shook. In fact, all of nature contained spirits, most of which were evil. For instance, Bagil woman had a snake shape and lived near springs. Bagil sought people who were breaking taboos, especially menstrual taboos. Sight of Bagil or her helper brother, the cannibal dragon Gilak, produced fright and sickness in a guilty person. There were special songs to cure a Bagil scare which might otherwise be fatal (Loeb 1926:300-304).

When a Northern or Eastern Porno woman wanted a child, she was likely to go to a special rock called a gawik xabe (children rock, Eastern Porno) and perform a ritual which involved prayers and the grinding or cutting of the rock. Many taboos, which applied to both the husband and wife, accompanied pregnancy and birth. Upon the birth of a child a series of gifts were exchanged between the father's and mother's families. The paternal grandmother came twice a day to wash the new baby in a special basket which was carefully saved and later given to the child (Loeb 1926:246-254).

As in neighboring Central California groups, a Porno girl underwent a puberty ceremony at the time of her first menses. A hut attached to the main house was constructed, and the young girl was confined here for four days, observing certain taboos and lying on a warm bed of coals covered with tules. At the end of her confinement she was given a basket of acorns to grind and prepare. Her mush was shared with the family and a few friends, but apparently no large feast was held as for Yuki or Nomlaki. The menstrual hut was only used for the first menses as the woman later stayed in a special corner of the main house (Loeb 1926:270-274).

Illnesses were most likely to be the result of supernatural causes, such as those stemming from breaking a taboo or encountering a malevolent supernatural monster (e.g. Bagil
or Gilak) or from magic causes stemming from the activities of a poisoner. Eastern and Northern Pomo had two kinds of doctors available to treat such illnesses: the outfit or singing doctor, and the sucking doctor. The outfit doctor inherited his position much like any other profession, as a young apprentice to a relative who taught him songs, the use of herbs, and who passed on to him the "outfit" of curing articles. The sucking doctor received powers in midlife through dreams or a vision. Women were frequently sucking doctors but never outfit doctors. The sucking doctor sang, sucked out poison and made small cuts to let blood (Freeland 1923; Loeb 1926:326-327; Barrett 1952, 2:359-361). The Lake Miwok doctors were apparently similar to these Pomo doctors (Callaghan 1978:269).

When a person died, the corpse was straightened out and covered with a robe. Wailing began, and relatives and friends piled gifts on the body. All these gifts were carefully noted as return gifts were made later by the family. After several days, the body was taken to the burning grounds about a half mile from the village, and a cremation ceremony held. The chief gave a speech, and the mourners danced and wailed in a frenzied manner while the body burned. More goods were thrown onto the pyre. Later, any remaining charred bones were gathered in a robe and buried near the pyre. The mourning period lasted a year. Women continued to wail and scratch their cheeks for sometime after a death, and also cropped their hair, daubing it with white clay. At the end of a year a second burning took place, marking the end of mourning (Loeb 1926:286-292; Barrett 1952, 2:397-407; Callaghan 1978:268).

The Pomo ceremonial cycle was complex and highly developed. In the ghost ceremony, the most awesome ceremony, spirits of the dead were impersonated by two classes of dancers: ordinary ghost dancers or devils, and ash devils or fire eaters. This ceremony was held in the dance house, and dancing accompanied by the footdrum. No women or uninitiated boys were allowed to witness this four day ceremony. The ash devils jumped in the fire, threw it around the dance house, and ate coals. The boys who were being initiated were kept covered with their heads hidden under blankets and were taken out periodically and tossed over the fire by the ash devils. The ceremony ended with a feast on the final morning (Loeb 1926:338-351, 1932:135-137; Barrett 1917:403-423).

The Kuksu ceremony initiated only those to become secret society members and included girls as well as boys. Accounts of this ceremony differ considerably, but all include the appearance of a Kuksu figure each of the several days and the scarification of the initiates (Loeb 1926:369, 1932:127-128; Barrett 1917:423-430; McLendon and Lowy 1978:317-318). There were other sacred dances as well such as the bear impersonation and condor dance, and a number of common dances.
Contact with Western civilization produced major changes in California Indian culture and drastically reduced the population. In that the project area is north of the major foci of the earliest European settlements, these changes were somewhat delayed in contrast to those in more southerly regions of California, but, nonetheless, the Indian peoples in the North Coast Range experienced the full range of disruption, relocation, enslavement and extermination by White settlement.

The impact of Western civilization on Northern California Indians basically began with the founding of the Mission San Francisco de Asis at San Francisco in 1776 and later Mission San Jose de Guadalupe in 1797. Patwin and Lake Miwok names occur in these early mission records (Merriam 1955:175-187; Callaghan 1978:265; Johnson 1978:351). Most of the Spanish exploration concentrated on the San Joaquin Valley region, however, in 1808 Gabriel Moraga went into the Sacramento Valley to some distance beyond the Sutter Buttes, and he made three forays into the Bodega Bay - Russian River Valley in 1810, 1812, and 1814. Luis Arguello led an 1821 expedition north along the Sacramento River and then into and across the North Coast Range possibly via Cottonwood Creek, returning to San Francisco by way of Trinity, Eel and Russian Rivers, thus at least skirting the project area (Beck and Haase 1974: map 18).

The Russians also began settlement in Northern California during this early period from 1776-1820. The Russian-American Company, a fur company, established Fort Ross on the coast in 1812 and several supply farms in the adjacent area in the ensuing years (Beck and Haase 1974: map 40). It is likely that their operations along the Russian River brought them into the Clear Lake area as well (Palmer 1881:48).

This early exploration and settlement probably had little impact on northern California in general and the project area in particular. However, with the founding of Mission San Raphael Arcangel in 1817, Mission San Francisco Solano de Sonoma in 1823, and Mexican independence in 1822, the situation changed significantly. Needless to say, these missions actively recruited many Pomo, Patwin, and Miwok peoples. For instance, in 1823 alone Sonoma mission converted 996 Indians (Barrett 1908:44). Mexican rule effected a change in land grant policy; where the Spanish had let only 20 grants in all of California, the Mexicans allowed 500, many of them after secularization of the missions in 1834-1836 (Bean 1973:70). Approximately one quarter of these grants were north of San Francisco in areas immediately adjacent to the project such as Capay, Berryessa, and Coyote Valleys. (This number does not take into account many acres that were used as ranches and where the grants were not later recognized as valid by
the U.S. government.) Salvador and Antonio Vallejo ran a cattle rancho on the west side of Clear Lake, including Big, Scotts, Upper Lake, and Bachelor Valleys, although it was not later recognized as a valid grant (Palmer 1881:48-49). During this period of ranch expansion, many Indians were captured and forced into enslavement as vaqueros, workers and servants (Bean and Theodoratus 1978:299; McLendon and Lowy 1978:318; Palmer 1881:49; Barrett 1908:45).

The effects of this advancing encroachment were delayed in eastern and northern portions of the project area. Bidwell was probably the first White into Indian Valley when he rode through in the 1840s (Rogers 1891), and the Yuki in Round Valley remained isolated until the Azbills came upon Eden and Round Valleys while exploring in 1854 (Miller 1979:35).

These more secluded peoples escaped the early effects of missionization, but they may not have entirely escaped the diseases which Western civilization brought, as these diseases frequently preceded actual, direct contact. The missions, for instance, had been disease-ridden, exhibiting twice as many deaths as births (Bean 1973:63); an epidemic, probably malaria, had swept the Central Valley in 1833, decimating the population, but its effect on the hill/mountain areas is difficult to determine (Cook 1955; Goldschmidt 1951:306). Gibbs in 1851 noted that smallpox had been experienced by the Clear Lake peoples (1972:9), and Gifford's census of Cigom demonstrates an infant mortality rate of 51% for the 1850s, though he felt it was probably actually even higher (1926:327).

Americans began filtering into California in an ever increasing stream in the 1840s and took possession of the state in 1846. Raiding Indian rancherias, kidnapping, and murder of the Indian people increased, and the geographical extent of these deprivations pushed northward, involving previously secluded groups (Barrett 1908:45). The well known Kelsey and Stone incident and the ensuing Massacre at Bloody Island at Clear Lake are examples of the treatment many Indians suffered from the rough settlers. Stone and Kelsey, two Americans, took over Salvador Vallejo's ranching operation in Big Valley in 1847. They forced the Indians to work for them, to build a house and corral and to herd the cattle. They treated them very poorly, not even feeding them adequately. In the fall of 1849, after several years of repeated incidents in which the Indians were demeaned, mistreated, and flogged, the Indians rose up and killed both Stone and Kelsey. The spring of 1850, however, brought soldiers and artillery seeking retribution. Cannon in whaleboats were brought across the Lake, and the Indians were caught on Bloody Island in a crossfire between the cannons on the Lake and the soldiers on the shore. The soldiers then proceeded on to Potter and Ukiah Valleys, killing scores of Indians without cause (Palmer 1881:49-62).
California Governor Peter Burnett expressed a view held by many Whites in 1850 in an address to the legislature that "a war of extermination will continue to be waged between the races until the Indian race becomes extinct" and that it was "beyond the power or wisdom of man" to prevent this from happening (Bean 1973:166). The U.S. Congress, however, passed an act in 1850 authorizing agents to negotiate treaties with the Indians, and in 1851 Col. Redick McKee, one of these three agents, traversed northern California making such arrangements. Eighteen treaties creating reservations totaling 11,700 square miles throughout California were negotiated, but they were never approved by Congress. In 1852 and 1853 Edward Beale, Superintendent of California Indian Affairs, initiated a policy of establishing several reservations of 25,000 acres each, and in 1854 five such were realized, one of them the Nome Lackee Reservation in the Tehama County foothills between Elder and Thomes Creeks, about 20 miles from Tehama.

The Indians in the area seemed to favor the reservation, at least initially, probably feeling it would give them some protection from the Mexicans who were stealing women and children and selling them to the south. At the end of the first year (August 1855) Captain Keyes reported there were approximately 1000 Indians on the reservation, that their appearance and morale seemed good, and that wheat and barley had been raised and stored along with baskets and sacks of wild foods (Goldschmidt 1951:308-309). Reports of success continued for several years, but soon this prime land was coveted by settlers, and the reservation was abandoned in 1859-1860. In 1863 the Indians in the Sacramento Valley were forcibly and brutally moved from the area over the mountains to the Round Valley Reservation (Goldschmidt 1951:311).

The Mendocino Reserve near Fort Bragg and the Nome Cult Farm in Round Valley were established in 1856; the Nome Cult Farm was originally connected with the Nome Lackee Reservation but gained reservation status of its own in 1858. Pomo peoples and others were driven, often without food or water, to these reservations in what the Indians call the Death March (Theodoratus, Peri, et al. 1975:50-53). Indian people escaped when they could, hiding in the hills where they had sought refuge on many previous occasions.

Hostilities between the Indians on the Round Valley Reservation and the settlers, who wanted the Valley for grazing, ran high for about ten years, and during this period perhaps thousands of Indians were exterminated. The Eel River Rangers, a volunteer company under the command of W.S. Jarboe and commissioned by the Governor, were formed in 1859 to rid the area of the Indians who were harrassing the settlers and stealing cattle. This volunteer company sought out and killed hundreds of Indians in its single year
of existence. There was also a small detachment of 17 regular U.S. troops stationed in Round Valley at that time. Their orders were to keep the peace between the settlers and Indians, but, while they apparently tried to be fair to each side, they were not actually empowered to take the necessary action to quell the hostilities. Ranchers would indiscriminately raid rancherias at the slightest provocation without stopping to establish any actual evidence of Indian cattle thieving (the usual complaint). Unfortunately, the agents in charge of the reservation, who might otherwise have alleviated the problems somewhat, were themselves corrupt and offered no real aid to the Indians (Miller 1979:57-73).

Many of the people, who had been removed from their homelands to the reservations, left and returned home when they could. The Mendocino Reserve was closed in 1867, leaving many homeless. A system of semipeonage developed whereby Indians settled on White's land and served as a source of cheap labor for the agricultural pursuits in a region (Bean and Theodoratus 1978:299).

In the early 1870s the northern California Indian communities were swept up in a revivalistic movement known as the Ghost Dance. Actually it was a series of closely related religious innovations which followed one another in rapid succession. The Ghost Dance originated in Nevada among the Walker Lake Paviotso about 1869-1870 and from there diffused into northern California. It focused on the imminent return of the dead (Indians) and the end of the world entailing elimination of the Whites but apparently the survival of the faithful Indian adherents of the movement. The movement took several geographical directions, one of them into Achomawi and Yana territory in 1871. Norelputus, a Yana-Wintu, elaborated on the cult and in 1871-1872 carried it himself to groups across the Sacramento Valley as far as Stonyford. His contribution was the requirement of the building of a deep earth house, like an assembly house, only deeper, in which to hold the event and await the end of the world, hence the name Earth Lodge Cult. This movement spread among the Hill Patwin, who then converted the Clear Lake Pomo. The Pomo congregated at centers to which Indians from considerable distances traveled in order to participate. The emphasis in this cult was on doctrine rather than ritual, and it encouraged the emergence of local dreamers or prophets (DuBois 1939:1, 129-132).

The Bole-Maru was an elaborate and original expression of the dream aspect of the cult innovated in 1872 by a Loisel Hill Patwin (Long Valley) named Lame Bill. This movement spread east through Cortina to River Patwin and on to the Chico Maidu and west to the Pomo. Homaldo, a Wintun from Dachimchini, was also an early proselytizer and carried the cult north into Wintu, Achomawi, and Shasta territory. This
cult validated the establishment of local dreamers (bole - Hill Patwin, maru - Eastern Pomo: dreamer) who received inspiration from God and who had authority to reveal these dreams, give dances, innovate costumes and songs, and preach a moralistic code. The dances in some cases were slightly altered, non-dangerous versions of the traditional, powerful dances such as the Patwin Hesi. As this cult disseminated, it took on many local variations, and it continues to be practiced today by both the Pomo and Patwin peoples (DuBois 1939:129-139).

Indian peoples continue to live in a number of traditionally occupied locations immediately adjacent to the project area, and exhibit a strong sense of cultural identity, continuing to practice cultural traditions integrated with modern economic activities. However, Indian progress from the position forced on them in the 19th century, that of the disenfranchised, non-citizen, slave or peon, toward economic and political parity has been slow due to numerous, systematic obstacles. There are a number of governmental and self-help agencies which currently attempt redress of these inequalities.
EVALUATION OF SOURCES

The sources vary considerably for the groups within the project area. The citations in the text provide a guide as to which sources contain materials pertinent to particular groups and/or subjects. A small number of materials offer information for a large part or the entire project area. The two handbooks, Kroeber (1925) and Heizer (editor, 1978), for instance, cover each group and organize considerable data in a useful manner, and the latter is especially useful for bibliographic references. Barrett (1908) covers the ethno-geography of a major portion of the region, omitting only the Yuki. His material was gathered early in this century and seems quite reliable; he collected it himself and spent an enormous amount of time in the field. Merriam's materials are nearly all published now (1955, 1966, 1974, 1977) except for his Yuki notes which are in the Bancroft Library. Merriam's data are invaluable, but they are largely uninterpreted and must be carefully compared to other data, e.g. Barrett's. Gifford's and Kroeber's CED list for Pomo (1939) deals mainly with Pomo but includes as well Lake Miwok, Hill Patwin, Nomlaki, and Salt Pomo. Gifford rates his Salt Pomo informant rather low and does not rate his non-Pomo informants at all so that, again, this data should be carefully compared to that from other sources. He is much more confident of the rest of the information contained in the study. Loeb's Kuksu publications (1932, 1933) also encompass much of the project and are worthwhile for understanding intragroup relationships.

The Nomlaki/Hill Patwin area is covered very scantily. Goldschmidt's (1951) monograph is excellent as far as it goes, but the material was collected late, in 1936, and his main informant was quite acculturated. Kroeber's monograph (1932) contains good information on village locations, large amounts of data on ceremonies, mostly dealing with the River Patwin however, and is minimal on other details. DuBois' (1935) monograph on the Wintu demonstrates that Wintu and Nomlaki are sufficiently different so that, unfortunately, her excellent materials are not generally applicable to Nomlaki.

Materials on the Yuki are also not full, although of better quality than for Nomlaki/Hill Patwin. Kroeber's Handbook (1925) chapters are richer on Yuki, for instance, as he spent considerable time there. Foster (1944) collected his Yuki material contemporaneously with Goldschmidt, however, he seems to have had several more knowledgeable informants, and his monograph is more complete. Essene's CED list (1942) provides good support of Kroeber's and Foster's work. Miller (1979) presents an interesting and valuable account of the early history of Round Valley and the vicissitudes of the Reservation. A good description of plant availability and Yuki and Pomo use of plants can be found in Chesnut (1902).
The Pomo materials, on the other hand, are abundant and rich. For instance, Barrett (1908, 1908a, 1916, 1918, 1917a, 1952) alone provides many times more information than that available for Yuki, Nomlaki and Hill Patwin combined, and there are, as well, Loeb (1926, 1932), Gifford (1923, 1926), Kroeber (1925), Stewart (1943), and Kniffen (1939) who present materials that are most appropriate to this study. Kunkel (1962) provides an analysis of Pomo social organization. One of the problems with such an abundance of information, however, is that some of it is conflicting. It should also be noted that a very small number of informants, four, generated the overwhelming bulk of data in the available accounts (McLendon and Lowy 1978:322). Furthermore, care must be taken to note the source of the information as both Barrett and Loeb tended to generalize from one group to another, attempting to make statements about all Pomo. Barrett's two volume publication (1952) on material culture is particularly useful as under the heading of each item he lists all other references pertaining to that category. There are also excellent sources available on Pomo myth (Barrett 1933; Angulo 1935; Angulo and Freeland 1928), which were not incorporated into this study. There are in addition some Harrington notes archived at the Smithsonian which may treat the Pomo in the project area.

Sources on Lake Miwok and Salt Pomo are so few as to be almost nonexistant, and, where they do exist, they are brief references within materials on other groups. Callaghan's article in the Handbook (1978) brings coherence to Lake Miwok data for the first time, and nothing similar is available for Salt Pomo. Finally, none of the early ethnographers was particularly interested in the seasonal cycle, and, consequently, though we have the rough outline, many important details are missing.

Future Research

A very important contribution would be to integrate Merriam's village locations and boundaries with Kroeber's and Barrett's and plot them properly on good maps. Ideally, a textual analysis would be developed with this since there exist a number of gaps in the record as well as conflicts which need explanation. The integration and analysis of this data would add significantly to our knowledge of settlement patterns, largely in terms of major village/peripheral village relations, and in terms of population concentration and general density. The largest proportion of these locations fall outside the Mendocino National Forest and BLM administered lands nevertheless, such a synthesis would supply vital information pertaining to the use of federally managed lands as resource areas. In fact, the use of these resource areas cannot be adequately understood without reference to these main settlements.
Ethnohistory also offers a rich field for future research. There are many records, documents, and Native American consultants with information concerning the strategies employed by Native Americans in maintaining their traditional cultures and adapting to the onslaught of Western civilization and modern economic activities. Finally, even though it is very late in the day, an ethnography could still be developed for the Hill Patwin.
1. Merriam did not record anything but the locations of these habitations so that we do not know how they were used seasonally, or how they were related to one another. Merriam's notes are rich in information but need a great deal of careful analysis for the rewards they seem to promise.

2. Merriam was often not discriminating in political or social terms, and so it is frequently difficult to ascertain the basis of his groupings. Nonetheless, one elderly consultant has confirmed the Kopa grouping but could not explain that it meant more than a general people. He also vehemently denied that "Patwin" means "people" and stated it should not be used for anything like a tribe. The "Pat" means outside; it is a word that should be applied to outsiders like the Chinese.

3. Hill Patwin names may be written with suffixes labe or sel meaning respectively "village/place" and "people/tribe", e.g., Edilabe or Edisel. Occasionally, the suffix dihi, "village" is used. It should also be carefully noted that Kroeber claims three tribelets in this area, Pakalabe, Edilabe, and Tcuhelmemlabe (which later moved to Kabalmem) but they are extremely close together, a supposition that does not seem reasonable.

4. Fredrickson et al. (1979) suggest another tribelet here at Wilbur Springs. It is possible, but it is a very small area and is more likely to have been associated with some others.

5. Kroeber's information on settlement in this area seems to agree (1932:362-363), but neither he nor Goldschmidt give it much attention, although it is comparable to the Sierra Miwok nena.


7. This is relatively true in terms of River vs. Hill fishing, but Stony Creek may have had more salmon than we are presently aware of. Information from a recent interview with Sharkey Moore indicates that salmon ran up Stony Creek as far as Red Bridge in significant numbers. This bears further research.

8. DuBois is used here even though she is dealing with Wintu who are fairly different from Hill Wintun/Patwin in terms of ecology. The data at hand is from the Bald Hills area which is intermediate to Wintun and Wintu so it may fairly safely be said to apply to this case. Regardless of any equivalency problems, it is more information than we have on this cycle from other sources.
9. In some other areas digger pine nuts were collected green in the spring before the cones could open and drop the nuts (Barrett and Gifford 1933), and it's possible that this was the practice here as well. This general seasonal gathering cycle is a product of field work in the Pomo area. While there are some local variations, this is such a general schedule that it can accommodate slight differences in species production within a larger region.

10. Kroeber remarks that "the man who erected such a structure (dancehouse) thereby became the headman of his settlement" (1925:164). This may indicate that there was a route by which a powerful and ambitious man might establish himself. Processes of group fission and fusion must have been going on in California, and here is a hint of how it may have occurred. (see also McKern 1922:243-244).

11. Two of these mines are currently being identified in the interviews conducted in this study.

12. It should be noted that Kroeber and Foster apparently used the same informant for this data.

13. The parts of the Lake referred to altogether as Clear Lake are: Upper Lake, at the head and now almost totally filled in; Clear Lake, the largest portion; East Lake, the eastern, lower arm; and Lower Lake, the southerly arm.

14. Palmer's estimates are based on information gathered from an Eastern Pomo from the Lakeport area in the 1870s.

15. Square milage figures are taken from Stewart's calculations (1943).

16. Pomo tribelets have presented some problems of definition. Kroeber recognizes 75 political units or principal villages (1925:229-234). Stewart collapses a number of these, arriving at a figure of 34 (1943:57-59), and Kunkel also lumps a number of groups essentially on the basis of Merriam's notes (1962:194, 234). It is likely that there are two levels of organization represented in these analyses. Kroeber is quite explicit about the criteria of a tribelet (see definition in Hill Patwin section), but the others are not explicit about their criteria. Kunkel in particular, and inspite of other good evidence, states he is relying on Merriam's categories without explaining that choice (1962:272, 386), and Merriam himself does not explain his criteria. It is confusing to use the same term, tribelet, for two levels.

17. This could possibly have been a post-contact phenomenon as many Lake Miwok were taken to the missions, and quite possibly their ceremonial structure was thereby destroyed (see Ethnohistory section).
CHAPTER IV
PREHISTORIC ARCHAEOLOGY
by
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and
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Introduction

This chapter is divided into the following sections: 1) literature review, 2) environmental review, 3) site typology development, 4) predictive model development, and 5) recommendations for management.

The literature review provides a summary and critical evaluation of archaeological investigations pertinent to the study area and emphasizes problems associated with the development of chronological sequences, site typologies, models of subsistence/settlement pattern change, models of social organizational change, and predictions of site locations.

The environmental section utilizes the general data provided in Chapter III and presents more specific data collected from five transects that have been placed across the study area. Within the transects the relative areas of particular vegetation communities, topographic features, and elevational intervals are to be calculated.

After having identified the problems other researchers have encountered while attempting to develop site typologies, an alternative approach is presented. The typology developed will be based on the co-occurrence of several site attributes collected from 1,120 site survey forms.

As in the typology section, the prediction of site locations attempts to improve upon methods used prior to this study. Data for the predictive model is restricted to what is identified within the above mentioned transects. The relative acreage surveyed of the categories identified in the environmental section is measured and the frequency of the sites present within each category calculated (e.g., frequency of sites per acre found within the conifer forest vs. those found in the oak woodland). Once this is accomplished, the above data is compared to the relative areas of the environmental categories within the total transect area, thus providing the data necessary to identify any bias that may have been incurred from the location of the surveys, as well as identifying the possible frequency of sites being ignored.
The final section attempts to integrate the research procedures and results within the meaning this work has for the management of the archaeological resources.

CRITICAL REVIEW OF THE LITERATURE

The purpose of this section is to provide a summary and critical evaluation of some of the pertinent archaeological investigations carried out within and proximal to the study area. These studies involved with the development of chronological sequences, site typologies, models of subsistence/settlement pattern change, models of social organizational change, and predictions of site locations are emphasized in this portion of the research. Problems involving the development of temporally significant projectile point typologies are not extensively addressed as this is addressed in another part of this report (Baumhoff, Appendix A).

The earliest significant study within the North Coast Range occurred at the Borax Lake site (CA-LAK-36) where, in 1938, Chester Post discovered a number of fluted points from the deposit. During that same year M.R. Harrington of the Southwest Museum conducted additional excavations and published the results ten years later (Harrington 1948). Based on the presence of fluted points and crescents and the use of cross dating, Harrington estimated that the original occupation occurred 10,000 years ago. In addition to the fluted points which he labeled as Folsom several other point types were defined (Pinto Basin, Silver Lake, Gypsum Cave, and Lake Mohave). Harrington suggested that an indigenous population utilized willowleaf points, metates, manos, charmstones, choppers, pointed scrapers, and, rarely, mortars, while the other point types were representative of visitors who came to make use of the obsidian quarries. The fact that all of the point types were relatively equally dispersed throughout the deposit led Harrington to conclude that the site was laid down within a short time period, perhaps within a few hundred years (Harrington 1948; Fredrickson 1973).

The major criticisms of Harrington's work were directed at his use of projectile point typologies developed in other regions to define local chronological sequences and movements of particular groups of people. In addition, it was thought that he failed to recognize that site disturbance may have been responsible for the lack of patterning in the artifact assemblage from top to bottom (Fredrickson 1973).

In an attempt to solve the above problems Meighan and Haynes (1968, 1970) conducted additional studies using information gathered from the excavation of 20 backhoe trenches that had an average depth of 10 feet. Eighty obsidian hydration measurements were collected from the excavation, and it was
found that the rim values did not correspond to the depths of where the artifacts were recovered. As a result, it was concluded that internal geologic disturbances had probably mixed up the associations within the site. Fortunately, when the projectile points were sorted on the basis of their hydration rim thicknesses, they fell into rather discrete morphological types. However, due to the fact that no radiocarbon dates were possible, clear, absolute dating of the morphological types could not be achieved.

On the basis of the hydration measurements Meighan and Haynes (1970) proposed the following hypothetical sequence. The earliest period was estimated to have occurred up to 12,000 years ago and is characterized by fluted points and crescents. The second period was thought to have followed a break in the occupation and probably occurred between 6000 and 3000 years ago. This was the period of major occupation and is characterized by the presence of wide-stem Borax Lake points and possibly the use of manos and metates. The final period, 3000 to 5000 years ago, is characterized by concave based points that lack fluting and stemmed points other than the Borax Lake wide-stem varieties. The use of manos and metates were thought to have continued into the period (Fredrickson 1973).

Before moving on, a final point concerning the Borax Lake site should be emphasized. The critiques of Harrington's use of projectile point typologies developed in other regions to define local chronological sequences and movements of particular groups of people should be taken seriously because this technique continues to be used today. For example, a Great Basin projectile point key has been used on the north coast of California to suggest the age of an occupation (Milburn et al. 1979), and a particular North Coast Range projectile point type has been given a Great Basin name (Humboldt Concave Base) to infer population movements in a context where there is no clear evidence for doing so (Parker 1979).

Following Harrington's work in the 1940s, the Army Corps of Engineers and the Bureau of Reclamation developed plans to dam numerous river valleys within the North Coast Range. Several archaeological surveys resulted from the projects including the work of Fenenga (1948) and Drucker (1948; 1949). The general goal of these surveys was to record the location and physical characteristics of the sites that were to be inundated. The information gained from the studies was useful in terms of identifying the spatial distribution of particular kinds of sites, but due to the lack of extensive excavation, little chronological data was made available.

During this same time period Treganza, Smith, and Weymouth (1950) conducted surveys and minimal excavations within the drainage of the Middle Fork of the Eel River (Eden, Williams,
Hull, and Round Valleys). The work was of significance because it developed a site typology, isolated the factors that may have influenced the location and density of sites, and briefly addressed chronological problems, particularly the relationship between Yuki and Wappo culture as well as problems involving millingstone sites.

Five site types were defined: 1) major habitations which are characterized by the presence of midden and may or may not contain house pits; 2) dance house pits which are found either off habitation sites or on habitation sites which are small in size; 3) auxiliary sites which are very small sites located on the periphery of habitation sites (their composition is unclear); 4) quarries which are outcrops of chert or steatite utilized aboriginally; and 5) millingstone sites which include metates and manos without associations with other materials. The location and density of habitation sites were thought to be influenced by accessibility of water, southern exposure, semimarshy areas, confluence of streams, and oak/buckeye areas (coniferous forest areas were avoided). Several sites made up exclusively of millingstones were observed, and it was stated that, although temporal placement was uncertain, similar sites in southern California were found in early contexts.

Additionally, the relationship between Yuki and Wappo culture was briefly addressed through the measurement of osteological remains. It was concluded that the morphology of the remains corresponded well with Gifford's (1926) Yukian type, and, that in order to determine the affinities between Yuki and Wappo, similar skeletal studies were needed in Wappo territory.

Treganza, Smith, and Weymouth (1950) might today be criticized because they did not provide a statement of survey methodology, systematically develop site types, nor quantify environmental variables in attempting to understand site location/density determinants. However, considering that they recorded numerous sites and interpreted them within a problem oriented context, the present authors conclude that the study is valuable.

Following his field work at CA-MEN-500 (near Willits), Meighan (1955) developed a cultural sequence for the North Coast Range. Six cultural complexes were defined: Borax Lake, Mendocino, McClure, Wooden Valley, Clear Lake, and Shasta. The Borax Lake Complex (2000 B.C. - A.D. 300), was based on the data recovered from the Borax Lake site (Harrington 1948). Contrary to the early dates proposed by Harrington, Meighan thought that the complex probably corresponded in time to the "Middle Horizon" of the Central Valley (it wasn't until 1968 when the site was reevaluated that Meighan agreed that the site was truly early). Artifacts diagnostic of the complex included obsidian crescents, fluted and wide-stemmed projectile
points, and the mano and metate, indicating a subsistence dominated by big game hunting with the use of the atlatl and dart accompanied by the collection of seeds which were processed with the millingstones.

The Mendocino Complex (A.D. 500 - A.D. 1000) was defined by materials found at the basal stratum of CA-MEN-500 and some of the artifacts from the Round Valley area (Treganza, Smith, and Weymouth 1950). Although use of the atlatl continued, projectile points were generally smaller, indicating that the bow and arrow may have been introduced. Like the atlatl, the mano and metate were still in use, however, the mortar and pestle were also present, indicating a more extensive use of acorns. Diagnostic artifacts included stemmed, lanceolate, concave base, corner and side-notched projectile points. Both the mano and metate and the mortar and pestle were in use.

The final four complexes co-occurred in different regions. The Clear Lake and Shasta Complexes fall within the study area whereas the McClure and Wooden Valley Complexes are to the south. The Clear Lake Complex (A.D. 1700 - A.D. 1850) was based on the data recovered from the upper component at CA-MEN-500 and corresponds to the ethnographic Pomo. It was characterized by large lanceolate and straight-based knives/projectile points, small corner-notched and side-notched projectile points, the hopper mortar, and special items such as charmstones, shell beads, and pendants.

The Shasta Complex (post A.D. 1600) was based on the data recovered from the Shasta Dam area (Smith and Weymouth 1952) and the Round Valley area (Treganza, Smith, and Weymouth 1950). The complex was thought to occur in the northern reaches of the North Coast Range, extending from northern Mendocino County to the Oregon border. Diagnostic artifacts included the hopper mortar and pestle, charmstones, haliotis pendants, and shell and pine nut beads. Perhaps the most diagnostic feature of this complex was the flanged projectile points, commonly referred to as the Gunther barbed.

Following the development of Meighan's cultural sequence, several large scale surveys were initiated in response to proposed dam projects (Treganza 1958; Edwards 1966; King 1966; Childress and Chartkoff 1966; Olsen and Payen 1969; Chartkoff and Childress 1966; Treganza and Heicksen 1969; Woolfenden 1969; and Orlins 1971). In 1966 three archaeological surveys were undertaken at proposed Army Corps of Engineers dam sites in the Eel River drainage. These were: Edwards (1966), the Etsel-Franciscan Reservoir Survey; King (1966), and Dos Rios Dam Survey; and Childress and Chartkoff (1966), the English Ridge Survey.

The Etsel-Franciscan Reservoir Survey (Edwards 1966) recorded 234 sites, of which 121 had been previously recorded.
by Treganza, Smith and Weymouth (1950). A wide range of artifacts were observed including mortars and pestles, manos and metates, and projectile points that probably range from at least Meighan's Mendocino Complex to the ethnographic period. Unfortunately, no analysis and interpretation of the material has been attempted.

The Dos Rios Dam Survey (King 1966) recorded 50 sites. The data recovered was analyzed through a comparison with an ethnographic model of site form and distribution. Deviations from the ethnographic model were viewed as possible indicators of cultural change through time and space with the results of the analysis indicating that the majority of the sites were located in open areas of oak woodland near streams. A significant number of sites were located away from water in contexts that led King to conclude that they were probably post contact refuge sites. Additional deviations from the ethnographic pattern included the distribution of barbed projectile points, the use of milling equipment, and the size of house pits. However, due to the lack of good chronological indicators, very little interpretive information regarding cultural change was provided.

The Childress and Chartkoff (1966) survey in the English Ridge area recorded 22 sites of which 20 were located on terraces of major drainages and only one did not include a midden deposit. This pattern of site form and location led Childress and Chartkoff to propose that local subsistence activities emphasized the use of riverine resources with these riverine sites representing permanent occupation areas from which smaller groups would leave to exploit upland flora and fauna as they became seasonally available.

The projectile points recovered during the survey seemed to represent the Borax Lake, Mendocino, and Clear Lake Complexes as defined by Meighan (1955). Of the points reported, all those attributed to the Borax Lake and Mendocino Complexes were made of chert, while 33.3% of the Clear Lake Complex points were made of obsidian. Hopper mortars were recorded, but no manos or metates were observed. Although the temporal significance of the above artifact types was mentioned, very little effort was made to address possible subsistence changes over time.

Following the work of Childress and Chartkoff (1966), Olsen and Payen (1969) conducted an archaeological survey of the Potter Valley Project. The areas surveyed were all within the 1966 English Ridge survey area of Childress and Chartkoff, and 6 new sites were recorded. Olsen and Payen suggested that some of the sites may have been of considerable antiquity due to the presence of leached middens and large, wide-stemmed projectile points.
On the eastern side of the North Coast Range four similar surveys occurred within the Stony Creek, Thomas Creek, and Cache Creek drainages. The original survey conducted within the Stony Creek drainage in anticipation of the construction of the Black Butte Reservoir was carried out by Mohr and Fredrickson (1949). Later, Treganza and Heicksen resurveyed the area and excavated three sites, publishing their results in 1969. Most of the sites found during both surveys were small midden deposits located on stream terraces. None of the sites either recorded or excavated during the surveys indicated any great antiquity, and Treganza and Heicksen (1969) suggested that the majority of them may have been winter villages which were largely vacated during other times of the year, when the people probably moved up into the higher elevations to the west.

In 1966 Chartkoff and Childress conducted a survey within the Thomas Creek and Stony Creek drainages in preparation for the construction of the Paskenta-Newville Reservoir. Forty-seven sites were recorded and fell into two classes: middens with house pits and middens without house pits. As in Teganza's and Heicksen's study (1969), no sites pre-dating late prehistoric times were observed. About two thirds of the sites were located on stream terraces, while most of the others were located on saddles on a nearby ridge. The highest density of sites was proximal to Thomas Creek where annual anadromous fish runs occurred. The sites located on the ridge were hypothesized to be historic refuge camps.

Further south along the east side, Orlins (1971) conducted a survey in Little Indian Valley prior to the damming of the North Fork of Cache Creek. Fifty-six surface sites and 14 midden sites were recorded. The midden sites were generally found in clusters within easy access to the major streams, while the surface sites were more diverse in their distribution. This study was of great significance because, unlike the surveys to the north, the Little Indian Valley survey recovered projectile points indicating occupations dating from Early Borax Lake times to the protohistoric period. One of the most important aspects of the study was the discovery of Borax Lake wide-stem points associated with manos and metates.

At approximately the same time, Edwards (1970) excavated three sites located along the lower reaches of Thomas Creek with hopes of gaining information that would extend the knowledge of the local prehistory beyond the protohistoric period (cf. Treganza and Heicksen 1969; Chartkoff and Childress 1966). The earliest phase identified was referred to as the Northern Millingstone Phase. The phase was characterized by: 1) milling-stones and handstones only (no mortar and pestle); 2) extensive core flake industry; 3) large chert and basalt projectile points more common than obsidian; 4) dependence on local lithic material. The phase was roughly dated through obsidian hydration
and cross dating of large stemmed projectile points to between 3000 B.C. to 0 B.C.

The Northern Millingstone Phase was followed by the Tehama Phase which was estimated to date between A.D. 0 to A.D. 1000. This phase was considered to be transitional between the millingstone orientation of the earlier adaptation and the mortar and pestle emphasis of the later Shasta Complex. The Tehama Phase includes both manos and metates and mortars and pestles, as well as evidence for more extensive trade with both northern California and the Delta.

The most important synthetic contribution to the prehistory of the North Coast Range since the work of Meighan (1955) was D.A. Fredrickson's Ph.D. dissertation, Early Cultures of the North Coast Ranges, California (1973). Fredrickson revised Meighan's chronology, basing many of his conclusions on data gained from his excavations at CA-LAK-261 (Houx site) and the revised data from CA-LAK-36 (Borax Lake site). He established five periods (Fredrickson 1973, 1974):

I. Paleo-Indian Period (10,000 - 6,000 B.C.)
   Post Pattern
II. Lower Archaic Period (6,000 - 3,000 B.C.)
   Early Borax Lake Pattern
III. Middle Archaic Period (3,000 - 1,000 B.C.)
   Late Borax Lake Pattern
IV. Upper Archaic Period (1,000 B.C. - A.D. 500)
   Berkeley Pattern (Houx Aspect)
V. Emergent Period (A.D. 500 - 1800)
   Shasta and Clear Lake Complexes

Data for the existence of the Post Pattern were restricted to the earliest materials identified at the Borax Lake site (Meighan and Haynes 1968; 1970). Artifacts diagnostic of the pattern included fluted points, chipped crescents, and a single-shoulder point. The temporal placement of the pattern is derived from the following:

Dating of the Post Pattern is largely inferential, but internally consistent. Analysis and comparisons of the geology of the Borax Lake site suggest a maximum age of 12,000 years. The thickest hydration bands measured upon artifacts from the site fall between 8 and 10 microns, which measurements suggest an age compatible with the geologic date. Cross-dating of artifact types, namely the crescents and the fluted points, also yields ages comparable to the geology and obsidian hydration readings (Fredrickson 1973:2).

The following general economic mode has been inferred:
The projectile points indicate an emphasis upon hunting, while the lakeshore location of the site suggests that available lacustrine resources may well have been utilized. Inferentially, seed collecting was less important than hunting and may have been restricted to those seeds which did not require extensive processing. No evidence of trade is yet apparent and no indication of a wealth emphasis has been found (Fredrickson 1973:212).

The Early Borax Lake Pattern of the Lower Archaic Period is characterized by the presence of the wide-stemmed Borax Lake projectile point and the mano and metate. Meighan and Haynes (1970) provided obsidian hydration data indicating that the wide-stemmed points from CA-LAK-36 may date back as far as 4000 to 6000 B.C. but could only guess that the mano and metate were associated. However, the association has been found by Orlins (1971; 1972) in Little Indian Valley and Clewett (1977) in the Klamath Mountains. Obsidian hydration data from Orlins indicated similar dates to those at Borax Lake, and a Cl⁴ date of 4580 B.C. from Clewett also supported the Meighan-Haynes interpretation.

Fredrickson (1974) suggested that the cultures of the Lower Archaic Period, perhaps in response to the Altithermal (a period characterized by warm temperatures and possibly low precipitation between approximately 6000 B.C. and 3000 B.C.), appear to have emphasized collecting and processing seeds with a reduced emphasis on the hunting of game (game populations were presumably lower in numbers).

The Late Borax Lake Pattern of the Middle Archaic Period is equivalent to Meighan's Mendocino Complex and is characterized by non-fluted, concave base projectile points and large, leaf-shaped, contracting stemmed points. The mano and metate continued to be used, but bowl mortars and pestles were introduced into the economy. The pattern is widely distributed in the North Coast Range but seems to vary in detail north to south. As a result, Fredrickson (1973) divided it into a northern portion and a southern portion. The northern portion is represented by what Edwards (1970) called the Northern Millingstone Complex which has been identified in the vicinity of Thomas Creek, Tehama County, and at a number of sites north of Redding, Shasta County. The complex is characterized by large stemmed points and the apparent absence of wide-stemmed and concave based points (Fredrickson 1973).

In the southern portion millingstones are most frequently found in association with concave base and stemless points, although stemmed points sometimes occur in small numbers. Dating of the pattern was based on a single Cl⁴ date from CA-LAK-261N and several supporting obsidian hydration measurements (Fredrickson 1973:222).
Fredrickson (1974) suggested that the transition from the Lower Archaic Period to the Middle Archaic Period may have been associated with the end of the Altithermal and the beginning of the Medithermal. The Middle Archaic Period is characterized by a more diverse form of adaptation evidenced by the spread of the mortar and pestle (acorn utilization).

The Berkeley Pattern of the Upper Archaic Period is represented by the Houx Aspect at the southern end of Clear Lake (the Houx Aspect is a regionally discrete variant of the Berkeley Pattern which was largely defined on the basis of material observed to the south). Diagnostic artifacts include contracting stemmed and lanceolate projectile points, and the period is thought to be characterized by the almost exclusive use of the mortar and pestle and the continued emphasis on hunting.

In terms of sociocultural change Fredrickson hypothesized the following (1974:48):

While technological and environmental changes appear to have provided the dominant themes for developments during the Middle Archaic, the Upper Archaic seems to have been marked by ever-increasing socio-political complexity, a growth of status distinctions based upon or marked by relative wealth, the emergence of group-oriented religious activities, and greater complexity of the exchange systems...

The Emergent Period is represented by Meighan's Clear Lake and Shasta Complexes extended back in time. Diagnostic artifacts included small corner-notch, side-notch, and barbed projectile points. The size of the points suggests the introduction of the bow and arrow which largely replaced the dart/ atlatl. The slab hopper mortar replaced the bowl mortar, and gathering acorns and hunting continued to be the dominant form of subsistence.

Fredrickson provided additional characteristics for the period (1974:48-49):

I propose the concept of the Emergent as a non-agricultural equivalent to the Formative. Evidence continues to accumulate that Californians modified the environment to increase its natural productivity..., that food storage and exchange relations served to equalize the distribution of resources unequally distributed in time and space..., that complex forms of social, religious, and occupational organization were emerging..., and that ranking societies and possibly chiefdoms were developing in several regions of the state...
Following the publication of Fredrickson's 1974 paper, King (1974a) attacked the use of Fredrickson's typological scheme. In general King determined that the typology was based on three attributes: 1) food procurement strategies; 2) exchange systematics; and 3) social organization. He then added two additional attributes mentioned by Fredrickson: climate and population movements. With the use of the five attributes, King attempted to form clusters that would define Fredrickson's typological categories. He found that he could not and concluded that the typology was useless (King 1974a:238):

I must suggest that Fredrickson's typology thus impedes rather than enhances our ability to perceive and understand culture change, and that it should be discarded as an obstruction to the systematic study of culture process in prehistoric California.

According to the present authors King did not understand how Fredrickson developed the typology and demonstrated this by not including archaeological assemblages in his list of attributes. As we see it, Fredrickson attempted to identify archaeological assemblages that seemed to co-occur in particular times periods. The identified assemblages were used to develop a chronological sequence for the North Coast Range and each archaeological assemblage then placed into the category "pattern". He attempted, based on the artifacts, site location, etc., to make general inferences as to the probable behavior of the peoples represented by the "pattern". Finally, in order to place his work into a broader context (e.g., California/New World), Fredrickson placed the "patterns" into the more general "periods".

The importance of Fredrickson's work does not so much lie with his guarded suggestions of the socio-adaptive patterns associated with particular artifact assemblages, but rather it lies with his organization of previously unorganized data into temporally significant categories. These categories, often hypothetical, have given other workers in the region a basis on which to organize their research. Without such synthetic work, as is clear from many of the early surveys discussed above, many researchers have no idea what their artifacts might represent or what questions they should be asking of their data. Fredrickson's work, at the very least, has provided problem orientations for those who may have been unfocused otherwise.

Interestingly enough, during this same time period, on the basis of high altitude excavations, King (1973; 1974b) provided the following "speculative hypothesis".
During the early time period represented by Fredrickson's Borax Lake Pattern (Fredrickson 1973), one would expect that the North Coast Ranges were occupied by small, relatively nomadic bands of hunter-gatherers, who would move as complete social groups in response to seasonal game migrations and shifts in the maturation of seed and other vegetal crops. During the late prehistoric and proto-historic, however, social groups were presumably larger and more sedentary, with relatively permanent villages in places like the Paskenta area, from which small task groups might issue periodically to exploit specific resources. If this were the case, then we might expect archaeological sites representative of early manifestations like the Borax Lake Pattern in the higher elevations to include assemblages indicative of the activities of a complete social group, while later sites would contain much more limited, specialized tool-kits... (King 1973, quoted in Jackson 1976:159-160).

King explained the settlement pattern shift:

We tend to account for the lack of late-period sites (at high elevations) as a function of increased trade and sedentism. As trade developed in the Sacramento Valley and North Coast Ranges, it was possible to move food to the people rather than people to food. Sedentary village life became practical and the need for seasonal movement of whole populations to sites like South Buck Rock vanished (King 1974b, quoted in Jackson 1976:160).

In his report on the Middle Eel Planning Unit (Mendocino National Forest) Jackson (1976) challenged King's (1973; 1974b) high altitude settlement hypothesis. For the purposes of his challenge, Jackson (1976:161-163) reviewed ethnographic data from the Chilula, Sinkyone, Wailaki, and Yuki and developed a seasonal subsistence model. The results of the model indicated that the late prehistoric and proto-historic patterns proposed by King were incorrect since the ethnographic data showed that entire groups would move into the high elevations during the summer and set up temporary villages that would be manifested archaeologically by a wide range of tool types rather than the specialized tool-kits expected by King. He defined the following "kinds" of archaeological sites which he subsequently used to challenge King on archaeological grounds (1976:149-150):
Quarry Sites: These are areas which have been exploited by prehistoric populations for the purpose of obtaining lithic materials for the manufacture of tools.

Procurement Sites: These sites are represented by such occurrences as isolated mortars, hopper slabs, metates or caches of milling tools. There may be a very limited flake scatter associated with these tools but, generally, these sites represent a very task-specific orientation. They also include fishing stations and ambush or kill sites.

Temporary Seasonal Camps: Such sites are represented at both the summer and winter level exploitation areas. While temporary in nature like the procurement sites, these sites are not necessarily task-specific and exist simply as an expression of the need for the population to gather resources in a diversified and dispersed work effort.

Seasonal Occupation Sites: This variety of occupation site is located within the summer range, that is, at elevations above 3500 feet. These are the "base camps" for the population as it occupies the summer range and are the locus for a great variety of economic and social activities.

Principal Occupation Sites: This site type is the "winter village," or main village, within the winter range (below 3500 feet in elevation). These sites are those which are most likely to be named or recognized with the name of the tribelet or village community.

Petroglyph Sites: The areas where petroglyphs occur. These cultural features may or may not be in association with any of the other kinds of sites outlined above.

Based on the location of these sites in the Middle Eel Survey, Jackson (1976:150-158) made predictions for site locations in the whole of the North Coast Range. Quarry sites were predicted to be located at chert, sandstone, metamorphosed rock, chalcedony, and jasper deposits. Procurement site locations were predicted on edges of glades and in oak groves marked by isolated millingstones or mortars and pestles. They could also be found in proximity to either a seasonal or principal occupation site or in association with a temporary
seasonal camp. Isolated projectile points and butchering tools, representing ambush and kill sites, were thought to be widespread throughout the area, however, they could be associated with patches of good deer browse. Seasonal occupation sites were expected to be located within the summer range at the junction of ridges near water, oaks, and grassy glades, but should not be found within the conifer forest.

Principal occupation sites were predicted in the winter range, usually on terraces near major sources of water and distinguished from seasonal occupation sites on the basis of their lower elevation and the presence of housepits. Otherwise, both site types are characterized by tools representing multiple activities. The location of petroglyphs was more difficult to understand however, and it was tentatively suggested that the presence of petroglyphs seemed to co-occur with the presence of other kinds of sites frequently on ridgetops.

Problems exist regarding the proposed typology, particularly in terms of its application to the King hypothesis. First, seasonal occupation sites are difficult to distinguish from principal occupation sites. As noted above, the basic difference lies in their elevation and the presence/absence of housepits. According to the present authors, the presence or absence of housepits can not be considered an accurate indicator of their actual prior existence because of their inability to survive natural as well as late cultural disturbances. As a result, we are left with elevation as the sole distinguishing feature between seasonal and principal occupation sites. Obviously the possibility exists for a seasonal occupation site which is located below 3500 feet to be typologically stamped as a principal occupation site solely on the basis of its elevational placement.

Another difficulty involving elevation is that no allowance is made for climatic changes that have probably occurred over the 7000 years. The analysis of pollen within the North Coast Range indicates that between approximately 6500 B.P. and 2500 B.P. a warm period occurred. This may have resulted in an upward migration of as much as 1000 feet of not only vegetative associations (West 1981a, b), but the upper elevation of the supposed winter range. If this were the case, multi-activity sites during Borax Lake Pattern times could have been occupied in the winter at elevations above 3500 feet. However, within the proposed typology, these would be called seasonal occupation sites. (A more extensive treatment of West's work will be presented in a following section).

The second major problem involves the archaeological assemblages utilized to define the site types. The criteria used to define site types may be mixing chronologically discrete assemblages. Many surface sites located on ridges
within the North Coast Range contain artifact assemblages representative of great spans of time and are commonly known as multi-component sites. Due to the equivocal nature of chronological indicators within the region, little attempt is made to distinguish among components when dealing with site typologies. As a result, it is possible to have a Borax Lake Pattern seasonal or principal occupation site (milling-stones, choppers, and wide stemmed points) that was subsequently used as a procurement site late in time (light flake scatter and small corner-notched points). Within the above typology the components would be lumped and labeled as a seasonal occupation site.

Although the King hypothesis is obviously faulty in light of the ethnographic information provided by Jackson, the idea should not be rejected completely. One of the major problems with it is that it is too easily rejected largely because it is too strict. As a matter of fact, a settlement shift similar to what King is proposing could have occurred, yet at the same time the hypothesis and its implications still be rejected. The following implication is a good example: Virtually no post Borax Lake Pattern base-camps should be found at high elevations in the North Coast Ranges (King 1974b, cited in Jackson 1976:160).

As demonstrated by Jackson, the entire hypothesis can be rejected by virtue of showing that multi-purpose summer settlements did indeed occur in the mountains during the ethnographic period, but this is not the way to test such a proposition. What we should be looking for are changes in the relative frequencies of settlements/artifacts within particular environmental contexts. Take, for instance, the following set of hypothetical data. Within a given study area, 10 late prehistoric sites are located in a river valley. All the sites are characterized by numerous, small, corner-notched projectile points. Two of the sites have a Borax Lake component where projectile points are very rare. When the adjoining ridges are surveyed, 10 additional sites are located, all above 4500 feet. These sites indicate the reciprocal patterning, that is, the Borax Lake sites and points are much more frequent than the late sites and points. Although late sites do exist in the mountains, there is a definite shift in land use pattern that should not be ignored. The presence or absence of patterns such as these will be investigated in the site typology section.

Two additional surveys have been conducted adjacent to the Middle Eel study area (Tamez 1974; Roberts 1977). The results of the surveys generally corresponded with the site location predictions provided by Jackson (1976). Tamez (1974) recorded 11 sites ranging in elevation between 6560 and 6840 all located in or near clearings on ridgetops or just below on midslope flats. The Roberts (1977) survey was also conducted
at high elevations, and similarly, all sites were found on ridgetops adjacent to clearings and glades.

Levulett et al. (1980) conducted a B.L.M. survey of several timber tracts that were distributed throughout the North Coast Range. Although the amount of land within each tract was relatively small and the survey areas quite divergent, the results corresponded rather well to the expectations of Jackson (1976). Most of the sites were located on secondary ridges or just below the crest of major trending ridges, usually adjacent to ecotones.

In contrast to the above results, surveys in other areas have shown different forms of settlement pattern (e.g. Hanks and Indermill 1974; Roberts 1974; Levulett 1977; and Fredrickson 1977). The Hanks and Indermill (1974) and the Roberts (1974) surveys were also conducted at high elevations, where most of the sites were located below the ridgetops on small flats. The Levulett (1977) survey found that no sites were located on the major trending ridge or at the junction of two ridges, but rather they were found on smaller, secondary ridges in areas of minimal slope. The Fredrickson (1977) surveys at the Geysers found that very few sites were located on ridgetops, but most were located on midslope flats or on stream terraces.

To the extreme north of the present study area Roberts (1975) recorded two ridgetop sites (CA-HUM-245 and CA-HUM-246) which were later test excavated by Flynn and Roop (1975) and subsequently extensively excavated by Jackson (1977). Based on the presence of Borax Lake wide-stem projectile points, Flynn and Roop (1975) concluded that the sites were occupied at 6000 B.C. In addition, the similarity between these sites and those excavated by King (1974) in terms of functional artifact categories, subsistence mode, and perhaps age, led Flynn and Roop (1975) to suggest that no late prehistoric sites may have existed in the immediate area.

However, based on the association of obsidian flakes with wide-stem points and subsequent obsidian hydration analysis, Jackson (1977) concluded that the site may not have been any older than 500 B.C. Also, along the same lines as his 1976 criticisms of King (1974), Jackson rejected the suggestion that the sites and local area were not occupied late in time.

Fredrickson (1979) argued that Jackson's dating of the chert wide-stem points was doubtful due to the earlier temporal affiliations given to the point elsewhere. Jackson (1980) has responded to this criticism by arguing that the temporal placement of projectile point types is basically unknown in the area (but see Baumhoff, Appendix A: if these points are basally thinned and ground, then they are undoubtedly early).
Tamez (1978, 1981) developed a site typology for the North Coast Range and a series of predictions as to site location relative to vegetation, topography, and hydrology. She defined three general site types:

**Task Specific Sites.** These sites were thought to reflect one dominant procurement and/or processing activity, and to be represented archaeologically by a single assemblage such as a mortar and pestle, a scatter of chert debitage, etc. The classification includes: 1) vegetal food processing sites represented by manos, metates, mortars and/or pestles, mauls; 2) kill sites represented by projectile points, utilized flakes, blades, choppers or scrapers; and 3) quarry/lithic workshops reflected in quarried material, tool forms, blanks, and/or hammerstones.

**Multi-Activity Sites.** These sites were thought to represent the seasonal exploitation of resources away from the permanent village, but in contrast to the Task Specific Sites, they must reflect two or more activities (e.g., points and ground stone).

**Permanent Occupation Sites.** These sites were defined on the basis of the presence of permanent architecture, that is, housepits, sweat houses, dance houses, etc. Permanent architecture does not, however, imply permanent occupation (cf. Jackson 1976).

Although similar to the Jackson typology, the Tamez typology is an improvement largely due to its simplicity. The major change involves the elimination of inferences concerning season of occupation based solely on elevation, but the typology continues to suffer from the use of housepits/dance houses as the sole criteria for a major site type, as well as from the problems previously mentioned concerning the possible lumping of multi-component sites.

Based on the ethnographic record, a predictive model of site locations was developed. When this approach was applied to the Yuki area, the following results emerged (Tamez 1981: 128, Fig. 8; see Figure 1). On the whole, Tamez (1981) concluded that the archaeological pattern conformed to the ethnographically predicted pattern. All four permanent occupation sites were located on the lower slopes of the hills below 3500 feet. Multi-activity sites were located on major ridge-tops or just below on sheltered, grassy flats near springs. Sites were also clustered around ridge junctions. Seven task specific sites and two multi-activity sites were found in young conifer forests. Tamez pointed out that many of the sites may have been in more open habitats prior to the cessation of aboriginal burning. This pattern has also been identified by others to be a frequent occurrence (Lewis 1973; Jackson 1976; Benson et al. 1979).
### Distribution

<table>
<thead>
<tr>
<th>Site Type</th>
<th>Predicted</th>
<th>Actual</th>
</tr>
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<tbody>
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<td>Permanent</td>
<td>Stream banks particularly on the river; in clearings</td>
<td>1 out of 4 on the river</td>
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<td></td>
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<td>2 on creeks</td>
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<td>1 at a spring</td>
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<td>2 in clearings</td>
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<td>1 in mixed vegetation</td>
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<td>1 in oaks</td>
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<td>Multiactivity</td>
<td>Springs, streams, ecotones</td>
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<tr>
<td></td>
<td></td>
<td>16 on creeks</td>
</tr>
<tr>
<td></td>
<td></td>
<td>1 on the river</td>
</tr>
<tr>
<td></td>
<td></td>
<td>1 at a pond</td>
</tr>
<tr>
<td></td>
<td></td>
<td>8 unreported</td>
</tr>
<tr>
<td></td>
<td></td>
<td>25 in mixed vegetation</td>
</tr>
<tr>
<td></td>
<td></td>
<td>20 in clearings or glades</td>
</tr>
<tr>
<td></td>
<td></td>
<td>4 in oaks</td>
</tr>
<tr>
<td>Task specific</td>
<td>Variable</td>
<td>56 at springs</td>
</tr>
<tr>
<td></td>
<td></td>
<td>42 on creeks</td>
</tr>
<tr>
<td></td>
<td></td>
<td>2 on the river</td>
</tr>
<tr>
<td></td>
<td></td>
<td>14 unreported</td>
</tr>
<tr>
<td></td>
<td></td>
<td>7 in conifers</td>
</tr>
<tr>
<td></td>
<td></td>
<td>1 at a pond</td>
</tr>
</tbody>
</table>
Although the sites were generally found within their predicted environmental contexts, it should be made clear that this kind of model does not provide the information necessary to predict the probability of finding a site given the presence of a particular environmental context. For example, site type A is predicted to be found in the meadow and not in the forest. However, during the survey all meadows were covered while the forest areas were not, and the results of the survey indicated that site type A was found in the meadow and not in the forest. Such an approach tells us nothing of the actual probability of finding sites within a given vegetative context. In order to determine the probability of finding a site within a particular environmental context, one must also know the frequency of sites per unit area within that context.

In 1979 Sonoma State University presented the results of a survey conducted within the Round Valley Indian Reservation (Stewart and Fredrickson eds. 1979). Consideration here will be restricted to the results of the Round Valley settlement pattern study. (For the results involving projectile point taxonomies and the chronological placement thereof see Baumhoff, Appendix A.)

With regard to the settlement pattern study, three models were developed. The first was a model of the seasonal round utilized by the native peoples as indicated by the ethnographic record. The second was a model of ethnographic site types. The site types, their locations, and the activities that took place were the logical outcome of the seasonal round model. The third model proposed the archaeological correlates for each ethnographic site type.

The following ethnographic site types were developed:

**Principle Occupation Sites:** a) principle village, and b) subsidiary village. These were the permanent, winter villages. The principle village had a dance house, and the subsidiary villages, which lacked dance houses, clustered around the principle village. They were located below 3500' next to permanent drainages with open exposure, in non-marshy areas of the valley floor or in the hill-valley transition zone.

**Seasonal Base Camps:** a) one or two family camps, and b) multiple family camps. These were high elevation base camps that were occupied after the snow melted and through the fall. A wide range of food and other resource processing activities took place. They were located on major ridge lines or on flats below the crest, near permanent water sources.

**Short-Term Sites:** a) hunting-related sites, b) fishing sites, and c) acorn/seed processing sites. These were resource gathering and processing sites where single and multiple tasks took place; e.g., butchering and/or tool repair. Use of
such sites ranged in time from less than a day to up to three days and they were located in a wide range of habitats. Fishing and acorn-processing sites were usually along drainages, while hunting sites were more frequently in higher elevations.

**Quarry Sites**: These were sites where stone was obtained and modified in preparation for making stone tools.

**Petroglyph Sites**: These were areas where incising occurs on rock outcrops and boulders.

They presented the following table of archaeological correlates:

**Figure 2**

**MODEL III: ARCHAEOLOGICAL CORRELATES**

(Stewart and Fredrickson eds. 1979:148)

<table>
<thead>
<tr>
<th>Type</th>
<th>Artifact/Feature Assemblages</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Principal Occupation Sites</strong></td>
<td></td>
</tr>
<tr>
<td>a. Principal Village</td>
<td>Midden and HP&lt;sup&gt;1&lt;/sup&gt; With DH&lt;sup&gt;2&lt;/sup&gt;</td>
</tr>
<tr>
<td>b. Subsidiary Village</td>
<td>Without DH</td>
</tr>
<tr>
<td><strong>Seasonal Base Camps</strong></td>
<td></td>
</tr>
<tr>
<td>a. One-, two-family Camps (Yuki)</td>
<td>Midden - No HP</td>
</tr>
<tr>
<td>b. Multiple Family Camps (Wailaki)</td>
<td>Without DH</td>
</tr>
<tr>
<td><strong>Short-Term Sites</strong></td>
<td></td>
</tr>
<tr>
<td>a. Hunting</td>
<td>No Midden - No HP</td>
</tr>
<tr>
<td>b. Fishing</td>
<td>a. Flakes, points</td>
</tr>
<tr>
<td>c. Acorn/seed processing</td>
<td>Flakes, tools</td>
</tr>
<tr>
<td></td>
<td>Flakes, points, tools</td>
</tr>
<tr>
<td></td>
<td>Points, tools, no flakes</td>
</tr>
<tr>
<td><strong>Quarry Sites</strong></td>
<td>Primary flakes, cores</td>
</tr>
<tr>
<td></td>
<td>(quarry waste only)</td>
</tr>
<tr>
<td><strong>Petroglyphs</strong></td>
<td>Incising on stone</td>
</tr>
</tbody>
</table>

Table devised by D. Fredrickson with P. Roberts.

<sup>1</sup>HP - House Pits
<sup>2</sup>DH = Dance House
Based on the above models the following predictions were outlined:

1) Sites with midden and housepits will be located primarily in the hill-valley transition area near permanent water supplies; they will have southern or open exposure and occur below 3500'.
2) Sites with dance houses will be larger than those without dance houses.
3) Sites with midden and no housepits will be smaller than sites with both midden and housepits.
4) Sites with midden and no housepits will be located along the crests of trending ridges and adjoining ridges (or flats just below crests) near active springs or permanent water courses and above 3500'.
5) Sites with flakes, points, and/or milling tools and/or other tools will be located throughout the area. Sites with flakes and points will be located in greater numbers in the foothills and on the ridges surrounding the valleys. Both flake/point/tool sites will be associated with water sources.

As should be clear, only four archaeological attributes were used to define the various types of sites: midden; housepits; dancehouses; and ground stone.

The next step was to develop the archaeological site types which would be compared to the above predictions. For reasons unclear to these authors, rather than using the above attributes to define the archaeological site types, additional data were collected. Two kinds of additional data were utilized: attributes of the site's cultural constituents and attributes of the site's environmental setting. Thirty-seven attributes were initially recorded: 17 constituent and 20 environmental. These data were placed into a computer with the objective of identifying clusters of variables that would define the site types. Unfortunately, due to a variety of problems the system did not work (this is the assessment of the present authors and not explicitly stated in the report), and rather than using the 17 constituent variables mentioned above, three variables were used to define the site types: midden; housepits, and groundstone. This methodology produced five site types: type 1, sites with midden and housepits; type 2, sites with midden and no housepits; type 3, sites with housepits and no midden; type 4, sites with flakes, tools, and/or points (no midden, no housepits); and type 5, sites with flakes, tools, or points plus groundstone. It should be noted that flakes, tools, and points are not considered variables because their presence or absence has no influence on the type of site that is defined, i.e., their presence or absence makes no difference for Types 1, 2, 3, and 5, while Type 4 is defined by the absence of the three variables (if site Type 4 had no flakes, tools, or points, it would not be a site).
The environmental attributes that were thought to co-occur with the various site types were: 1) landform: valley floor, hill/valley, major ridgetop, other ridgetop, terrace, slope, and flat; 2) type of water: permanent, and intermittent; and 3) distance to water: 50 meter intervals from 0 to 900. Due to the unknown degree of change in vegetation and the lack of secure chronological indicators, variables involving vegetation and chronology were not used.

The final site types and their expected locations are as follows:

Type 1. Midden and Housepits (Principal Occupation Sites) were expected to be located below 3500 feet next to permanent drainages with open exposure, in non-marshy areas on the valley floor or in the hill-valley transition zone. Thirty-eight percent were found in the hill-valley transition zone, while none were found in the valley. This latter deviation from the expected result may have been, it was suggested, attributable to the destruction of housepits by agriculture. If this was the case, the number of reliable variables would be reduced from 3 to 2, and the ability to distinguish type 1 sites from type 2 sites would be lost. An additional unexpected result emerged. Thirty-three percent of the sites were unexpectedly located on ridgetops, however, all were below 1900 feet. All but 36% of the sites were located near permanent sources of water.

Type 2. Midden and no Housepits (Seasonal Base Camps) were expected to be located on ridgetops near active springs or permanent water courses above 3500 feet. Contrary to the expectations, these sites were evenly distributed across the valley floor, hill-valley transition, and ridgetops. No sites were located over 3500 feet and only four out of 69 sites were located over 1800 feet. Based on this typology and Jackson's (1976), one would conclude that the local peoples had no Seasonal Occupation sites. However, it was stated that this probably wasn't the case but, rather, due to the fact that very little of the survey area was located above 3500 feet, it was concluded that the probability of finding such sites was quite low. This is precisely the problem pointed out earlier concerning predictive models that are presented without taking account of the areas that are surveyed.

Type 3. Housepits and no Midden will not be dealt with because there were no predictions nor discussions concerning their locations.

Type 4. Flake Scatters (Short Term Sites) were expected to be evenly distributed throughout the region, with the majority of sites on ridgetops. Sixty percent were found on ridgetops, 22% in the hill-valley transition zone, and 6% in the valley floor. They occurred at all elevations from 1000 to 5400'. Sixty-six percent of the sites were within 50 meters of water.
**Type 5.** Ground stone Sites (Short Term Sites) were expected to be evenly distributed across landforms and elevations, but a majority were located on ridges (57%). The remaining 43% were relatively even in distribution. The sites were equally associated with intermittent and permanent streams, with the majority of sites occurring within 50 meters of the water source.

Although there were many problems involved with the Round Valley study, it should be stressed that it was one of the first systematic attempts to quantify settlement pattern data from the North Coast Range. We view the study as quite useful because subsequent researchers will learn from the problems and continue to improve the quality of prehistoric research in the region.

As a result of her work at Redwood National Park, Bickel (1979) defined two types of sites plus an intermediate category: village sites, trail use sites, and "concentrations". Village sites were characterized by midden, fire-cracked rock, ground stone, chipped stone, etc. Trail use sites were defined as elongate, narrow flake scatters where the distance between cultural remains averaged between two and ten meters. Concentrations were considered an intermediate category between village sites and trail use sites. They lack midden and fire-cracked rock but have higher densities of lithic remains (including ground stone) than the trail use sites.

In a recent overview Jackson (1980) suggested that, rather than using a wide range of terminology to describe what appear to be similar kinds of sites, a more general and flexible one should be utilized in the North Coast Range. The following typology was proposed:

1) **Task specific sites** are those which would be included in Jackson's definition of his "quarry" and "procurement" sites and which would probably also account for some of the phenomena which Bickel terms "concentrations."

2) **Multi-activity sites** are those sites which would be subsumed under Jackson's definitions of "temporary seasonal camps," "seasonal occupation sites," and "principal occupation sites." In Tamez's scheme, her "multi-activity sites," "permanent occupation sites" and her "refuge sites" would all be incorporated. Bickel's "village" sites, as well as some of her "concentrations" would be included in our definition of site type. For our purposes here, multi-activity sites are those sites where more than two distinct subsistence, habitation or manufacturing enterprises were carried out at any simultaneous point in time in the past. The complexity of these sites where more than two distinct subsistence, habitation or manufacturing enterprises were carried
out at any simultaneous point in time in the past. The complexity of these sites will vary greatly and we will ultimately require some sort of sub-type categories to account for the array of phenomena. Basically, this generalization seeks to avoid unnecessary confusion arising from the use of such terms as "seasonal" and "occupation."

3) **Trail sites** are basically as defined by Bickel, with the emphasis that there is a direction and regularity to the distribution of what would otherwise appear to be simply isolated artifacts scattered on the landscape. Density of artifact distribution (and, similarly, the distribution of other manuports along the route) will be irregular.

4) **Isolated features** is a category meant to subsume the inventory of isolated petroglyphs, rock cairns, rock circles, "prayer seats" and other such features which are found apart from other site types. Where they occur in conjunction with evidence of other human activities they must be incorporated under "multi-activity" sites. The attempt here is to avoid the use of the subjective term "ritual" as is often applied to such sites. This category also includes caches.

Jackson (1980) also presented a general predictive model derived from the work of Fredrickson (1979:151-152):

...biophysical features suggestive of high archaeological sensitivity include some combination of the following:
(a) level of gently sloping topography;
(b) nearby springs or flowing drainages;
(c) major trending ridges;
(d) glades or meadows;

Conversely, biophysical features suggestive of low archaeological sensitivity include:
(a) slopes with gradients greater than 50%;
(b) an absence of fresh water;
(c) no major ridges
(d) slopes that lack flats or terraces;
(e) springs or flowing drainages that lack glades, meadows, or terraces in their vicinities...

Jackson (1980) then provided a more specific model that predicted the location of the individual site types. The model was based on the ethnographic record and was developed specifically for the Six Rivers National Forest. Due to its complexity, it will not be examined further here, however, it is recommended to researchers interested in problems concerning predictive models, as it is the most detailed attempt thus far presented in northwestern California.
In addition to archaeological survey, numerous test excavations have been carried out within the study area in recent years. Although the research value of this work has been generally low (many sites yielding little more than shallow flake scatters), some have been very important in terms of contributing to our knowledge of North Coast Range chronology. The work by Flaherty (1981) is a good example where at CA-MEN-1609, although excavations were applied to only 1% of the site, several projectile points were discovered. The point types, based on morphology, seemed to be indicative of Fredrickson's Middle to Upper Archaic Periods (1973). When obsidian hydration studies were conducted, the results seemed to confirm the original chronological designation. This report also included pollen data provided by West. The fact that the warm trend co-occurred with the dating of the site, led Flaherty to conclude that such information has made it necessary to modify Jackson's 1976 site typology.

One important area in the prehistory of California that has largely been overlooked in North Coast Range research, is the discovery of sites that may be attributed to the Millingstone Horizon. This was illustrated by the results of a survey near the southern boundary of the study area (True, Baumhoff and Hellen 1979). During the two year drought from 1975 through 1977, the reservoir level at Lake Berryessa dropped 40 feet, exposing land devoid of vegetation. Along the hillsides away from the streambeds, artifacts that are characteristic of the Millingstone Horizon as defined by Wallace (1954) were discovered. The Berryessa assemblages were characterized by: 1) the overwhelming predominance of cobble tools relative to other chipped stone forms, with an emphasis on tools with probable scraping functions; 2) the presence of milling implements (manos and metates) and the apparent absence of mortars and pestles; and 3) the scarcity of projectile points, chipping waste, and other small chipped stone implements.

When similar areas covered by vegetation above the original reservoir level were surveyed, nothing could be found. This leads to the possibility that such sites may be widespread in northern California, as they are in southern California, but difficult to identify.

Before concluding the literature review it should be pointed out that studies concerned with the analysis of obsidian have made significant contributions to our knowledge of prehistoric intergroup relations within the North Coast Range (King 1974b; Jackson 1974, 1976; Taylor 1977; Hughes 1978; Ericson 1977; Kaufman 1980; Basgall 1979; Origer et al. 1980). Obsidian manifests important properties which can be tested revealing its original quarry source and others by which manufacture/use date estimates can be calculated. Obsidian from each geologic source or quarry is marked by a
characteristic chemical composition identifiable through X-ray fluorescence spectroscopy, neutron activation or similar analytic techniques. Thus, archaeologically recovered obsidian can be ascribed to its geologic origin thereby providing the potential for the reconstruction of prehistoric patterns of obsidian procurement and exchange. Major sources chemically identified to date for the Mendocino National Forest and East Lake Planning District include the Annadel and Glass Mountain obsidian flows in the Sonoma Valley and Napa areas, respectively, Borax Lake and Mount Konocti sources in the Clear Lake Basin, as well as several sources in northeast and northcentral California including Medicine Lake Highlands, "Source X" (identifiable chemically but quarry unknown), Kelly Mountain, and Modoc Plateau. There are possibly other as yet unidentified sources for the area.

The cultural resource management oriented investigations sponsored in recent years by the federal agencies have produced valuable and abundant information regarding the obsidian distribution within the project area, but, given the management requirements behind the research, there has not been systematic coverage of the whole area, i.e., there is rich data for some areas and none for others. Ideally, research should be based on a stratified, random sampling design incorporating environmental and ethnographic regions as variables, as well as a range of tool types and sizes including ethnographically stated preferences for the use of particular sources for particular uses.

In spite of the uneven coverage of the obsidian studies, a number of generalizations can be derived from the results. The Clear Lake sources, Borax Lake in particular, dominate the flaked stone assemblages in sites at least 20 miles north, east and west of Clear Lake (and possibly further). Northeastern California sources begin to appear in archaeological sites in significant numbers in an area some 20-50 miles to the northeast of Clear Lake on the eastern slopes of the North Coast Range. Further testing will define the limits of this trend more accurately. Napa obsidian is found in relative abundance in the southern portion of the East Lake Planning District in the Berryessa region. It was apparently highly valued as a good quality resource as it is often found in sites very close to other major sources such as Borax Lake or Mount Konocti. These patterns of source use may provide the basis for inferences concerning procurement and exchange systems and in changes in those systems over time.

Source identification also has the potential to isolate possible differences in relationships among groups by identifying archaeological patterns that indicate differential access to the resource. These patterns have shown that, in some cases, obsidian was acquired more frequently from sources other than those most proximal to the sites in question. This has led to the conclusion that negative intergroup relations may
have existed between the occupants of the sites and those controlling the nearby source (cf. Origer et al. 1980). Such patterns are very important because they indicate that sociological variables may have had a sufficiently significant influence to prevent people from following forms of behavior which would be predicted by materially based optimal/least effort models.

The second kind of analysis to which obsidian can satisfactorily be subjected is known as obsidian hydration. Obsidian absorbs atmospheric water at a relatively predictable rate which begins at the moment that a fresh obsidian surface is exposed as, for instance, during the manufacture of a stone tool. The rate of accumulation varies according to the chemical composition so that different sources reflect different rates of absorption (see Michels 1965; Michels and Tsong 1980; Ericson 1977; and Kaufman 1980). This process of hydration produces a rind which is read in microns and translated into years. For instance, the Mount Konocti source hydrates extremely slowly at approximately 1800 years per micron (Kaufman 1980) while the Borax Lake source hydrates at approximately 900 years per micron. While this dating technique is not as precise as radiocarbon determinations, it is highly useful, particularly in the North Coast Range where poor preservation of organic materials often precludes the possibility of radiocarbon dates.

Summary

In general, the earliest archaeological research in the North Coast Range was largely concerned with the development of chronological sequences. Later, in the late 1960s, large scale reservoir surveys resulted in an increased interest in settlement pattern studies. Concern with settlement patterns extended through the 1970s and resulted in a heavy emphasis on the development of functional site typologies. Unfortunately, most of the typologies were based on synchronic ethnographic models and ignored the diachronic nature of the archaeological record. Recently, there has been renewed interest in studies of both environmental and cultural change. We consider this to be a positive trend and hope to contribute to it in the following pages by studying patterns of settlement within a diachronic context.

ENVIRONMENTAL CONTEXT

Introduction

The relative amounts of pertinent environmental variables must be determined in order to develop a predictive model for site location. Five transects two miles wide were selected
to serve this purpose, since the measurement of the entire study area would be too massive an undertaking.

Methods and Materials

Transect location was selected on the basis of the best archaeological survey coverage in conjunction with environmental variation, i.e. transects were placed to sample each portion of the study area (Map 15). The three most salient environmental variables were selected: vegetation, elevation and topography.

The Forest Service provided recently devised vegetation strata maps of their land holdings, while vegetation information on B.L.M. lands was gained by a combination of aerial photos and 7.5 minute topographic sheets. Elevation and topographic information came directly from the 7.5 minute topographic maps. Measurements were made with a Keuffel and Esser plane planimeter and were converted to acres and relative percentages.

The vegetation communities were based on information presented in Chapter III; however, some aspects of vegetation required more specific information, while in other situations that level of generalization was appropriate for purposes of model development. The vegetation communities are listed below as revised and subsequently measured (after Kuchler 1977a, b).

1. Forest. This consists of the Mixed Evergreen Forest with Rhododendron lumped with the Coast Montane Forest community.

2. Oak Woodland. The Blue Oak-Digger Pine Forest has been split into two categories. This one refers to more dense stands of trees with scrubby underbrush.

3. Savanna. This is the second category of the divided Blue Oak-Digger Pine Forest. It describes an open, parklike situation in which trees are widely spaced with grass as the dominant form of ground cover.

4. Grassland. This division was required in order to account for the scattered prairies that are often found on the common debris flow phenomena of the North Coast Range (Irwin 1960). This community is similar to the Coastal Prairie of Munz and Keck (1959). It is important because of its link to ecotonal areas which are favorable habitats for many economic plant and animal species important to Native Americans.
5. Chaparral. No alterations were necessary for this community. It is of interest that chaparral species (particularly manzanita and digger pine) are often associated with ultramafic (i.e. serpentine) derived soils (Bailey, Irwin and Jones 1964).

Elevation was separated into seven divisions at 1000 foot intervals beginning with 1500 feet and below through 6500 feet and above.

Topographic features were divided into three categories for the planimetric measurements. The first is ridgetops and refers to the area of land on ridges with a slope of less than 25%. Valleys, the second division, are defined by relatively flat, low lying land that is associated with permanent streams. The last category, slope, is made up of all lands that range between ridgetops and valleys.

Analysis

Transect 1 traverses the South Yolla Bolly Mountains in the extreme north of the study area. Transect 2 begins in the west at the Eel River Station and extends east to where it ends near Newville. Transect 3 begins in the west just south of Eden Valley and extends east almost to the Stony Gorge Reservoir. Transect 4 begins in the west near Potter Valley and extends east to Lodoga. Transect 5 begins in the west at Lower Lake and extends east to Rumsey (Map 15).

The environmental data collected from within each transect are summarized in Table 3. As mentioned in other portions of this paper (Chapter III), vegetation, elevation and topography vary from north to south, and the transect data further illustrate this differentiation.

Vegetation in Transect 1 is predominantly forest with negligible amounts of the other communities. Transect 2 contains the most diversity with all communities represented in sizable amounts. Forest comprises 41% of the total, followed by chaparral 25%, oak woodland 20%, grassland near 10%, and savanna 4%. Forest increases in Transect 3 to nearly 75% of the total, followed by oak woodland and chaparral in equal amounts, while grassland and savanna are represented in minute quantities. Transect 4 shows a drop in forest cover of 10% from Transect 3 and 20% from Transect 1, but at 62% it is still the most represented community. Chaparral approaches 25% of the total, with oak woodland, grassland, and savanna in small amounts. Forest cover in Transect 5 does not exist. Chaparral composes 50% of the vegetation, followed by oak woodland, grassland, and savanna, in that order.
Map 15. Transects across the Study Area
<table>
<thead>
<tr>
<th></th>
<th>Vegetation</th>
<th>Elevation</th>
<th>Topography</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Oak Woodland</td>
<td>Grassland</td>
<td>Savannah</td>
</tr>
<tr>
<td>Transect 1</td>
<td>2.7</td>
<td>0.2</td>
<td>--</td>
</tr>
<tr>
<td>Transect 2</td>
<td>19.7</td>
<td>9.7</td>
<td>3.7</td>
</tr>
<tr>
<td>Transect 3</td>
<td>13</td>
<td>1.3</td>
<td>4</td>
</tr>
<tr>
<td>Transect 4</td>
<td>6</td>
<td>4</td>
<td>4.3</td>
</tr>
<tr>
<td>Transect 5</td>
<td>23</td>
<td>17</td>
<td>10</td>
</tr>
</tbody>
</table>

Table 3. Summary of Transect Environmental Data
All figures in percentages.
The north to south gradation in elevation begins in Transect 1 where 80% of the land is above 4500 feet, and no elevations exist under 1500 feet. Low elevations are represented in Transect 2, but the bulk (75%) of land is between 2500 and 6500 feet. Seventy-five percent of Transect 3 elevations also fall in this range. Transect 4 continues the shift to lower elevations, with 70% between 1500 and 4590 feet. In Transect 5 no elevations are over 3500 feet, and 60% are 2500 feet or below.

Topographic features show the least amount of overall variation. Slopes between ridgetops and valley bottoms are the major element in all transects, and ridgetops are more evident than valleys in all transects except number 5. Indeed, Transect 5 shows the most diversity in topography since valleys compose 25% of the total and ridgetops are half that figure with slopes the remainder.
SITE TYPOLOGY

Introduction

The information presented in the literature review indicates that there is a general consensus regarding the development of site typologies in the North Coast Range. The site types are usually similar to those proposed by Jackson (1980): multi-activity sites; task specific sites; trail sites; and isolated features. It is also common, when developing such a typology, to aggregate all artifacts together as if they are representative of the same time period, usually the ethno­graphic period.

In this study we will shift the focus of site typology analysis since we are interested in tracing the relative frequency of the co-occurrence of particular artifact forms, especially those that have been suggested to be chronological indicators in previous archaeological investigations as well as in Appendix A. This kind of analysis is useful because, if there is evidence in the archaeological record for a shift in land use patterns through time, it can be identified. With the use of aggregated site types as in previous studies, patterns may be occurring and yet remain unobserved by the researcher.

Methods and Materials

Artifactual and environmental data were collected from the 1,120 sites located within the study area. All information was gathered from site survey forms, 7.5' topographic maps, or collected artifacts. The information was recorded on Stanford sorting cards and each attribute given a number corresponding to a hole on the perimeter of the card. When a particular attribute was present, the hole was punched open. In this system, when the researcher wishes to examine all the cards that possess that attribute, a rod is placed through the hole, allowing those cards to fall out, while those not possessing the attribute (not having been punched) remain on the rod.

Before moving on to the data analysis, a major data collection problem should be pointed out. The area of concern involves the description of projectile points during the survey phase. Of the sites recorded to have had projectile points, only 35% included outline drawings and only 15% indicated that some form of artifact collection had occurred. These patterns not only constrain the interpretive potentials of this report, but also indicate that a great deal of important information is in risk of being permanently lost.

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Analysis

This data is analyzed and presented through the development of a series of null hypotheses. No attribute is dealt with by itself but is compared with the distribution of at least one other attribute. Four major categories of possible chronological indicators are selected for examination of correlations with other variables: ground stone; projectile points; projectile point association with ground stone; and lithic scatters. Correlations are sought between these and environmental variables, other artifact categories, the presence of midden, and chert/obsidian ratios.

It should be noted at the outset that the numbers of a category, e.g. ground stone, associated with one variable may be different from the numbers of that category associated with another variable. This discrepancy is due to the fact that not all variables are uniformly recorded, as for instance, elevation may be more regularly recorded than vegetation. Secondly, two environmental categories are used in the following analyses which were not used in the preceding environmental section. These are "small stream" which previously fell under the heading "slope" and "forest meadow" which was subsumed under the heading "conifer forest". These categories are recorded on the site survey forms and so included in the following discussion, but they could not be identified and measured with the vegetation maps that were used for the environmental analysis.

Analysis of Sites with Ground Stone

\[H_0\] - There is no difference in the distribution between sites with manos and/or metates and sites with mortars and/or pestles regarding vegetation.

Two hundred-ninety-one sites (26% of the total) were determined to have ground stone included in the assemblage. Of 264 sites that had ground stone and could be assigned to vegetation communities, 168 exhibited manos and/or metates (63.6%), 56 exhibited mortars and/or pestles (21.2%), and 40 sites had both categories of ground stone (15.2%).

Table 4a. Manos/Metates vs. Mortars/Pestles with Vegetation

<table>
<thead>
<tr>
<th></th>
<th>M/M</th>
<th>M/P</th>
<th>Both</th>
<th>Row Totals</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>#</td>
<td>%</td>
<td>#</td>
<td>%</td>
</tr>
<tr>
<td>forest</td>
<td>67</td>
<td>(39.9)</td>
<td>8</td>
<td>(14.3)</td>
</tr>
<tr>
<td>forest/meadow</td>
<td>23</td>
<td>(13.7)</td>
<td>7</td>
<td>(12.5)</td>
</tr>
<tr>
<td>oak woodland</td>
<td>27</td>
<td>(16.1)</td>
<td>11</td>
<td>(19.6)</td>
</tr>
<tr>
<td>chaparral</td>
<td>11</td>
<td>(6.5)</td>
<td>8</td>
<td>(14.3)</td>
</tr>
<tr>
<td>savanna</td>
<td>12</td>
<td>(7.1)</td>
<td>4</td>
<td>(7.1)</td>
</tr>
<tr>
<td>grassland</td>
<td>6</td>
<td>(3.6)</td>
<td>4</td>
<td>(7.1)</td>
</tr>
<tr>
<td>ecotone</td>
<td>22</td>
<td>(13.1)</td>
<td>14</td>
<td>(25.0)</td>
</tr>
<tr>
<td>Totals</td>
<td>168</td>
<td>(100)</td>
<td>56</td>
<td>(100)</td>
</tr>
</tbody>
</table>
When the forest and forest meadow categories are lumped and compared to the others, the following values emerge:

Table 4b. Summarized Manos/Metates vs. Mortars/Pestles with Vegetation

<table>
<thead>
<tr>
<th></th>
<th>M/M</th>
<th>M/P</th>
<th>Row totals</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>#</td>
<td>%</td>
<td>#</td>
</tr>
<tr>
<td>forest/forest meadow</td>
<td>90</td>
<td>(53.6)</td>
<td>15</td>
</tr>
<tr>
<td>others</td>
<td>78</td>
<td>(46.4)</td>
<td>41</td>
</tr>
<tr>
<td>Totals</td>
<td>168</td>
<td>(100)</td>
<td>56</td>
</tr>
</tbody>
</table>

X^2 = 12.1, significant at .001.

Sites with manos and/or metates are found in the forest/forest meadow significantly more frequently than sites with mortars and/or pestles. Chi square performed on the summarized data showed significance at .001, and consequently H_1 is rejected.

H_2 - There is no difference in the distribution between sites with manos and/or metates and sites with mortars and/or pestles regarding elevation.

Of 284 sites that had ground stone and could be assigned to an elevation, 177 had manos and/or metates (62.3%), 73 had mortars and/or pestles (25.7%), while 34 had both (12%).

Table 5a. Ground Stone with Elevation

<table>
<thead>
<tr>
<th>1000'</th>
<th>M/M</th>
<th>M/P</th>
<th>Both</th>
<th>Row Totals</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>#</td>
<td>%</td>
<td>#</td>
<td>%</td>
</tr>
<tr>
<td>0-15</td>
<td>16</td>
<td>(9.0)</td>
<td>23</td>
<td>(31.5)</td>
</tr>
<tr>
<td>15-25</td>
<td>20</td>
<td>(11.3)</td>
<td>8</td>
<td>(11.0)</td>
</tr>
<tr>
<td>25-35</td>
<td>18</td>
<td>(10.2)</td>
<td>7</td>
<td>(9.6)</td>
</tr>
<tr>
<td>35-45</td>
<td>36</td>
<td>(20.3)</td>
<td>14</td>
<td>(19.2)</td>
</tr>
<tr>
<td>45-55</td>
<td>39</td>
<td>(22.0)</td>
<td>13</td>
<td>(17.8)</td>
</tr>
<tr>
<td>55-65</td>
<td>44</td>
<td>(24.9)</td>
<td>8</td>
<td>(11.0)</td>
</tr>
<tr>
<td>65+</td>
<td>4</td>
<td>(2.3)</td>
<td>--</td>
<td>--</td>
</tr>
<tr>
<td>Totals</td>
<td>177</td>
<td>(100)</td>
<td>73</td>
<td>(100)</td>
</tr>
</tbody>
</table>

When the elevation intervals are combined, the following values emerge:
Table 5b. Summarized Ground Stone with Elevation

<table>
<thead>
<tr>
<th></th>
<th>M/M</th>
<th></th>
<th>M/P</th>
<th></th>
<th>Row Totals</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>#</td>
<td>%</td>
<td>#</td>
<td>%</td>
<td>#</td>
</tr>
<tr>
<td>0-25</td>
<td>36</td>
<td>(20.3)</td>
<td>31</td>
<td>(42.5)</td>
<td>67</td>
</tr>
<tr>
<td>25-45</td>
<td>54</td>
<td>(30.5)</td>
<td>21</td>
<td>(28.8)</td>
<td>75</td>
</tr>
<tr>
<td>45+</td>
<td>87</td>
<td>(49.2)</td>
<td>21</td>
<td>(28.8)</td>
<td>108</td>
</tr>
<tr>
<td>Totals</td>
<td>177</td>
<td>(100)</td>
<td>73</td>
<td>(100)</td>
<td>250</td>
</tr>
</tbody>
</table>

\[ X^2 = 14.91, \text{ significant at .001.} \]

The data clearly show that the mano/metate sites are more frequent than the mortar/pestle sites at elevations above 4500 feet, and that within the mortar/pestle category, more sites occur below 2500 feet. The zone between 2500 feet and 4500 feet is an area of overlap. This distribution is significant at .001 when tested by chi square, and, as a result, \( H_0 \) is rejected.

\( H_0 \) - There is no difference in the distribution between sites with manos and/or metates and sites with mortars and/or pestles regarding topography.

Of 272 sites which had ground stone and could be assigned to a topographical category, 170 had manos and/or metates (62.5%), 72 had mortars and/or pestles, and another 30 had both (11%).

Table 6a. Ground Stone with Topography

<table>
<thead>
<tr>
<th></th>
<th>M/M</th>
<th></th>
<th>M/P</th>
<th></th>
<th>Both</th>
<th></th>
<th>Row Totals</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>#</td>
<td>%</td>
<td>#</td>
<td>%</td>
<td>#</td>
<td>%</td>
<td>#</td>
</tr>
<tr>
<td>ridge</td>
<td>83</td>
<td>(48.8)</td>
<td>22</td>
<td>(30.6)</td>
<td>7</td>
<td>(23.3)</td>
<td>112</td>
</tr>
<tr>
<td>slope</td>
<td>55</td>
<td>(32.4)</td>
<td>20</td>
<td>(27.8)</td>
<td>15</td>
<td>(50.0)</td>
<td>90</td>
</tr>
<tr>
<td>valley</td>
<td>17</td>
<td>(10.0)</td>
<td>5</td>
<td>(6.9)</td>
<td>2</td>
<td>(6.7)</td>
<td>24</td>
</tr>
<tr>
<td>sm. stream</td>
<td>15</td>
<td>(8.8)</td>
<td>25</td>
<td>(34.7)</td>
<td>6</td>
<td>(20.0)</td>
<td>46</td>
</tr>
<tr>
<td>Totals</td>
<td>170</td>
<td>(100)</td>
<td>72</td>
<td>(100)</td>
<td>30</td>
<td>(100)</td>
<td>272</td>
</tr>
</tbody>
</table>

When the topographic variables are aggregated, the following pattern becomes apparent:

Table 6b. Summarized Ground Stone with Topography

<table>
<thead>
<tr>
<th></th>
<th>M/M</th>
<th></th>
<th>M/P</th>
<th></th>
<th>Row Totals</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>#</td>
<td>%</td>
<td>#</td>
<td>%</td>
<td>#</td>
</tr>
<tr>
<td>ridge/slope</td>
<td>138</td>
<td>(81.2)</td>
<td>42</td>
<td>(58.3)</td>
<td>180</td>
</tr>
<tr>
<td>valley/small stream</td>
<td>32</td>
<td>(18.8)</td>
<td>30</td>
<td>(41.7)</td>
<td>62</td>
</tr>
<tr>
<td>Totals</td>
<td>170</td>
<td>(100)</td>
<td>72</td>
<td>(100)</td>
<td>242</td>
</tr>
</tbody>
</table>

\[ X^2 = 13.83, \text{ significant at .001.} \]
The above data indicate that mano/metate sites are found relatively more often on ridges and slopes than are mortar/pestle sites. On the other hand, mortar/pestle sites are found relatively more frequently in valleys or along streams than are mano/metate sites. The chi square on this distribution is significant at .001, and as a result, $H_3$ is rejected.

$H_4$ - There is no difference between sites with manos and/or metates and sites with mortars and/or pestles in the frequency at which they include midden.

Of the total 291 sites that are recorded for the presence of ground stone, 180 contain manos and/or metates (61.9%), 71 contain mortars and/or pestles (24.4%), and 40 contain both (13.7%). Middens are a feature of only 30.2% of these ground stone sites.

Table 7. Ground Stone with Midden

<table>
<thead>
<tr>
<th></th>
<th>M/M</th>
<th></th>
<th>M/P</th>
<th></th>
<th>Both</th>
<th></th>
<th>Row Totals</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>#</td>
<td>%</td>
<td>#</td>
<td>%</td>
<td>#</td>
<td>%</td>
<td>#</td>
</tr>
<tr>
<td>midden</td>
<td>48</td>
<td>(26.7)</td>
<td>25</td>
<td>(35.2)</td>
<td>15</td>
<td>(37.5)</td>
<td>88</td>
</tr>
<tr>
<td>midden not recorded</td>
<td>132</td>
<td>(73.3)</td>
<td>46</td>
<td>(64.8)</td>
<td>25</td>
<td>(62.5)</td>
<td>203</td>
</tr>
<tr>
<td>Total</td>
<td>180</td>
<td>(100)</td>
<td>71</td>
<td>(100)</td>
<td>40</td>
<td>(100)</td>
<td>291</td>
</tr>
</tbody>
</table>

$X^2 = 1.81$, not significant, .20. ("Both" category eliminated for test.)

While sites with mortars and/or pestles include midden slightly more often than sites with manos and/or metates, the difference is not significant, and $H_4$ is confirmed.

$H_5$ - There is no difference between sites with manos and/or metates and sites with mortars and/or pestles in the frequency at which they include projectile points.

All 291 sites with ground stone are also compared in regard to their inclusion of points.

Table 8. Ground Stone with Projectile Points

<table>
<thead>
<tr>
<th></th>
<th>M/M</th>
<th></th>
<th>M/P</th>
<th></th>
<th>Both</th>
<th></th>
<th>Row Totals</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>#</td>
<td>%</td>
<td>#</td>
<td>%</td>
<td>#</td>
<td>%</td>
<td>#</td>
</tr>
<tr>
<td>points</td>
<td>48</td>
<td>(26.7)</td>
<td>9</td>
<td>(12.7)</td>
<td>8</td>
<td>(20.0)</td>
<td>65</td>
</tr>
<tr>
<td>without points</td>
<td>132</td>
<td>(73.3)</td>
<td>62</td>
<td>(87.3)</td>
<td>32</td>
<td>(80.0)</td>
<td>226</td>
</tr>
<tr>
<td>Total</td>
<td>180</td>
<td>(100)</td>
<td>71</td>
<td>(100)</td>
<td>40</td>
<td>(100)</td>
<td>291</td>
</tr>
</tbody>
</table>

$X^2 = 5.67$, significant at .02. ("Both" category eliminated in test.)
Although neither kind of ground stone site has a very high frequency of correlation with projectile points, sites with manos and/or metates show a tendency to include projectile points more frequently than do sites with mortars and/or pestles. A chi square test shows moderate significance at .02, and consequently H₅ is rejected.

H₆ - There is no difference between sites with manos and/or metates and sites with mortars and/or pestle in their chert/obsidian ratios.

Although only 194 (66.6%) of the 291 sites with ground stone could be used in this analysis, the relative distribution between the categories of mano/metate, mortar/pestle, and both remained comparable to their distribution when all sites are considered (66%, 21.1%, and 12.9% respectively; see H₄ for comparison).

### Table 9a. Ground Stone and Chert/Obsidian Ratios

<table>
<thead>
<tr>
<th></th>
<th>M/M</th>
<th>M/P</th>
<th>Both</th>
<th>Row Totals</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>#</td>
<td>%</td>
<td>#</td>
<td>%</td>
</tr>
<tr>
<td>all obsidian</td>
<td>12</td>
<td>(9.4)</td>
<td>16</td>
<td>(39.0)</td>
</tr>
<tr>
<td>predominantly</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>obsidian</td>
<td>11</td>
<td>(8.6)</td>
<td>2</td>
<td>(4.9)</td>
</tr>
<tr>
<td>all chert</td>
<td>65</td>
<td>(50.8)</td>
<td>19</td>
<td>(46.3)</td>
</tr>
<tr>
<td>predominantly</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>chert</td>
<td>40</td>
<td>(31.3)</td>
<td>4</td>
<td>(9.8)</td>
</tr>
<tr>
<td>Totals</td>
<td>128</td>
<td>(100)</td>
<td>41</td>
<td>(100)</td>
</tr>
</tbody>
</table>

When the values are combined, the following patterns are evident:

### Table 9b. Summarized Ground Stone and Chert/Obsidian Ratios

<table>
<thead>
<tr>
<th></th>
<th>M/M</th>
<th>M/P</th>
<th>Row Totals</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>#</td>
<td>%</td>
<td>#</td>
</tr>
<tr>
<td>all obsidian/</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>predominantly</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>obsidian</td>
<td>23</td>
<td>(18.0)</td>
<td>18</td>
</tr>
<tr>
<td>all chert/</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>predominantly</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>obsidian</td>
<td>105</td>
<td>(82.0)</td>
<td>23</td>
</tr>
<tr>
<td>Totals</td>
<td>128</td>
<td>(100)</td>
<td>41</td>
</tr>
</tbody>
</table>

\[ X^2 = 9.86, \text{ significant at .01.} \]
Manos and metates are more frequently associated with chert, and mortars and pestles are relatively more frequently associated with obsidian. When tested with chi square, this distribution shows significance at .01, and consequently \( H_0 \) is rejected.

**Ground Stone Summary**

By functionally differentiating sites on the basis of their ground stone constituents, several interesting patterns have emerged. Sites with manos and/or metates were found more often than sites with mortar and/or pestles at higher elevations, in the conifer forest, and on ridges and slopes. They were also more frequently associated with projectile points but less frequently associated with obsidian. On the other hand, sites with mortars and/or pestles were found more often at lower elevations, outside the conifer forest, and in valleys or proximal to small streams. They were also more frequently found in sites containing obsidian but were less frequently found with projectile points. Midden was not frequently associated with ground stone, but was slightly more often found in sites with mortars and/or pestles.

**Ground Stone Interpretation**

Three alternative interpretations could be used to explain the patterns of the above data. We will label them as follows, "synchronic", "latitudinal", and "diachronic".

If one assumes that all the data are synchronic and representative of the "ethnographic present", the following interpretation could be proposed. The variability between mano/metate sites and mortar/pestle sites in their distributions and associations is the direct result of annual patterns of specialized adaptations to particular habitats. Mano/metate sites are found in the high mountains where they are used to process pine nuts and grass seed. Midden does not develop because they are intermittent, temporary camps and obsidian is sparse for unknown reasons (less hunting, tool manufacture, etc.). Mortar/pestle sites are found at lower elevations in the oak areas where they are used to process acorns. The sites were probably more regularly occupied demonstrating a slightly higher presence of midden. The presence of obsidian remains difficult to explain.

The second alternative is the latitudinal interpretation. As stated in the environmental section, the northern reaches of the study area are dominated by high elevations, conifer forest and almost completely lack valleys. The southern areas, on the other hand, show greater amounts of low elevation valleys
with non-conifer forest plant communities. This being the case, it follows, that the mano/metate sites are more frequently found in the north and lack obsidian because they are farther away from the more southerly obsidian quarries. It also follows that the mortar/pestle sites are more frequently found in the south and have obsidian by virtue of being near the obsidian sources.

Because it is unlikely that the patterns of the "ethnographic present" have remained static for the last 10,000 years, the final, diachronic interpretation is necessary. If one assumes the two forms of ground stone can be used as rough chronological indicators, the above patterns fit rather well with the previously discussed ideas of Fredrickson (1973), West (1981a, b) and King (1974). Fredrickson (1973) proposed that the transition from the mortar/pestle began to occur at 3000 B.C. and became complete by 500 B.C. He also suggested that this transition was associated with an increase in the amount of intergroup trade of items such as obsidian. West (1981a, b) proposed that a warm period occurred from approximately 4500 B.C. to 500 B.C. at the end of which time a cooling trend developed. During this warm period it is thought that the more productive oak-woodland communities moved up at least 1000 feet in elevation as well as some undetermined distance in latitude. Finally, King (1974), proposed a shift in settlement from high to low elevations with a corresponding increase in trade during the latter period. In conclusion, the diachronic view would argue that many of the mano/metate sites are representative of an earlier, high elevation adaptation to environments that may have contained many more oak related habitats than currently present. The mortar/pestle sites are representative of a later, lowland, acorn oriented economy that was associated with an increase in the amount of trade.

As should be clear, in order to eliminate some of these alternatives, stronger chronological placement of the sites is necessary. As a result, we will next analyze the distribution of time sensitive projectile points and follow with an analysis of how they relate to the ground stone sites.

Analysis of Sites with Projectile Points

Four projectile point categories have been defined for the purposes of this discussion. Typing of the points was based largely on the observation of drawings, and as a result, the interpretations presented should be viewed with caution.

1) wide-stemmed points: these points resemble the Borax Lake Wide-stem, the Houx Square-stem, and the Houx Contracting-stem (Baumhoff, Appendix A).
2) mendocino points: these resemble the Willits Side-notched and the Mendocino Concave-base (Baumhoff, Appendix A).

3) excelsior points: these resemble the Large and Small Excelsior (Baumhoff, Appendix A), and include other leaf-shaped points.

4) late points: these resemble the Gunther and Rattlesnake Corner-notched points (Baumhoff, Appendix A).

Two hundred and two site forms (18% of the 1120 total) recorded one or more of these projectile types. Since more than one type may be recorded per form, this figure does not represent the total number of observations of types, which is greater, numbering 253. It should also be reiterated that not all variables are recorded uniformly on the site forms so that totals in regard to one set of variables may not be the same for others.

H_0 - There is no difference in the distribution of sites regarding vegetation based on the presence or absence of projectile point types.

Of the total of 253 observations of projectile points, 210 (83%) could be assigned to type and vegetation categories. Wide-stemmed points made up 14.8%, mendocino points 33.8%, excelsior points 15.7%, and late points 35.7% of the total here.

Table 10a. Projectile Points with Vegetation

<table>
<thead>
<tr>
<th></th>
<th>ws</th>
<th></th>
<th>men</th>
<th></th>
<th>ex</th>
<th></th>
<th>lt</th>
<th></th>
<th>row totals</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>#</td>
<td>%</td>
<td>#</td>
<td>%</td>
<td>#</td>
<td>%</td>
<td>#</td>
<td>%</td>
<td>#</td>
</tr>
<tr>
<td>forest</td>
<td>12</td>
<td>(38.7)</td>
<td>28</td>
<td>(39.4)</td>
<td>15</td>
<td>(45.5)</td>
<td>25</td>
<td>(33.3)</td>
<td>80</td>
</tr>
<tr>
<td>forest meadow</td>
<td>10</td>
<td>(32.3)</td>
<td>22</td>
<td>(31.0)</td>
<td>8</td>
<td>(24.2)</td>
<td>16</td>
<td>(21.3)</td>
<td>56</td>
</tr>
<tr>
<td>oak woodland</td>
<td>2</td>
<td>(6.5)</td>
<td>3</td>
<td>(4.2)</td>
<td>3</td>
<td>(9.1)</td>
<td>4</td>
<td>(5.3)</td>
<td>12</td>
</tr>
<tr>
<td>chaparral</td>
<td>1</td>
<td>(3.2)</td>
<td>3</td>
<td>(4.2)</td>
<td>1</td>
<td>(3.0)</td>
<td>7</td>
<td>(9.3)</td>
<td>12</td>
</tr>
<tr>
<td>savanna</td>
<td>--</td>
<td>--</td>
<td>--</td>
<td>--</td>
<td>--</td>
<td>--</td>
<td>4</td>
<td>(5.3)</td>
<td>4</td>
</tr>
<tr>
<td>grassland</td>
<td>--</td>
<td>--</td>
<td>2</td>
<td>(2.8)</td>
<td>--</td>
<td>--</td>
<td>3</td>
<td>(4.0)</td>
<td>5</td>
</tr>
<tr>
<td>ecotone</td>
<td>6</td>
<td>(19.4)</td>
<td>13</td>
<td>(18.3)</td>
<td>6</td>
<td>(18.2)</td>
<td>16</td>
<td>(21.3)</td>
<td>41</td>
</tr>
<tr>
<td>Totals</td>
<td>31</td>
<td>(100)</td>
<td>71</td>
<td>(100)</td>
<td>33</td>
<td>(100)</td>
<td>75</td>
<td>(100)</td>
<td>210</td>
</tr>
</tbody>
</table>

When the forest and forest/meadow categories are lumped and compared to the others, the following values emerge:

Table 10b. Summarized Projectile Points and Vegetation

<table>
<thead>
<tr>
<th></th>
<th>ws</th>
<th></th>
<th>men</th>
<th></th>
<th>ex</th>
<th></th>
<th>lt</th>
<th></th>
<th>row totals</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>#</td>
<td>%</td>
<td>#</td>
<td>%</td>
<td>#</td>
<td>%</td>
<td>#</td>
<td>%</td>
<td>#</td>
</tr>
<tr>
<td>forest/forest</td>
<td>22</td>
<td>(68.7)</td>
<td>50</td>
<td>(70.4)</td>
<td>23</td>
<td>(69.7)</td>
<td>41</td>
<td>(54.6)</td>
<td>136</td>
</tr>
<tr>
<td>meadow</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>others</td>
<td>9</td>
<td>(31.3)</td>
<td>21</td>
<td>(29.6)</td>
<td>10</td>
<td>(30.3)</td>
<td>34</td>
<td>(45.4)</td>
<td>74</td>
</tr>
<tr>
<td>Totals</td>
<td>31</td>
<td>(100)</td>
<td>71</td>
<td>(100)</td>
<td>33</td>
<td>(100)</td>
<td>75</td>
<td>(100)</td>
<td>210</td>
</tr>
</tbody>
</table>

\[ X^2 = 5.22, \text{ not significant at .20.} \]
Wide-stem, mendocino, and excelsior types all followed the same pattern, however, the late point sites showed a higher frequency of locations out of the conifer forest. Nevertheless, the chi square does not show the differences in the distribution to be significant, so $H_1$ cannot be rejected.

$H_2$ - There is no difference in the distribution of sites regarding elevation based on the presence or absence of projectile point types.

Of the 194 projectile point observations (76.7% of the total) that could be assigned to elevations, 14.9% were wide-stemmed, 39.2% were mendocino, 14.4% were excelsior, and 31.4% were late points.

Table 11a. Projectile Points and Elevation

<table>
<thead>
<tr>
<th></th>
<th>ws</th>
<th></th>
<th>ex</th>
<th></th>
<th>lt</th>
<th></th>
<th>row totals</th>
</tr>
</thead>
<tbody>
<tr>
<td>#</td>
<td>%</td>
<td></td>
<td>%</td>
<td></td>
<td>%</td>
<td></td>
<td></td>
</tr>
<tr>
<td>0-15</td>
<td>1</td>
<td>(3.4)</td>
<td>3</td>
<td>(4.0)</td>
<td>1</td>
<td>(3.6)</td>
<td>9</td>
</tr>
<tr>
<td>15-25</td>
<td>2</td>
<td>(6.9)</td>
<td>7</td>
<td>(9.3)</td>
<td>--</td>
<td>--</td>
<td>10</td>
</tr>
<tr>
<td>25-35</td>
<td>2</td>
<td>(6.9)</td>
<td>4</td>
<td>(5.3)</td>
<td>1</td>
<td>(3.6)</td>
<td>1</td>
</tr>
<tr>
<td>35-45</td>
<td>3</td>
<td>(10.3)</td>
<td>7</td>
<td>(9.3)</td>
<td>4</td>
<td>(14.3)</td>
<td>5</td>
</tr>
<tr>
<td>45-55</td>
<td>6</td>
<td>(20.7)</td>
<td>14</td>
<td>(18.7)</td>
<td>11</td>
<td>(39.2)</td>
<td>11</td>
</tr>
<tr>
<td>55-65</td>
<td>15</td>
<td>(51.7)</td>
<td>39</td>
<td>(50.7)</td>
<td>9</td>
<td>(32.1)</td>
<td>23</td>
</tr>
<tr>
<td>65-</td>
<td>--</td>
<td></td>
<td></td>
<td></td>
<td>2</td>
<td>(7.1)</td>
<td>2</td>
</tr>
<tr>
<td>Totals</td>
<td>29</td>
<td>(100)</td>
<td>76</td>
<td>(100)</td>
<td>28</td>
<td>(100)</td>
<td>61</td>
</tr>
</tbody>
</table>

When the elevational intervals are merged, the following patterns are discernible:

Table 11b. Summarized Projectile Points and Elevation

<table>
<thead>
<tr>
<th></th>
<th>ws</th>
<th></th>
<th>ex</th>
<th></th>
<th>lt</th>
<th></th>
<th>row totals</th>
</tr>
</thead>
<tbody>
<tr>
<td>#</td>
<td>%</td>
<td></td>
<td>%</td>
<td></td>
<td>%</td>
<td></td>
<td></td>
</tr>
<tr>
<td>0-25</td>
<td>3</td>
<td>(10.3)</td>
<td>10</td>
<td>(13.3)</td>
<td>1</td>
<td>(3.6)</td>
<td>19</td>
</tr>
<tr>
<td>25-45</td>
<td>5</td>
<td>(17.2)</td>
<td>11</td>
<td>(14.6)</td>
<td>5</td>
<td>(17.9)</td>
<td>6</td>
</tr>
<tr>
<td>45-</td>
<td>21</td>
<td>(72.4)</td>
<td>55</td>
<td>(72.1)</td>
<td>22</td>
<td>(78.4)</td>
<td>36</td>
</tr>
<tr>
<td>Totals</td>
<td>29</td>
<td>(100)</td>
<td>76</td>
<td>(100)</td>
<td>28</td>
<td>(100)</td>
<td>61</td>
</tr>
</tbody>
</table>

$x^2 = 14.26$, significant at .05.

Wide-stem and mendocino sites show very similar distributions. Excelsior sites are also similar to the wide-stem and mendocino sites with the exception of the low elevations where there is almost a complete lack of sites. As with the vegetation, the late point sites show a change in pattern,
where a higher than expected percentage (31.3) of the sites are located at the low elevations. A chi square test shows significance at .05 so $H_2$ is rejected.

$H_3$ - There is no difference in the distribution of sites regarding topography based on the presence or absence of projectile point types.

Of the 253 projectile point observations, 190 (75.1%) could be assigned to topographic categories.

Table 12a. Projectile Points and Topography

<table>
<thead>
<tr>
<th></th>
<th>ws</th>
<th>%</th>
<th>men</th>
<th>%</th>
<th>ex</th>
<th>%</th>
<th>lt</th>
<th>%</th>
<th>row totals</th>
</tr>
</thead>
<tbody>
<tr>
<td>ridge</td>
<td>15</td>
<td>53.6</td>
<td>36</td>
<td>51.4</td>
<td>12</td>
<td>41.4</td>
<td>36</td>
<td>57.1</td>
<td>99</td>
</tr>
<tr>
<td>slope</td>
<td>10</td>
<td>35.7</td>
<td>29</td>
<td>41.4</td>
<td>16</td>
<td>55.2</td>
<td>18</td>
<td>28.6</td>
<td>73</td>
</tr>
<tr>
<td>valley terrace</td>
<td>1</td>
<td>3.6</td>
<td>--</td>
<td>--</td>
<td>--</td>
<td>--</td>
<td>3</td>
<td>4.8</td>
<td>4</td>
</tr>
<tr>
<td>small stream</td>
<td>2</td>
<td>7.1</td>
<td>5</td>
<td>7.1</td>
<td>1</td>
<td>3.4</td>
<td>6</td>
<td>9.5</td>
<td>14</td>
</tr>
<tr>
<td>Totals</td>
<td>28</td>
<td>100</td>
<td>70</td>
<td>100</td>
<td>29</td>
<td>100</td>
<td>63</td>
<td>100</td>
<td>190</td>
</tr>
</tbody>
</table>

When the topographic categories are combined, the following patterns emerge:

Table 12b. Summarized Projectile Points and Topography

<table>
<thead>
<tr>
<th></th>
<th>ws</th>
<th>%</th>
<th>men</th>
<th>%</th>
<th>ex</th>
<th>%</th>
<th>lt</th>
<th>%</th>
<th>row totals</th>
</tr>
</thead>
<tbody>
<tr>
<td>ridge/slope</td>
<td>25</td>
<td>89.3</td>
<td>65</td>
<td>92.9</td>
<td>28</td>
<td>96.6</td>
<td>54</td>
<td>85.7</td>
<td>172</td>
</tr>
<tr>
<td>valley terrace/ small stream</td>
<td>3</td>
<td>10.7</td>
<td>5</td>
<td>7.1</td>
<td>1</td>
<td>3.4</td>
<td>9</td>
<td>14.3</td>
<td>18</td>
</tr>
<tr>
<td>Totals</td>
<td>28</td>
<td>100</td>
<td>70</td>
<td>100</td>
<td>29</td>
<td>100</td>
<td>63</td>
<td>100</td>
<td>190</td>
</tr>
</tbody>
</table>

$x^2 = 3.46$, not significant (.50).

Although the late sites are more frequently found in valley/stream contexts, the difference is not significant, so that $H_3$ is confirmed. Therefore, it is concluded that there is little difference in the distribution of sites regarding topography based on the presence or absence of projectile point types.

$H_4$ - There is no difference in the frequency at which sites include midden based on the presence or absence of projectile point types.
Table 13. Projectile Points and Midden

<table>
<thead>
<tr>
<th></th>
<th>ws</th>
<th>%</th>
<th>men</th>
<th>%</th>
<th>ex</th>
<th>%</th>
<th>lt</th>
<th>%</th>
<th>row totals</th>
</tr>
</thead>
<tbody>
<tr>
<td>midden recorded</td>
<td>7 (25.0)</td>
<td>14 (19.7)</td>
<td>1 (3.3)</td>
<td>10 (15.9)</td>
<td>32 (16.7)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>midden not recorded</td>
<td>21 (75.0)</td>
<td>57 (80.3)</td>
<td>29 (96.7)</td>
<td>53 (84.1)</td>
<td>160 (83.3)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Totals</td>
<td>28 (100)</td>
<td>71 (100)</td>
<td>30 (100)</td>
<td>63 (100)</td>
<td>192 (100)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

\[ X^2 = 5.74, \text{ not significant (}.20). \]

Wide-stem sites are most frequently found with midden, excelsior sites are almost never found with midden, and mendocino and late sites are intermediate. While a trend is thus indicated, the chi square does not show significance for this distribution, and \( H_4 \) cannot be rejected.

\( H_5 \) - There is no difference in the frequency at which sites include ground stone based on the presence or absence of projectile point types.

Table 14. Projectile Points and Ground Stone

<table>
<thead>
<tr>
<th></th>
<th>ws</th>
<th>%</th>
<th>men</th>
<th>%</th>
<th>ex</th>
<th>%</th>
<th>lt</th>
<th>%</th>
<th>row totals</th>
</tr>
</thead>
<tbody>
<tr>
<td>ground stone</td>
<td>11 (39.3)</td>
<td>26 (36.6)</td>
<td>5 (16.7)</td>
<td>19 (30.2)</td>
<td>61 (31.7)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>no ground stone</td>
<td>17 (60.7)</td>
<td>45 (63.4)</td>
<td>25 (83.3)</td>
<td>44 (69.8)</td>
<td>131 (68.2)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Totals</td>
<td>28 (100)</td>
<td>71 (100)</td>
<td>30 (100)</td>
<td>63 (100)</td>
<td>132 (100)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

\[ X^2 = 4.67, \text{ not significant (}.20). \]

As in \( H_4 \), wide-stem sites are most frequently found with ground stone, and excelsior sites, rarely found with ground stone, are the most divergent from the pattern. Mendocino and late sites lie in between. Although this distribution again indicates a trend, the chi square does not demonstrate a significant difference in the distribution, and \( H_5 \) cannot be rejected.

\( H_6 \) - There is no difference in the chert/obsidian ratios of sites based on the presence or absence of projectile point types.

One hundred forty-five observations (57.3\%) could be correlated with chert/obsidian ratios. Relative distribution across point type categories remains consistent in spite of decreased numbers.
Table 15a. Projectile Points and Chert/Obsidian Ratios

<table>
<thead>
<tr>
<th></th>
<th>ws</th>
<th></th>
<th>men</th>
<th></th>
<th>ex</th>
<th></th>
<th>lt</th>
<th></th>
<th>row totals</th>
</tr>
</thead>
<tbody>
<tr>
<td>all obs.</td>
<td>1</td>
<td>5.9</td>
<td>4</td>
<td>(7.7)</td>
<td>3</td>
<td>(13.6)</td>
<td>13</td>
<td>(24.1)</td>
<td>21</td>
</tr>
<tr>
<td>more obs. than cht.</td>
<td>1</td>
<td>(5.9)</td>
<td>3</td>
<td>(5.8)</td>
<td>2</td>
<td>(9.1)</td>
<td>8</td>
<td>(14.8)</td>
<td>14</td>
</tr>
<tr>
<td>all cht.</td>
<td>6</td>
<td>(35.3)</td>
<td>16</td>
<td>(30.8)</td>
<td>10</td>
<td>(45.5)</td>
<td>14</td>
<td>(25.9)</td>
<td>46</td>
</tr>
<tr>
<td>more cht. than obs.</td>
<td>9</td>
<td>(52.9)</td>
<td>29</td>
<td>(55.8)</td>
<td>7</td>
<td>(31.8)</td>
<td>19</td>
<td>(35.2)</td>
<td>54</td>
</tr>
<tr>
<td>Totals</td>
<td>17</td>
<td>(100)</td>
<td>52</td>
<td>(100)</td>
<td>22</td>
<td>(100)</td>
<td>54</td>
<td>(100)</td>
<td>145</td>
</tr>
</tbody>
</table>

When the values are lumped, the following patterns emerge:

Table 15b. Summarized Projectile Points and Chert/Obsidian Ratios

<table>
<thead>
<tr>
<th></th>
<th>ws</th>
<th></th>
<th>men</th>
<th></th>
<th>ex</th>
<th></th>
<th>lt</th>
<th></th>
<th>row totals</th>
</tr>
</thead>
<tbody>
<tr>
<td>all obs./more</td>
<td>2</td>
<td>(11.8)</td>
<td>7</td>
<td>(13.5)</td>
<td>5</td>
<td>(22.7)</td>
<td>21</td>
<td>(38.9)</td>
<td>35</td>
</tr>
<tr>
<td>obs. than cht.</td>
<td>15</td>
<td>(88.2)</td>
<td>45</td>
<td>(86.5)</td>
<td>17</td>
<td>(77.3)</td>
<td>33</td>
<td>(61.1)</td>
<td>110</td>
</tr>
<tr>
<td>all cht./more</td>
<td>17</td>
<td>(100)</td>
<td>52</td>
<td>(100)</td>
<td>22</td>
<td>(100)</td>
<td>54</td>
<td>(100)</td>
<td>145</td>
</tr>
</tbody>
</table>

\[ \chi^2 = 11.16, \text{ significant at .02.} \]

The frequency with which obsidian is associated with projectile points shows a clear trend with an increase correlated with each successive point type, i.e., the use of obsidian increases steadily as one approaches the historic period. The chi square supports this with significance at .02, and consequently \( H_6 \) is rejected.

**Projectile Point Summary**

With the exception of the excelsior sites, the projectile point data reveal trends towards the mano/metate vs. mortar/pestle pattern. The early wide-stem and mendocino sites differ significantly from the late sites in that they are more frequently found at high elevations and less frequently found with obsidian. They show a tendency for more frequent occurrence in the conifer forest. The excelsior data causes problems, however, as the data does fall into the Fredrickson (1974) pattern in terms of obsidian. Excelsior sites are found in the forest and at high elevations just as frequently as the mendocino and wide-stem sites. Late sites demonstrate expected patterns of relatively more frequent occurrence at lower elevation and with obsidian.
Projectile Point Interpretation

The data show that there was a settlement pattern shift, however it appears to have occurred much later than proposed by King (1974) and does not correspond with the climatic data provided by West (1981a, b). However, there is a possibility that this discrepancy may have been the result of typological errors made by the current authors. Rather than using the excelsior criteria forwarded by Fredrickson (1973), all leaf-shaped points were placed within the category (the confusion probably resulted from the inclusion of large chert bi-points). Regardless of this problem, the patterns of the data seem strong enough to reject the "synchronic" or functional explanation at least for the distribution of late period points vs. all others. In addition, the "latitudinal" interpretation is also considered insufficient, because we know from the ethnographic record that the Yuki utilized late period points. It must be concluded that the differential distribution of projectile points represents changes in behavior over time.

Analysis of Projectile Point - Ground Stone Associations

The goal of this section is to attempt to date the ground stone through associations with types of projectile points. As with the entirety of the projectile association study, the results should be viewed with some caution because there is no guarantee that the various artifact forms are truly associated in time. Nevertheless, by looking at the relative frequencies of particular associations, steps to the solution of the problem perhaps will be made.

Table 16. Projectile Point - Ground Stone Association

<table>
<thead>
<tr>
<th>Ground Stone</th>
<th>M/M (N=31)</th>
<th>Men (N=71)</th>
<th>Ex (N=33)</th>
<th>Lt (N=75)</th>
<th>Total (N=210)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>#</td>
<td>%</td>
<td>#</td>
<td>%</td>
<td>#</td>
</tr>
<tr>
<td>M/M</td>
<td>9 (81.8)</td>
<td>19 (73.1)</td>
<td>4 (80)</td>
<td>16 (84.2)</td>
<td>18 (73)</td>
</tr>
<tr>
<td>M/P</td>
<td>0 (0)</td>
<td>3 (11.5)</td>
<td>1 (20)</td>
<td>3 (15.8)</td>
<td>4 (11.5)</td>
</tr>
<tr>
<td>Both</td>
<td>2 (18.2)</td>
<td>4 (15.4)</td>
<td>0 (0)</td>
<td>0 (0)</td>
<td>0 (0)</td>
</tr>
<tr>
<td>Total</td>
<td>11 (100)</td>
<td>26 (100)</td>
<td>5 (100)</td>
<td>19 (100)</td>
<td>21 (100)</td>
</tr>
</tbody>
</table>

$X^2 = 1.72$, not significant (.70).

Projectile points are not associated with ground stone with high frequency: 35.5% of the wide-stem points, 36.6% of the mendocino points, 15.2% of the excelsior points, and 25.3% of the late points show association with ground stone. As presented in Table 16, the wide-stem data show virtually no association with mortar/pestle. The mendocino sites reflect a dominance of the mano/metate, but also the introduction of the mortar/pestle. Excelsior sites continue to show the
dominance of the mano/metate with only a slight increase in the relative frequency of mortar/pestle, and the late sites follow the same basic pattern as the mendocino and excelsior sites. Rather than seeing a shift from the mano/metate to the mortar/pestle, we see that the mano/metate remains dominant.

**Projectile Point - Ground Stone Summary**

The mano/metate complex is associated with projectile point types that date from Early Borax Lake times to the ethnographic period. The mortar/pestle complex is not associated with projectile points dating to Early Borax Lake times and minimally associated with points dating from the Late Borax Lake times to the ethnographic period.

**Projectile Point - Ground Stone Interpretation**

Although direct temporal associations are difficult to pin down and the sample is rather small, the above data, contrary to the expectations of Fredrickson (1973, 1974), indicate that the mano/metate complex was important from Early Borax Lake times to the ethnographic period. Similar to the expectations of Fredrickson (1973, 1974), the mortar/pestle complex is not evident in Early Borax Lake times and was probably minimally present during the Late Borax Lake time period. While it is definitely present thereafter, it is infrequently found on sites with projectile points.

**Analysis of Sites with Lithic Scatters**

The lithic scatter sites include all sites with lithicdebitage and no reported presence of ground stone and/or projectile points. These data have been divided into the following categories:

- OB - sites with obsidian only
- O/c - sites with more obsidian than chert
- CH - sites with chert only
- C/o - sites with more chert than obsidian

H₁: There is no difference in the distribution of sites regarding vegetation based on the relative frequencies of lithic material

Five hundred and eighteen (46% of total sites) are determined to be lithic scatters. Of this number, 426 could be assigned to vegetation communities and obsidian/chert dominance categories.
Table 17a. Obsidian-Chert Frequencies and Vegetation

<table>
<thead>
<tr>
<th>OB</th>
<th>O/c</th>
<th>CH</th>
<th>C/o</th>
<th>row totals</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>#</td>
<td>%</td>
<td>#</td>
<td>%</td>
</tr>
<tr>
<td>forest</td>
<td>7 (7.0)</td>
<td>4 (16.0)</td>
<td>77 (34.5)</td>
<td>35 (44.9)</td>
</tr>
<tr>
<td>forest/meadow</td>
<td>1 (1.0)</td>
<td>7 (28.0)</td>
<td>45 (20.2)</td>
<td>17 (21.8)</td>
</tr>
<tr>
<td>oak woodland</td>
<td>7 (7.0)</td>
<td>3 (12.0)</td>
<td>55 (24.7)</td>
<td>11 (14.1)</td>
</tr>
<tr>
<td>chaparral</td>
<td>57 (57.0)</td>
<td>6 (24.0)</td>
<td>12 (5.4)</td>
<td>2 (2.6)</td>
</tr>
<tr>
<td>savanna</td>
<td>7 (7.0)</td>
<td>0 (0.0)</td>
<td>9 (4.0)</td>
<td>2 (2.6)</td>
</tr>
<tr>
<td>grassland</td>
<td>10 (10.0)</td>
<td>1 (4.0)</td>
<td>4 (1.8)</td>
<td>2 (2.6)</td>
</tr>
<tr>
<td>ecotone</td>
<td>11 (11.0)</td>
<td>4 (16.0)</td>
<td>21 (9.4)</td>
<td>9 (11.5)</td>
</tr>
<tr>
<td>Totals</td>
<td>100 (100)</td>
<td>25 (100)</td>
<td>223 (100)</td>
<td>78 (100)</td>
</tr>
</tbody>
</table>

When the forest and forest/meadow categories are merged and compared to others, and the OB, O/c and CH, C/o categories are combined, the following patterns emerge:

Table 17b. Summarized Obsidian-Chert Frequencies and Vegetation

<table>
<thead>
<tr>
<th>OB - O/c</th>
<th>CH - C/o</th>
<th>row totals</th>
</tr>
</thead>
<tbody>
<tr>
<td>#</td>
<td>%</td>
<td>#</td>
</tr>
<tr>
<td>forest</td>
<td></td>
<td>forest/meadow</td>
</tr>
<tr>
<td>others</td>
<td>106 (84.8)</td>
<td>127 (42.2)</td>
</tr>
<tr>
<td>Totals</td>
<td>125 (100)</td>
<td>301 (100)</td>
</tr>
</tbody>
</table>

\[ \chi^2 = 64.62, \text{ significant at } .001. \]

The above data indicate that sites with obsidian are found much less frequently in the forest than sites with chert. A chi square test shows this distribution to be highly significant, and thus \( H_0 \) is rejected.

\( H_0.2 \) - There is no difference in the distribution of sites regarding elevation based on the relative frequencies of lithic material.

Table 18a. Obsidian-Chert Frequencies and Elevation

<table>
<thead>
<tr>
<th>OB</th>
<th>O/c</th>
<th>CH</th>
<th>C/o</th>
<th>row totals</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>#</td>
<td>%</td>
<td>#</td>
<td>%</td>
</tr>
<tr>
<td>0-15</td>
<td>62 (59.6)</td>
<td>1 (4.0)</td>
<td>0 (0.0)</td>
<td>1 (1.2)</td>
</tr>
<tr>
<td>15-25</td>
<td>20 (19.2)</td>
<td>7 (28.0)</td>
<td>10 (4.4)</td>
<td>7 (8.5)</td>
</tr>
<tr>
<td>25-35</td>
<td>15 (14.4)</td>
<td>5 (20.0)</td>
<td>21 (9.2)</td>
<td>10 (12.2)</td>
</tr>
<tr>
<td>35-45</td>
<td>2 (1.9)</td>
<td>2 (8.0)</td>
<td>31 (13.5)</td>
<td>13 (15.9)</td>
</tr>
<tr>
<td>45-55</td>
<td>3 (2.9)</td>
<td>4 (16.0)</td>
<td>84 (36.7)</td>
<td>19 (23.2)</td>
</tr>
<tr>
<td>55-65</td>
<td>2 (1.9)</td>
<td>4 (16.0)</td>
<td>78 (34.1)</td>
<td>25 (30.5)</td>
</tr>
<tr>
<td>65+</td>
<td>0 (0.0)</td>
<td>2 (8.0)</td>
<td>5 (2.2)</td>
<td>7 (8.5)</td>
</tr>
<tr>
<td>Totals</td>
<td>104 (100)</td>
<td>25 (100)</td>
<td>229 (100)</td>
<td>82 (100)</td>
</tr>
</tbody>
</table>
When the data is aggregated, the following patterns are exposed:

Table 18b. Summarized Obsidian-Chert Frequencies and Elevation

<table>
<thead>
<tr>
<th></th>
<th>OB</th>
<th>CH</th>
<th>row totals</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>#</td>
<td>%</td>
<td>#</td>
</tr>
<tr>
<td>0-25</td>
<td>90</td>
<td>(69.8)</td>
<td>18</td>
</tr>
<tr>
<td>25-45</td>
<td>24</td>
<td>(18.6)</td>
<td>75</td>
</tr>
<tr>
<td>45-</td>
<td>15</td>
<td>(11.6)</td>
<td>218</td>
</tr>
<tr>
<td>Totals</td>
<td>129</td>
<td>(100)</td>
<td>311</td>
</tr>
</tbody>
</table>

\[ x^2 = 210.37, \text{significant at .001} \]

The above data clearly indicate that sites with obsidian are far more frequent at low elevations than statistically expected and rare at high elevations. Sites with chert, on the other hand, are rare at low elevations and frequent at high elevations. As shown by the chi square test, this distribution is highly significant, and \( H_2 \) is rejected.

\( H_3 \): There is no difference in the distribution of sites regarding topography based on the relative frequencies of lithic material.

Table 19a. Obsidian-Chert Frequencies and Topography

<table>
<thead>
<tr>
<th></th>
<th>OB</th>
<th>O/c</th>
<th>CH</th>
<th>C/o</th>
<th>row totals</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>#</td>
<td>%</td>
<td>#</td>
<td>%</td>
<td>#</td>
</tr>
<tr>
<td>ridge</td>
<td>21</td>
<td>(19.3)</td>
<td>130</td>
<td>(56.0)</td>
<td>38</td>
</tr>
<tr>
<td>slope</td>
<td>18</td>
<td>(16.5)</td>
<td>76</td>
<td>(32.8)</td>
<td>30</td>
</tr>
<tr>
<td>valley terrace</td>
<td>31</td>
<td>(28.4)</td>
<td>6</td>
<td>(2.6)</td>
<td>3</td>
</tr>
<tr>
<td>small stream</td>
<td>39</td>
<td>(35.8)</td>
<td>4</td>
<td>(16.7)</td>
<td>6</td>
</tr>
<tr>
<td>Totals</td>
<td>109</td>
<td>(100)</td>
<td>232</td>
<td>(100)</td>
<td>77</td>
</tr>
</tbody>
</table>

When the data are merged, the following patterns become evident:

Table 19b. Summarized Obsidian-Chert Frequencies and Topography

<table>
<thead>
<tr>
<th></th>
<th>OB</th>
<th>O/c</th>
<th>CH</th>
<th>C/o</th>
<th>row totals</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>#</td>
<td>%</td>
<td>#</td>
<td>%</td>
<td>#</td>
</tr>
<tr>
<td>ridge/slope</td>
<td>59</td>
<td>(44.4)</td>
<td>274</td>
<td>(88.7)</td>
<td>333</td>
</tr>
<tr>
<td>valley terrace/ small stream</td>
<td>74</td>
<td>(55.6)</td>
<td>35</td>
<td>(11.3)</td>
<td>109</td>
</tr>
<tr>
<td>Totals</td>
<td>133</td>
<td>(100)</td>
<td>309</td>
<td>(100)</td>
<td>442</td>
</tr>
</tbody>
</table>

\[ x^2 = 98.26, \text{significant at .001} \]
The above data strongly indicate that sites with obsidian are found significantly more often in valleys or near streams than are sites with chert, and conversely sites with chert are more frequently found on ridgetops and on slopes and less often in valleys than sites with obsidian. The chi square test reflects significance at .001, and $H_0$ is rejected.

**Lithic Scatter Summary**

The lithic scatter data demonstrate a pattern quite similar to that found with the ground stone and projectile points. Sites dominated by chert were more frequently found in the conifer forest, at high elevations, and on ridges and slopes. The obsidian sites trended the opposite direction, being more frequently found outside the conifer forest, at lower elevations, and in valleys or near small streams. These distributions are consistently highly statistically significant, showing the highest correlations in these analyses.

**Lithic Scatter Interpretation**

The previous sections presented data indicating that a settlement pattern shift had occurred. These data also showed that late in time, at the end of the shift, the use of obsidian increased. In terms of the lithic scatter data, the fact that the chert dominated sites followed the earlier pattern and the obsidian dominated sites followed the later pattern, seems to strongly support the notion that trade increased through time (Fredrickson 1973, King 1974). Although this was probably the case, it is also probable that the previously discussed latitudinal causality simultaneously contributed to the patterns that emerged. That is, non-conifer forest habitats and low elevation valleys are located much closer to obsidian sources than conifer forest habitats and high elevation ridges. Though it is difficult to determine which cause was dominant, both the "diachronic" and "latitudinal" interpretations are necessary for an adequate explanation.

**Summary and Conclusion**

The review of the literature indicated that previous studies involving site typologies had a tendency to aggregate all artifacts together as if they were representative of the ethnographic period. In this study we attempt to alleviate some of the problems inherent in such an approach by tracing the relative frequencies of co-occurrences between artifacts suggested to be functional as well as chronological indicators.

The results of the study indicate that most habitats within the study area were occupied to some degree or another from
Early Borax Lake times to the present. In addition, contrary to previous studies, manos/metates appear to have been used during this entire span of time. However, the distribution and form of these occupations have not remained uniform over time and space. This is demonstrated on a general level by the fact that sites characterized by manos/metates, early projectile points, and the lack of obsidian are more frequently found in the conifer forest at high elevations and on ridges and slopes than sites characterized by mortars/pestles, late points, and greater amounts of obsidian. The latter assemblages are more frequently found outside the conifer forest, at lower elevations, and in valleys or near streams.

These patterns seem to indicate that there was a shift from a subsistence system that favored high elevations early in time to one that favored lower elevations later in time. The patterns also indicate, due to latitudinal changes in topography and vegetation from north to south, that some artifacts attributed to later time periods (e.g., mortar/pestle, obsidian) are located not only at low elevations outside the conifer forest but at low latitudes because that is where the low elevation/non-conifer forest habitats are most abundantly present. In terms of obsidian, latitudinal variability may be much more important than elevational variability because the sources of obsidian are located only near the southern portions of the project.

The reason for this change in emphasis can be at least partially attributed to increased reliance on the acorn (as manifested in the increased use of the mortar/pestle). An additional factor that may have contributed, which is yet difficult to demonstrate at this time, is the increase utilization of anadromous fishes. During the warm period between 4500 and 2500 B.P., there may have been a reduction in rainfall and a corresponding down stream migration of spawning grounds. If this occurred, it would have reduced the total amount of spawning territory as well as moved some of the spawning habitats to the west and east of the study area. If the change to lower elevation stream-side adaptations occurred at the end of this period (unfortunately the present data can not nail this down), the increase availability of anadromous fishes may have had something to do with it. Although we are not currently in a position to verify or reject the proposal, it is something that researchers will be able to address in the future.

The ultimate reasons for such a shift (e.g., population pressure) and the identification of the people who were involved (e.g., invasions of new peoples) are well beyond our interpretive powers based on the data we have been able to generate. However, the fact that we have shown that some change has occurred over time and space is a step in the right direction.
In conclusion, the above discussion demonstrates that site typologies that do not acknowledge the variability within general categories of ground stone and projectile points are covering up important forms of functional and/or chronological information. By distinguishing between manos/metates and mortars/pestles and various projectile points, this analysis is able to show strong differences in their distribution through space and less striking yet significant differences in their distribution through time. While in terms of the ground stone it is not entirely clear when spatial variability can be attributed to temporal differences rather than contemporary differences in function, at least the problem is identified, and an attempt made to solve it.

It should be made clear that it is not the opinion of the present authors that previous site typologies are useless. Rather, we consider them important tools that should continue to be used, but, they should not be used simply as tools for viewing the archaeological record as a synchronic reflection of an ethnography. We recommend that future studies use the typology proposed by Jackson (1980) (this study pp. 44-45), but within each type functionally and/or temporally significant artifacts should be sought out and identified. If we do not do this, the use of typologies will do nothing but restrict our abilities to study culture change.
PREDICTION OF SITE LOCATIONS

Introduction

As projected in the literature review (cf., Jackson 1976, Stewart and Fredrickson 1978, Tamez 1981), the data examined in the site typology section indicate the probability of finding a particular type of site given one environmental context vs. another, however, it does not indicate the probability of encountering the site within that context (i.e., its frequency of occurrence per unit area). For example, consider a hypothetical area that is made up of 33% ridge, 33% slope, and 33% valley. A survey is conducted only on the ridges. Several sites are found on the ridges, but none are found on the slopes or in the valley (this may or may not be due to the fact that slopes and valleys were not surveyed). Without considering where the survey had been conducted, the study would conclude that ridges are sensitive areas whereas slopes and valleys are not. This problem will be avoided here by measuring surveyed areas vs. unsurveyed areas. Although this is a time consuming process and our sample is small, it is a more useful approach than making strictly deductive predictions (e.g., Jackson 1980).

Methods and Materials

This aspect of the study is carried out only within the five transects (Map 15). In the first step the frequency of sites per acre within the various environmental zones that have been previously surveyed are calculated. The frequency values then provide the data necessary for developing the predictive model. More specifically, the frequency data will be the prediction for the future. For example, if we find ten sites per acre on oak covered ridges, we will predict that in the future, when an oak covered ridge is encountered, there should be ten sites present for every acre of land. This approach is useful because each new survey will feed information back into the predictive model, testing it and increasing its accuracy through time.

Once this first step is completed, the areas surveyed will be compared to the areas within the total transect, thus indicating whether or not significant/sensitive areas are being systematically excluded from the surveys.

Analysis of Areas Surveyed within the Transects

Before addressing the site frequency data, the amount of land surveyed within each transect is presented which indicates the variability of survey sample size across the transects.
Table 20. Transect Acres and Survey Acres

<table>
<thead>
<tr>
<th>Transect</th>
<th>transect acres</th>
<th>survey acres</th>
<th>percent surveyed</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>34150</td>
<td>872</td>
<td>6.2%</td>
</tr>
<tr>
<td>2</td>
<td>31778</td>
<td>4522</td>
<td>14.2%</td>
</tr>
<tr>
<td>3</td>
<td>36251</td>
<td>4703</td>
<td>13.0%</td>
</tr>
<tr>
<td>4</td>
<td>33078</td>
<td>2690</td>
<td>8.1%</td>
</tr>
<tr>
<td>5</td>
<td>24352</td>
<td>1380</td>
<td>5.7%</td>
</tr>
</tbody>
</table>

The transects are examined in terms of three salient variables, vegetation, topography, and elevation.

Vegetation

Table 21a. Transect Surveys, Vegetation & Site Frequency

<table>
<thead>
<tr>
<th>Transect 1</th>
<th>oak woodland</th>
<th>grass</th>
<th>savanna</th>
<th>chap</th>
<th>forest</th>
</tr>
</thead>
<tbody>
<tr>
<td>acres</td>
<td>---</td>
<td>---</td>
<td>---</td>
<td>---</td>
<td>872</td>
</tr>
<tr>
<td>site frequency</td>
<td>---</td>
<td>---</td>
<td>---</td>
<td>---</td>
<td>14</td>
</tr>
<tr>
<td>site/acre</td>
<td>---</td>
<td>---</td>
<td>---</td>
<td>---</td>
<td>1/63</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Transect 2</th>
<th>oak woodland</th>
<th>grass</th>
<th>savanna</th>
<th>chap</th>
<th>forest</th>
</tr>
</thead>
<tbody>
<tr>
<td>acres</td>
<td>354</td>
<td>699</td>
<td>118</td>
<td>418</td>
<td>2933</td>
</tr>
<tr>
<td>site frequency</td>
<td>16</td>
<td>5</td>
<td>15</td>
<td>1</td>
<td>9</td>
</tr>
<tr>
<td>site/acre</td>
<td>1/22</td>
<td>1/140</td>
<td>1/8</td>
<td>1/418</td>
<td>1/326</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Transect 3</th>
<th>oak woodland</th>
<th>grass</th>
<th>savanna</th>
<th>chap</th>
<th>forest</th>
</tr>
</thead>
<tbody>
<tr>
<td>acres</td>
<td>54</td>
<td>9</td>
<td>---</td>
<td>173</td>
<td>4467</td>
</tr>
<tr>
<td>site frequency</td>
<td>6</td>
<td>0</td>
<td>---</td>
<td>3</td>
<td>9</td>
</tr>
<tr>
<td>site/acre</td>
<td>1/9</td>
<td>0/9</td>
<td>---</td>
<td>1/53</td>
<td>1/496</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Transect 4</th>
<th>oak woodland</th>
<th>grass</th>
<th>savanna</th>
<th>chap</th>
<th>forest</th>
</tr>
</thead>
<tbody>
<tr>
<td>acres</td>
<td>83</td>
<td>16</td>
<td>---</td>
<td>116</td>
<td>2475</td>
</tr>
<tr>
<td>site frequency</td>
<td>7</td>
<td>0</td>
<td>---</td>
<td>1</td>
<td>12</td>
</tr>
<tr>
<td>site/acre</td>
<td>1/12</td>
<td>0/16</td>
<td>---</td>
<td>1/116</td>
<td>1/206</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Transect 5</th>
<th>oak woodland</th>
<th>grass</th>
<th>savanna</th>
<th>chap</th>
<th>forest</th>
</tr>
</thead>
<tbody>
<tr>
<td>acres</td>
<td>191</td>
<td>581</td>
<td>354</td>
<td>254</td>
<td>---</td>
</tr>
<tr>
<td>site frequency</td>
<td>1</td>
<td>2</td>
<td>1</td>
<td>0</td>
<td>---</td>
</tr>
<tr>
<td>site/acre</td>
<td>1/191</td>
<td>1/290</td>
<td>1/354</td>
<td>0/254</td>
<td>---</td>
</tr>
</tbody>
</table>

Although it is relatively clear that the oak woodland and savanna communities have the highest site densities, the other communities show a greater degree of variability across transects. When all the transect data is totalled, a clearer picture emerges.
Table 21b. Summarized Transect Survey, Vegetation & Site Frequency

<table>
<thead>
<tr>
<th></th>
<th>oakw</th>
<th>grass</th>
<th>savanna</th>
<th>chap</th>
<th>forest</th>
</tr>
</thead>
<tbody>
<tr>
<td>acres</td>
<td>682</td>
<td>1305</td>
<td>472</td>
<td>961</td>
<td>10,747</td>
</tr>
<tr>
<td>site frequency</td>
<td>30</td>
<td>7</td>
<td>16</td>
<td>5</td>
<td>44</td>
</tr>
<tr>
<td>site/acre</td>
<td>1/23</td>
<td>1/186</td>
<td>1/30</td>
<td>1/192</td>
<td>1/244</td>
</tr>
</tbody>
</table>

Oak woodland and savanna show by far the highest densities, followed by grassland and chaparral which show relatively equal densities but considerably lower than the oak woodland/savanna communities, and the conifer forest shows the lowest density of all. Although this data reveal rather clear patterning, it should be stressed that in any particular situation a great deal of variance can occur. A good example of such an occurrence is the forest density of 1/63 in Transect 1.

Topography

Table 22a. Transect Surveys, Topography & Site Frequency

<table>
<thead>
<tr>
<th>Transect 1</th>
<th>ridgetop</th>
<th>slope</th>
<th>valley</th>
</tr>
</thead>
<tbody>
<tr>
<td>acres</td>
<td>273</td>
<td>600</td>
<td>---</td>
</tr>
<tr>
<td>site frequency</td>
<td>11</td>
<td>2</td>
<td>---</td>
</tr>
<tr>
<td>site/acre</td>
<td>1/25</td>
<td>1/300</td>
<td>---</td>
</tr>
<tr>
<td>Transect 2</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>acres</td>
<td>503</td>
<td>4024</td>
<td>46</td>
</tr>
<tr>
<td>site frequency</td>
<td>16</td>
<td>24</td>
<td>12</td>
</tr>
<tr>
<td>site/acre</td>
<td>1/31</td>
<td>1/167</td>
<td>1/4</td>
</tr>
<tr>
<td>Transect 3</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>acres</td>
<td>1518</td>
<td>3172</td>
<td>---</td>
</tr>
<tr>
<td>site frequency</td>
<td>5</td>
<td>14</td>
<td>---</td>
</tr>
<tr>
<td>site/acre</td>
<td>1/304</td>
<td>1/227</td>
<td>---</td>
</tr>
<tr>
<td>Transect 4</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>acres</td>
<td>670</td>
<td>2002</td>
<td>8</td>
</tr>
<tr>
<td>site frequency</td>
<td>6</td>
<td>13</td>
<td>0</td>
</tr>
<tr>
<td>site/acre</td>
<td>1/112</td>
<td>1/154</td>
<td>0/8</td>
</tr>
<tr>
<td>Transect 5</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>acres</td>
<td>464</td>
<td>473</td>
<td>446</td>
</tr>
<tr>
<td>site frequency</td>
<td>0</td>
<td>0</td>
<td>4</td>
</tr>
<tr>
<td>site/acre</td>
<td>0/464</td>
<td>0/473</td>
<td>1/112</td>
</tr>
</tbody>
</table>
The topographic densities follow a clearer pattern than the vegetation densities. Valley densities are generally highest, followed by ridges and finally slopes. This is more clearly illustrated by the summarized data.

Table 22b. Summarized Transect Surveys, Topography & Site Frequency

<table>
<thead>
<tr>
<th></th>
<th>ridge</th>
<th>slope</th>
<th>valley</th>
</tr>
</thead>
<tbody>
<tr>
<td>acres</td>
<td>3428</td>
<td>10,271</td>
<td>500</td>
</tr>
<tr>
<td>site  frequency</td>
<td>38</td>
<td>53</td>
<td>16</td>
</tr>
<tr>
<td>site/acre</td>
<td>1/90</td>
<td>1/194</td>
<td>1/31</td>
</tr>
</tbody>
</table>

Elevation

Table 23a. Transect Surveys, Elevation & Site Frequency

|----------|-----|-------|-------|-------|-------|-------|-----|

<table>
<thead>
<tr>
<th>Transect 1</th>
<th>acres</th>
<th>18</th>
<th>218</th>
<th>372</th>
<th>1662</th>
<th>2034</th>
<th>281</th>
</tr>
</thead>
<tbody>
<tr>
<td>site</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>frequency</td>
<td></td>
<td>5</td>
<td>12</td>
<td>4</td>
<td>12</td>
<td>9</td>
<td>3</td>
</tr>
<tr>
<td>site/acre</td>
<td></td>
<td>1/4</td>
<td>1/18</td>
<td>1/93</td>
<td>1/138</td>
<td>1/236</td>
<td>1/94</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Transect 2</th>
<th>acres</th>
<th>64</th>
<th>826</th>
<th>2261</th>
<th>1435</th>
<th>100</th>
</tr>
</thead>
<tbody>
<tr>
<td>site</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>frequency</td>
<td></td>
<td>0</td>
<td>3</td>
<td>3</td>
<td>13</td>
<td>0</td>
</tr>
<tr>
<td>site/acre</td>
<td></td>
<td>0/64</td>
<td>1/275</td>
<td>1/754</td>
<td>1/110</td>
<td>0/100</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Transect 3</th>
<th>acres</th>
<th>73</th>
<th>827</th>
<th>1026</th>
<th>708</th>
</tr>
</thead>
<tbody>
<tr>
<td>site</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>frequency</td>
<td></td>
<td>2</td>
<td>6</td>
<td>4</td>
<td>1</td>
</tr>
<tr>
<td>site/acre</td>
<td></td>
<td>1/36</td>
<td>1/145</td>
<td>1/256</td>
<td>1/88</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Transect 4</th>
<th>acres</th>
<th>309</th>
<th>699</th>
<th>345</th>
</tr>
</thead>
<tbody>
<tr>
<td>site</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>frequency</td>
<td></td>
<td>3</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>site/acre</td>
<td></td>
<td>1/103</td>
<td>0/699</td>
<td>0/345</td>
</tr>
</tbody>
</table>

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The elevational data shows a rather uniform and interesting pattern. The extreme high and low elevations show the highest site densities while the mid-elevations show the lowest densities. This is better illustrated by the summarized data.

Table 23b
Summarized Transect Surveys, Elevation and Site Frequency

<table>
<thead>
<tr>
<th>Elevation Range</th>
<th>Acres</th>
<th>Site Frequency</th>
<th>Site/Acre</th>
</tr>
</thead>
<tbody>
<tr>
<td>-15</td>
<td>327</td>
<td>8</td>
<td>1/40</td>
</tr>
<tr>
<td>15-25</td>
<td>1054</td>
<td>14</td>
<td>1/75</td>
</tr>
<tr>
<td>25-35</td>
<td>2415</td>
<td>13</td>
<td>1/186</td>
</tr>
<tr>
<td>35-45</td>
<td>4949</td>
<td>19</td>
<td>1/260</td>
</tr>
<tr>
<td>45-55</td>
<td>4213</td>
<td>31</td>
<td>1/136</td>
</tr>
<tr>
<td>55-65</td>
<td>953</td>
<td>13</td>
<td>1/73</td>
</tr>
<tr>
<td>65+</td>
<td>272</td>
<td>4</td>
<td>1/68</td>
</tr>
</tbody>
</table>

This pattern is rather easily explained once the problems associated with using elevation as a predictive variable are identified. While the topographic and vegetation variables are relatively independent (e.g., oaks can be found on ridges, slopes, and valleys), the variability in elevation is not. Rather than elevation itself primarily determining the density of sites, the low density of sites at the mid-elevations is, in this case, attributable to the high percentage of slopes surveyed at those elevations. In Transects 2, 3, and 4, where almost all the mid-elevation surveys occurred, 77% of the land covered was slope. If 77% of the land surveyed would have been ridgetop, a different density value would have emerged, regardless of the elevation. It is concluded therefore, that in this case, elevation is not an accurate predictor of site location and as a result will not be used for that purpose.

Transect Discussion

As is clear from the data presented at the beginning of this section, not only are the survey samples small, but there are also great differences in the amount of land surveyed within each transect. This problem is most extreme in the southern reaches of the study area, particularly within Transect 5 where only 5.7% of the transect was surveyed. The small sample size in Transect 5 should be emphasized because it is the only transect that contains significant amounts of low elevation, non-forested, valley lands. (Transect 1 contains a small surveyed sample, but the forest community, the major constituent, is well represented in the other transects.) The predictions proposed in the following section should be viewed with some caution, but if we continue to collect such data from every survey that occurs (as well as more data from past surveys), we will ultimately have data of high predictive value.
Predictive Model of Site Location

The predictive model to be presented is basically a summary of the patterns shown above. Due to the sampling difficulties already discussed the frequency data within each environmental dimension will be lumped into the following categories:

- high probability of being present = "+
- medium probability of being present = "o"
- low probability of being present = "-"

Two environmental dimensions will be used:

<table>
<thead>
<tr>
<th>Topography</th>
<th>Vegetation</th>
</tr>
</thead>
<tbody>
<tr>
<td>valley (+)</td>
<td>oak woodland/savanna (+)</td>
</tr>
<tr>
<td>ridge (o)</td>
<td>grassland/chaparral (o)</td>
</tr>
<tr>
<td>slope (-)</td>
<td>conifer forest (-)</td>
</tr>
</tbody>
</table>

Table 34 demonstrates how the variables are organized into the predictive model.

Table 24. Model of Site Location

<table>
<thead>
<tr>
<th></th>
<th>oak woodland</th>
<th>grassland</th>
<th>conifer</th>
</tr>
</thead>
<tbody>
<tr>
<td>savanna</td>
<td>+</td>
<td>o</td>
<td>- +</td>
</tr>
<tr>
<td>valley</td>
<td>+</td>
<td>o</td>
<td>-</td>
</tr>
<tr>
<td>grass/chaparral</td>
<td>o</td>
<td>o</td>
<td>- o</td>
</tr>
<tr>
<td>ridge</td>
<td>+</td>
<td>-</td>
<td>- -</td>
</tr>
<tr>
<td>slope</td>
<td>+</td>
<td>-</td>
<td>- -</td>
</tr>
</tbody>
</table>

In terms of vegetation, oak woodland and savanna equals "+", grassland and chaparral equals "o", and conifer forest equals "-". However, these values change depending on the topographic setting of the community. For example, although forests are generally low (−), when found in a valley, the ranking increases to a medium level (+ − or basically o). Based on the above data, the following ranking of environmental contexts can be made. It is predicted that site frequencies will be higher at the top of the list and lower at the bottom.

1) oak woodland/savanna - valley
2) oak woodland/savanna - ridge
   grass/chaparral - valley
3) oak woodland/savanna - slope
   grassland/chaparral - ridge
   conifer forest - valley
4) conifer forest - ridge
   grassland/chaparral - slope
5) conifer forest - slope
Site Location Discussion

The model developed above predicts that the highest site densities will be within vegetation areas that include oaks. It also predicts that the lowest site densities will be dominated by conifers. In terms of topography, it predicts that valleys will have higher site densities than ridges and much higher densities than slopes.

As demonstrated in the site typology section, sites characterized by manos/metates, non-late projectile points, and the dominance of chert are more frequently found in the conifer forest at high elevations and on ridges and slopes than sites characterized by mortars/pestles, late points, and greater amounts of obsidian. These latter assemblages are most frequently found outside the conifer forest, at lower elevations, and in valleys or near streams.

The combination of the site location and site typology data illustrate a very important pattern that corresponds rather well with the proposed shift in subsistence. When the site typology data is viewed in conjunction with the predictions of site location, one finds that the mortar/pestle, etc. sites are concentrated around the predicted locations. The mano/metate, etc. sites, on the other hand, do not follow the predicted pattern and appear to be much more dispersed. This is well demonstrated by the fact that the conifer forest - ridge/slope areas have the lowest site frequencies per unit area yet the highest frequencies of mano/metate, etc. sites.

As a result, it is concluded that the earlier upland adaptation may have been oriented toward exploiting a wide range of dispersed resources while the later lowland adaptation was concentrated spatially, specializing more on the oak/riverine resources.

Survey Coverage

The goal of this section is to compare the environmental constituents within the areas that were surveyed with the constituents of the total area encompassed by each transect, and to present the data in the form of relative percentages. Such a comparison will identify any areas that are being systematically under represented in the surveys.
Vegetation

Table 25a. Transect Survey Coverage of Vegetation

<table>
<thead>
<tr>
<th>Transect 1</th>
<th>oak woodland</th>
<th>grass</th>
<th>savanna</th>
<th>chap</th>
<th>forest</th>
<th>barren*</th>
</tr>
</thead>
<tbody>
<tr>
<td>survey %</td>
<td>---</td>
<td>---</td>
<td>---</td>
<td>---</td>
<td>100</td>
<td>---</td>
</tr>
<tr>
<td>veg %</td>
<td>3</td>
<td>1</td>
<td>---</td>
<td>6</td>
<td>87</td>
<td>4</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Transect 2</th>
<th>oak woodland</th>
<th>grass</th>
<th>savanna</th>
<th>chap</th>
<th>forest</th>
<th>barren*</th>
</tr>
</thead>
<tbody>
<tr>
<td>survey %</td>
<td>8</td>
<td>15</td>
<td>3</td>
<td>9</td>
<td>65</td>
<td>---</td>
</tr>
<tr>
<td>veg %</td>
<td>20</td>
<td>10</td>
<td>4</td>
<td>25</td>
<td>42</td>
<td>---</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Transect 3</th>
<th>oak woodland</th>
<th>grass</th>
<th>savanna</th>
<th>chap</th>
<th>forest</th>
<th>barren*</th>
</tr>
</thead>
<tbody>
<tr>
<td>survey %</td>
<td>1</td>
<td>---</td>
<td>---</td>
<td>4</td>
<td>95</td>
<td>---</td>
</tr>
<tr>
<td>veg %</td>
<td>13</td>
<td>1</td>
<td>1</td>
<td>13</td>
<td>72</td>
<td>---</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Transect 4</th>
<th>oak woodland</th>
<th>grass</th>
<th>savanna</th>
<th>chap</th>
<th>forest</th>
<th>barren*</th>
</tr>
</thead>
<tbody>
<tr>
<td>survey %</td>
<td>3</td>
<td>1</td>
<td>---</td>
<td>4</td>
<td>92</td>
<td>---</td>
</tr>
<tr>
<td>veg %</td>
<td>6</td>
<td>4</td>
<td>4</td>
<td>23</td>
<td>63</td>
<td>---</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Transect 5</th>
<th>oak woodland</th>
<th>grass</th>
<th>savanna</th>
<th>chap</th>
<th>forest</th>
<th>barren*</th>
</tr>
</thead>
<tbody>
<tr>
<td>survey %</td>
<td>14</td>
<td>42</td>
<td>26</td>
<td>18</td>
<td>---</td>
<td>---</td>
</tr>
<tr>
<td>veg %</td>
<td>23</td>
<td>17</td>
<td>10</td>
<td>50</td>
<td>---</td>
<td>---</td>
</tr>
</tbody>
</table>

* bedrock outcrops

Several clear patterns are evident in these surveys. The oak woodland and chaparral communities are under-represented in surveys in all transects, while the forest and grassland are over-represented by the surveys in all transects. The savanna community exists only minimally in all transects except for Transect 5 where it is present in a significant amount and is over-represented in survey efforts.

The following merged data illustrate the patterns more clearly.

Table 25b. Summarized Transect Survey Coverage of Vegetation

<table>
<thead>
<tr>
<th>oak woodland</th>
<th>grass</th>
<th>savanna</th>
<th>chap</th>
<th>forest</th>
<th>barren</th>
</tr>
</thead>
<tbody>
<tr>
<td>survey %</td>
<td>5</td>
<td>12</td>
<td>6</td>
<td>7</td>
<td>70</td>
</tr>
<tr>
<td>veg %</td>
<td>13</td>
<td>7</td>
<td>4</td>
<td>23</td>
<td>53</td>
</tr>
</tbody>
</table>

The merged data again show a clear bias in favor of forest/grassland at the expense of oak woodland/chaparral. The most

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extreme biases lie within the conifer forest and chaparral zones. The over-emphasis on forest surveys is probably attributable to commercial timber sale project priorities. The lack of survey within the chaparral may be the reciprocal result of the same emphasis as well as the inability and/or lack of desire on the part of archaeological surveyors to penetrate the dense brush which characterizes the zone.

**Topography**

Table 26a. Transect Survey Coverage of Topography

<table>
<thead>
<tr>
<th>Transect</th>
<th>ridge</th>
<th>slope</th>
<th>valley</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>survey %</td>
<td>31</td>
<td>69</td>
<td>--</td>
</tr>
<tr>
<td>topo %</td>
<td>11</td>
<td>88</td>
<td>1</td>
</tr>
<tr>
<td>2</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>survey %</td>
<td>11</td>
<td>88</td>
<td>1</td>
</tr>
<tr>
<td>topo %</td>
<td>4</td>
<td>95</td>
<td>1</td>
</tr>
<tr>
<td>3</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>survey %</td>
<td>32</td>
<td>68</td>
<td>--</td>
</tr>
<tr>
<td>topo %</td>
<td>13</td>
<td>87</td>
<td>--</td>
</tr>
<tr>
<td>4</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>survey %</td>
<td>25</td>
<td>75</td>
<td>1</td>
</tr>
<tr>
<td>topo %</td>
<td>15</td>
<td>83</td>
<td>2</td>
</tr>
<tr>
<td>5</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>survey %</td>
<td>34</td>
<td>34</td>
<td>32</td>
</tr>
<tr>
<td>topo %</td>
<td>13</td>
<td>62</td>
<td>25</td>
</tr>
</tbody>
</table>

As with the vegetation, clear patterns are present. In every transect ridgetops are over-represented while slopes are under-represented. Slopes of course contain a significant amount of excessively steep terrain which is not feasible to survey. It was not possible to include degree of slope as a variable here. Valleys are practically non-existant except in Transect 5 where they exist significantly and are over-represented by survey. The combined data show the same patterns.

Table 26b. Summarized Transect Survey Coverage of Topography

<table>
<thead>
<tr>
<th>ridge</th>
<th>slope</th>
<th>valley</th>
</tr>
</thead>
<tbody>
<tr>
<td>survey %</td>
<td>27</td>
<td>67</td>
</tr>
<tr>
<td>topo %</td>
<td>11</td>
<td>83</td>
</tr>
</tbody>
</table>

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Elevation

Table 27a. Transect Survey Coverage of Elevation

<table>
<thead>
<tr>
<th>Transect 1</th>
<th>survey %</th>
<th>el. %</th>
</tr>
</thead>
<tbody>
<tr>
<td>-15</td>
<td>---</td>
<td>1</td>
</tr>
<tr>
<td>15-25</td>
<td>---</td>
<td>6</td>
</tr>
<tr>
<td>25-35</td>
<td>---</td>
<td>13</td>
</tr>
<tr>
<td>35-45</td>
<td>4</td>
<td>30</td>
</tr>
<tr>
<td>45-55</td>
<td>65</td>
<td>34</td>
</tr>
<tr>
<td>55-65</td>
<td>31</td>
<td>17</td>
</tr>
<tr>
<td>65+</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Transect 2</th>
<th>survey %</th>
<th>el. %</th>
</tr>
</thead>
<tbody>
<tr>
<td>-15</td>
<td>1</td>
<td>5</td>
</tr>
<tr>
<td>15-25</td>
<td>8</td>
<td>36</td>
</tr>
<tr>
<td>25-35</td>
<td>24</td>
<td>29</td>
</tr>
<tr>
<td>35-45</td>
<td>22</td>
<td>22</td>
</tr>
<tr>
<td>45-55</td>
<td>3</td>
<td>6</td>
</tr>
<tr>
<td>55-65</td>
<td>14</td>
<td>17</td>
</tr>
<tr>
<td>65+</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Transect 3</th>
<th>survey %</th>
<th>el. %</th>
</tr>
</thead>
<tbody>
<tr>
<td>-15</td>
<td>5</td>
<td>16</td>
</tr>
<tr>
<td>15-25</td>
<td>24</td>
<td>29</td>
</tr>
<tr>
<td>25-35</td>
<td>22</td>
<td>22</td>
</tr>
<tr>
<td>35-45</td>
<td>31</td>
<td>20</td>
</tr>
<tr>
<td>45-55</td>
<td>21</td>
<td>16</td>
</tr>
<tr>
<td>55-65</td>
<td>14</td>
<td>17</td>
</tr>
<tr>
<td>65+</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Transect 4</th>
<th>survey %</th>
<th>el. %</th>
</tr>
</thead>
<tbody>
<tr>
<td>-15</td>
<td>22</td>
<td>52</td>
</tr>
<tr>
<td>15-25</td>
<td>52</td>
<td>26</td>
</tr>
<tr>
<td>25-35</td>
<td>26</td>
<td>24</td>
</tr>
<tr>
<td>35-45</td>
<td>24</td>
<td>21</td>
</tr>
<tr>
<td>45-55</td>
<td>21</td>
<td>15</td>
</tr>
<tr>
<td>55-65</td>
<td>15</td>
<td>6</td>
</tr>
<tr>
<td>65+</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Transect 5</th>
<th>survey %</th>
<th>el. %</th>
</tr>
</thead>
<tbody>
<tr>
<td>-15</td>
<td>22</td>
<td>52</td>
</tr>
<tr>
<td>15-25</td>
<td>52</td>
<td>26</td>
</tr>
<tr>
<td>25-35</td>
<td>26</td>
<td>24</td>
</tr>
<tr>
<td>35-45</td>
<td>24</td>
<td>21</td>
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<td>45-55</td>
<td>21</td>
<td>15</td>
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<td>55-65</td>
<td>15</td>
<td>6</td>
</tr>
<tr>
<td>65+</td>
<td></td>
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</tr>
</tbody>
</table>

The above data indicate that areas below 3500' are underrepresented by surveys in all transects except Transect 5 where at 2500'-3500' there is an over-representation. Once over 3500' there is a general shift to equal or over-representation (exceptions include Transect 1, 3500'-5500' and Transect 3, 5500'-6500'). The aggregated data clearly show the shift.

Table 27b. Summarized Transect Survey Coverage of Elevation

<table>
<thead>
<tr>
<th>survey %</th>
<th>el. %</th>
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<tbody>
<tr>
<td>-15</td>
<td>5</td>
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<tr>
<td>15-25</td>
<td>12</td>
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<tr>
<td>25-35</td>
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<tr>
<td>55-65</td>
<td>15</td>
</tr>
<tr>
<td>65+</td>
<td>6</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>survey %</th>
<th>el. %</th>
</tr>
</thead>
<tbody>
<tr>
<td>65+</td>
<td>3</td>
</tr>
</tbody>
</table>

Due to the co-occurrence of high elevations and the conifer forest, the bias in favor of high elevation survey can probably be attributed to the emphasis on timber harvest projects.
Survey Coverage Summary

There is a general survey bias in favor of high elevation ridgetops located within the conifer forest. These are the same areas that are favored by the low density, dispersed mano/metate, non-late projectile point, chert dominated sites. The areas under-represented in the surveys are generally marked by the high density, concentrated mortar/pestle, late projectile point, obsidian sites.

Surprisingly, such a survey strategy comes rather close to what the present authors would recommend in the absence of timber harvest concerns. Due to the differences of site distribution within the various environmental zones, it would be appropriate to stratify the study area along those zones, and implement sample sizes adequate to insure the identification of the various kinds of sites that exist. Thus, due to the low density of sites in the conifer forest, if it is desired to find those sites, a larger sample may be necessary than that which is required outside of the conifer forest.

It is concluded, therefore, that the past and present approach to survey is adequate for locating the various kinds of archaeological sites that exist in the study area. However, data gained from the surveys can only be evaluated and utilized when the biases of the surveys and the actual site frequencies per acre are known. Otherwise, patterns in the archaeological record may be the result of prehistoric human behavior or the result of sampling problems, the difference being unknown to the researcher.

Conclusions

In general, this study has been concerned with the development of site typologies and predictive models. A review of past studies with similar concerns has indicated that: 1) site typologies were developed by aggregating chronologically distinct artifacts into single, functional units that were derived from the ethnographic record; and 2) predictive models of site location were developed without measuring site frequencies per acre surveyed within the various environmental zones under study.

The results of this study indicate that site typologies which do not take into account the variability within general categories of artifacts such as ground stone and projectile points mask important forms of functional and/or chronological information. By distinguishing between manos/metates and mortars/pestles, and various projectile point types, it has been possible here to discover that sites characterized by manos/metates, non-late projectile points, and the dominance of chert, are more frequently found in the conifer forest, at
high elevations and on high ridges and slopes than sites charac-
terized by mortars/pestles, late points, and dominance of ob-
sidian. These latter assemblages are more frequently found
outside the conifer forest, at lower elevations, and in valleys
or near streams.

It was also noted that these patterns manifested them-
selves latitudinally due to the fact that the former habitats
are abundant in the north while the latter are abundant in the
south. Although latitude is very important in terms of the
presence of obsidian (for the southern end of the project is
where the sources are located), it is not considered as im-
portant in terms of chronological indicators because we know
that the northern reaches of the study were occupied late in
time by people who used late period projectile points as well
as mortars and pestles.

By measuring the site frequencies per acre surveyed within
particular environmental settings, it has been predicted that
in the future site densities should vary from high to low
along the following environmental continuum:

1) oak woodland/savanna - valley
2) oak woodland/savanna - ridge
   grass/chaparral - valley
3) oak woodland/savanna - slope
   grassland/chaparral - ridge
   conifer forest - valley
4) conifer forest - ridge
   grassland/chaparral - slope
5) conifer forest - slope

When the typology data were combined with the data used
to develop the predictive model, it was found that the sites
characterized by the mortars/pestles, late points, and domin-
ance of obsidian were concentrated in high densities around
the locations predicted by the model. On the other hand, the
sites characterized by manos/metates, non-late points, and the
lack of obsidian were much more dispersed and found in low
densities in areas considered of low sensitivity by the model.

Such patterning seems to imply that: 1) the early inhabi-
tants of the study area (Borax Lake) lived in low densities
and were widely dispersed favoring high elevations in what is
now the conifer forest; and 2) the late inhabitants (Emergent)
lived in higher densities favoring lower elevations where they
were concentrated in what is now the oak woodland and savanna
plant communities. Although it is clear from the ethnographic
record that these later peoples exploited upland habitats, it
appears that their activities resulted in lower densities in
the upland areas than in the lowlands. Such a settlement
pattern shift could possibly be attributed to the proposed
warm period that began at 2500 B.C. and ended at approximately
500 B.C. (West 1981a, b). If this were the case, the shift
should be evident before the late period. The transitional period was defined here on the basis of the presence of Excelsior (leaf-shaped) projectile points (Berkeley Pattern), and unfortunately, the Excelsior data does not follow a clear pattern. Although it is somewhat similar to the late sites in its artifact assemblages (eg., obsidian and mortars/pestles), it is quite similar to the early periods in its settlement pattern. As mentioned in the projectile point section, this confusion may be the result of the leaf-shaped point being an inaccurate temporal indicator (rather than using the strict definition of the Excelsior point as defined by Fredrickson (1973), the present authors included all leaf shaped points).

In conclusion, there appears to have been a settlement pattern shift, but the exact timing and causes are unclear. In order to better address this problem more climatic studies should be conducted as well as attempts made to clarify the problems associated with sites dating to the Excelsior time period.

RESEARCH SUMMARY, FUTURE WORK AND MANAGEMENT RECOMMENDATIONS

Introduction

The objective of this section is to integrate the research procedures and results, with the meaning this work has for the management of the archaeological resources. Pertinent North Coast Range research issues are summarized and the evaluation of the archaeological literature in light of these issues reiterated to emphasize the research orientations of this study. A summation of the results of our work allows the opportunity to address, from a research perspective, problems of site significance, mitigation procedures, and recommendations for future work.

Summary of Research Issues

The summary of the research issues pertinent to this study is presented as a series of interconnected research goals.

(1) Development of chronological sequences.
   To achieve such a goal, one must identify diagnostic artifacts, assemblages, etc., known to have been utilized during discrete periods of time.

(2) Identification of subsistence changes through time.
   Given the ability to date artifact assemblages, the next goal is to provide functional interpretations of those assemblages. If one is able to differentiate functionally between sites (i.e., develop a site typology), and these

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sites are known to have been developed at different points in time and in different environmental contexts, a change in subsistence/settlement pattern may be identified.

(3) Causes of subsistence/settlement pattern change. Three general factors are most frequently considered; environmental change, population pressure, and population invasion. Environmental change: through the use of paleoecological methods (e.g., analysis of fossil pollen, etc.) environmental changes that could have caused changes in subsistence may be identified. Population pressure: in many cases, increased degrees of population pressure result in human populations intensifying their exploitation of the environment (e.g., utilizing more labor intensive resources such as the acorn). Population invasion: if a new group of people moved into the area bringing in a new form of adaptation, this could be identified through the use of historical linguistics and the ability to assign linguistic affiliation to particular archaeological assemblages (for an in depth discussion of this subject see Chapter IV).

(4) Social organizational changes. The form of social organization can be interpreted as being a necessary outcome of a particular strategy of subsistence if strong analogies to similar situations in the ethnographic record are known. Additional inferences concerning social organization can be made e.g., through the study of the dynamics of obsidian distribution.

(5) Development of predictions. Finally, based on the knowledge that we have accumulated, it can be expected that the distribution through time and space of the various archaeological materials can be accurately predicted. If this can be achieved, it will document our understanding of the archaeological record.

Summary of Literature Review

The intent of the review of the archaeological literature was an evaluation of previous work in light of the research issues summarized above. These issues generally fell into the realms of chronology, subsistence/settlement patterns, social organization, and predictive models.

The study of chronology has been a major area of interest in North Coast Range research from its inception (Harrington 1948; Meighan 1955) to the present (Baumhoff, Appendix A). Although we are still generally restricted to the use of a regional sequence, encouraging progress is being made in the development of local sequences, particularly by individuals at Sonoma State University and the University of California, Davis (see Appendix A).
Useful settlement pattern studies had their inception with the work of Treganza, Smith and Weymouth (1950) and continued with the late 1960's reservoir studies of King (1966), Treganza and Heickson (1969), Childress and Chartkoff (1966), and Orlins (1971). These projects were followed by studies that attempted the development of functional site typologies (Jackson 1976, 1980; Tamez 1978, 1981; Stewart and Fredrickson 1979; Bickel 1979), however most of the typologies were based on synchronic ethnographic models and ignored the diachronic nature of the archaeological record. In relation to the development of these site typologies, attempts at constructing predictive models of site location were made (Jackson 1976; Tamez 1978, 1981; Stewart and Fredrickson 1979). Unfortunately however, predictions were developed and tested without considering the site frequency per unit area surveyed within the environmental contexts for which the predictions were made. This methodology resulted in conclusions that were based either on the patterns of prehistoric human behavior or on the biases of the research design, the correct alternative unknown to the researcher.

Attempts to deal with changes in social organization have generally remained on a hypothetical level (Fredrickson 1973, 1974; King 1974), largely due to the fact that the occurrence of proper archaeological implications that adequately test such proposals have been quite limited.

Recent studies of environmental change (West 1980a, b), have contributed significantly to the potential of explaining the causes of settlement pattern changes. However, up until this overview few attempts have been made to demonstrate any changes in settlement pattern, let alone correlate them with environmental changes. Although this study had difficulty with its attempt at this correlation, future attempts are strongly encouraged.

The results of the literature review indicated that three general areas were most in need of improvement: 1) the development of chronological sequences (Baumhoff, Appendix A); 2) chronologically sensitive site typologies; and 3) accurate predictive models of site location (i.e., predictive models based on some of the data we have been collecting over the years).

Summary of Site Typology: Results

The literature review revealed that in the process of site typology development, it had become common to aggregate artifacts as if they were representative of one time period, usually the ethnographic period. This method ignored the diachronic nature of the archaeological record, thus leaving
the researcher unable to observe any changes through time that may have occurred. This study has attempted to identify subsistence/settlement pattern changes by tracing the frequency of the co-occurrence of artifact forms that have been suggested to be sensitive indicators of both function and chronology.

The particular categories chosen for manipulation were ground stone (manos/metates and mortars/pestles), various projectile point forms, projectile points in association with ground stone, and lithic scatters.

The results of the study indicated that most habitats within the study area were probably occupied to some degree or another from Early Borax Lake times to the present. However, the distribution and form of these occupations did not remain uniform over time and space. Manos/metates appear to have been used throughout the time span of occupation, while mortar/pestles appear not to have been important until after Late Borax Lake times. In addition, sites characterized by the combination of manos/metates, non-late period projectile points, and the dominance of chert were more frequently found in the conifer forest at high elevations and on ridges and slopes than sites with mortars/pestles, late points, and greater amounts of obsidian. The latter assemblages were more frequently found outside the conifer forest, at lower elevations, and in valleys or near streams.

These patterns indicated that there was a shift from a subsistence system that favored high elevations early in time to one that favored lower elevations late in time. It was also noted that there was a simultaneous relationship between elevation and latitude. Some of the artifacts attributed to the later time periods (mortars/pestles, obsidian) were located not only at low elevations outside the conifer forest but also at low latitudes because that was where these low elevation, non-conifer vegetation communities were most abundantly present. In terms of obsidian, this pattern was amplified by the fact that the obsidian quarries were also located in the southern latitudes.

It was suggested that the reason for the change could have at least been partially due to the increased reliance on the acorn. It was also more tentatively suggested that an increase in the availability and utilization of salmon may have also had an effect (however, due to problems with the chronological indicators, the timing of the shift and the possible increase in salmon could not be correlated). Whether these changes were the result of population pressure or the invasion of a new people could not be addressed due to the limitations of the data that were generated.
Summary of Site Location Predictions

The literature review pointed out that previous predictive models were developed and tested without considering the site frequency per unit area surveyed within the environmental contexts for which the predictions were made. Through the collection of small samples of site frequency data that accounted for the above mentioned survey bias, the study predicted that in the future, site densities should vary from high to low along the following environmental continuum.

1) oak woodland/savanna - valley
2) oak woodland/savanna - ridge
   grass/chaparral - valley
3) oak woodland/savanna - slope
   grassland/chaparral - ridge
   conifer forest - valley
4) conifer forest - ridge
   grassland/chaparral - slope
5) conifer forest - slope

When the typology data were combined with the predictive model, it was found that the mortar/pestle, etc. sites were concentrated in high densities around the locations predicted by the model, while the mano/metate, etc. sites were much more dispersed and found in low densities in areas considered to be of low sensitivity. This led to the conclusion that not only were different habitats being exploited, but they were also exploited in differing degrees of intensity.

Summary of Survey Coverage

Within the samples collected by this study, it was found that there was a general bias in favor of high elevation ridge-tops located within the conifer forest. The fact that these were generally the same habitats where the lowest site densities occurred led us to conclude that greater sample sizes in these areas constituted an acceptable approach to research. However, it was also stated that this would only be the case as long as the site frequency per acre surveyed within each environmental zone was recorded.

Site Significance

On one level site significance is determined by legal guidelines set forth by the Advisory Council on Historic Preservation which defines the criteria by which a site is eligible or not for the inclusion on the National Register of Historic Places. These criteria are stated as:
The quality of significance in American history, architecture, archaeology, and culture is present in districts, sites, buildings, structures, and objects of state and local importance that possess integrity of location, design, setting, materials, workmanship, feeling and association, and:

1) that are associated with events that have made a significant contribution to the broad patterns of our history; or

2) that are associated with the lives of persons significant in our past; or

3) that embody the distinctive characteristics of a type, period, method of construction or that represent the work of a master, or that possess high artistic values, or that represent a significant and distinguishable entity whose components may lack distinction; or

4) that have yielded, or may be likely to yield, information important to prehistory or history (36 Code of Federal Regulation 60.6).

It is essentially the fourth criterion which must be addressed concerning the prehistory of the North Coast Range, and consequently we must attempt to determine what is "important information" in this context. Moratto and Kelly (1978: 2-3) have stated that the importance of an archaeological site depends on: 1) the context of assessment, as well as its inherent qualities, since there is no universal measure of cultural worth; 2) the criteria of significance change as the goals of the discipline of archaeology evolve, and as public interest or national priorities change; 3) the value of material remains shift depending upon the research issue to be addressed; and 4) the level of analysis, whether the topic of study is the artifact, site, or region. For any given period of time then, the question of significance rests with the regional research issues and the potential which each site has for solving the problems associated with those issues.

To facilitate the definition of significance for the various types of sites that exist in the study area, we will utilize the site typology provided by Jackson (1980). Each site type will be described, and its significance will be addressed in light of the research issues discussed above.

(1) Task specific sites.
These are sites where a single activity took place. They can take the form of lithic scatters, isolated ground stone, cached ground stone, quarries, etc.

These sites do very little toward increasing our knowledge of chronology largely because they lack materials that yield absolute dates. However, many of these sites have the potential to contribute significantly to our knowledge of the
dynamics of subsistence and settlement. As demonstrated in this study, the environmental context of ground stone implements, when viewed in conjunction with other forms of data, is very important to the study of subsistence/settlement pattern change and potentially important to the study of environmental change, population pressure, and population movements. Similarly, in terms of lithic scatters, when projectile points are present, they can be used with other data to address some of the same questions by identifying environmental categories which were most frequently utilized at various times in the past. Even in the absence of projectile points, chert/obsidian ratios and obsidian sourcing can provide valuable information regarding prehistoric trade relationships and/or movements of people. Quarry sites, although rarely addressed in this study, have the potential to increase our knowledge of prehistoric stone tool manufacture and may increase our understanding of the determinants of site location (i.e., a good quarry is likely to be surrounded by a high density of sites).

(2) Multi-activity sites.
These are sites where multiple activities have taken place. Due to these multiple activities, a range of artifact forms are present including lithic scatters, ground stone, midden, fired rock, faunal remains, floral remains, etc.

These sites contain the potential to address all the questions laid out above and more. From a chronological standpoint they are most valuable if they contain buried deposits that have assemblages that are associated with datable materials. If such buried deposits also contain food refuse in association with tools used to process that food, our functional interpretation can be quite strong both at that site and, through analogy, at other sites which are not so well endowed. If such sites contain burial lots, questions regarding population pressure (dietary stress), linguistic affiliation (assemblages associated with identifiable peoples), and social stratification (differential wealth within the lot) can be addressed.

(3) Trail sites.
These sites are quite similar to the task specific sites, differing largely in the distribution of the artifacts. Rather than having artifacts highly concentrated in areas where specific tasks occurred, these sites are characterized by rather sparse dispersal of accumulated debris.

Similar to the task specific sites, trail sites have limited potential to contribute new chronological information. However, their significance is equal to the task specific sites due to similar capacity to address the issues discussed above.
(4) Isolated features.
These are sites characterized by the presence of petroglyphs, rock cairns, rock circles, prayer seats, etc.

These sites can be very important to the study of past and present religious practices (see Chapter V). The location and form of such entities can also, with the help of independent information, contribute to our abilities to trace through time the distribution of particular ethnolinguistic groups (e.g., there has been some speculation that pitted/cupule rocks are directly associated with speakers of languages within the "Hokan Stock").

Mitigation

As is clear from the above discussion, the different kinds of sites vary in their potential for addressing regional research issues and, as a result, have varying degrees of significance. It follows therefore, that in situations of impact, differing mitigative steps will be necessary, depending on the significance of the site.

The goal of this section is to review the kinds of sites that fall under the Jackson (1980) typology and provide recommendations regarding the procedures that should be used to mitigate future impacts on those sites. For the purposes of this discussion, we will assume that the impacts will be of an extreme nature, such as road construction, timber harvests, mining, etc.

(1) Task specific sites / Trail sites

(a) lithic scatters
In case of impacts, the site should be mapped and described in detail, all formed tools should be collected, and sample of the total scatter should be collected (i.e., all materials within the sample should be collected). If feasible (small site with sparse scatter) all surface materials should be collected.

(b) ground stone sites
Such sites should be mapped and described in detail, and all materials collected.

(c) quarries
Such sites should be mapped and described in detail. Samples sufficient to allow us to understand lithic reduction sequences should be collected. Samples of representative mineral types should also be collected.
In all the above situations, money adequate for at least the writing of short, descriptive reports should be provided.

(2) Multi-activity sites

(a) surface sites
Such sites should be mapped and described in detail. Systematic surface collections should be carried out on a level of detail that will allow us to define activity areas (this is particularly important for multi-component sites that may have "horizontal stratigraphy"). The sampling procedures necessary will vary with the nature of the site.

(b) midden sites
Such sites should be mapped and described in detail. Systematic surface collections similar to those described above should be carried out. Excavations should be conducted on a level of detail that will allow us to recover the sorts of data necessary to address the research questions discussed earlier (eg., C14 samples, flora, fauna, etc.). It should be stressed however, if procedures are more detailed than warranted by the data recovery, they should be abandoned (this topic will be dealt with further in the next section).

Due to the greater amount of significant information that is yielded by such sites, more extensive reports are necessary. Similar to the task specific site reports, these reports should include a detailed description of the methods and materials utilized and the data recovered. In addition, the reports should attempt to integrate the newly recovered information with data previously collected with the hope of increasing our abilities to deal with the regional research issues and hypotheses presented in this report.

(3) Isolated features

(a) petroglyphs, rock cairns, rock circles, prayer seats, etc.
Such sites are very difficult to mitigate and hopefully will be rarely in danger of destruction. However, if it can not be avoided, reports including accurate description, illustration and interpretation should be compiled.

Future Work

There are four basic levels of archaeological investigation involved with mitigation and management procedures: 1) research design, 2) survey, 3) test, and 4) surface collection/
excavation. In terms of survey, the site location section considered that past strategies have proved to be adequate in terms of coverage. However, it was also recommended that each survey report should include a record of the number of acres covered within each biophysical context as well as the site density within each of those contexts. Such data will, in the future, increase our ability to predict site locations accurately.

During the course of analysis of the 1120 site survey forms, it became clear that there was a great deal of variability in the manner in which these forms were filled out. Two important variables for the study of settlement patterns were not utilized in this analysis due to problems with their recordation: degree of slope and proximity to water. Over 60% of the site forms did not record the slope of the site. This data must be collected in the field because differences between on-site and off-site slope are often too subtle to show up on 7.5' topographic maps.

The problems involved with the recording of proximity to water were the result of the site record forms. Although the distance to the nearest water was recorded on the majority of the forms, the condition of the water source was often not identified, i.e., whether it was intermittent or permanent. An additional problem involving water emerged as a result of the current researchers' inability to determine how far away a source of water could be and still be important to the location of a site. The data cards utilized in the study had two categories, water on-site and water off-site. In many cases water might be off-site yet close enough to be easily accessible. In the future this problem can be avoided by recording distances in the form of increments such as 0 to 50 meters, 50 to 100 meters, etc.

An additional area of concern involves the description of artifacts during the survey phase, in particular, the description of projectile points. As mentioned earlier, of the sites with recorded projectile points only 35% included outline drawings of those points, and of the same sites, only 15% indicated that some form of artifact collection had been made. These patterns strongly indicate that a great deal of critical information is not being recorded and is in risk of being permanently lost. The Projectile Point Typology presented in Appendix A provides a management tool with which these artifacts may be compared and classified and an evaluation of the site significance made in terms of both chronology and regional distribution. In this context each point becomes theoretically important, and it is recommended here that not only should they be outlined on the survey form but also that they be collected at the time of the initial survey.
This introduces an important point concerning the mitigation of task specific sites. As stated in the mitigation section, such sites would be considered mitigated when all formed tools and samples of all other materials were collected and a report written including a detailed site description and map as well as a description of the materials recovered. If these steps were taken during the initial survey of areas that are sure to be impacted, it would save a great deal of time and expense.

In summary, the site survey forms currently used by the U.S. Forest Service, both the standard and supplement, are more than satisfactory if filled out fully and correctly. It is emphasized however, that survey personnel should at least: 1) record on-site and off-site slope during the survey; 2) record the distance of permanent and/or intermittent water in increments of distance; and 3) illustrate and collect all projectile points during the survey.

Additionally, the test excavation phase could be revised significantly. The goal of establishing the presence or absence of a subsurface deposit and of identifying the content of the deposit when present, could be achieved through the use of low cost, rapid recovery techniques such as shovels and screens instead of highly sophisticated and expensive methods of excavation and report preparation. It is further suggested that this phase might be most efficiently carried out by in-house personnel thus saving a significant expenditure of funds particularly in the case where virtually no subsurface deposit is discovered. This savings in funds could then be passed on to the more fruitful phases of management, the surveys, surface collections, and full excavations.

Several methodological suggestions are made concerning the surface collection/excavation phase of site mitigation. First, the minimum size recommended for units is 1x1 meters. The basic problem with smaller units is that they are too small to work in, thus not allowing a midden deeper than an arm's reach to be properly and thoroughly tested. A concomitant advantage would be that data across sites would be comparable.

Secondly, wet screening is recommended whenever possible. This method reduces problems of adhesive clay and silt particles thus increasing ease and efficiency of recovery due to increased visibility of cultural materials. It also assures that the cultural materials are recovered in maximum state of preservation as processes of dry screening are in some cases apt to damage fragile items.

It is further recommended that soil tests, including those for pH and phosphates, organic carbon, and soil fraction measurements, be eliminated in future research efforts in the
North Coast Range on the basis of virtually no results for fairly high cost. Since these tests have repeatedly shown no results in the past, they should not be included in the future.

Finally, lithic analysis should be conducted only to degree that it is comensurate with results. For most excavations the artifact yield is not large enough to warrant examination of 25 attributes relating to tool production and use. For the most part, adequate analysis and interpretation can be accomplished via essential visual inspection. Further analysis is simply not cost effective. This recommendation does not apply to the fruitful areas of obsidian sourcing and hydration analysis.

Past, Present, and Future Impact on the Cultural Resource Base

The goal of this section is to provide interested individuals with data concerning the past, present and perhaps future destruction of archaeological sites within the study area. Several kinds of disturbances were recorded from the site survey forms onto the same analysis cards used for earlier portions of this overview (e.g. the Site Typology section). Of the 1120 recorded sites only 18.5% were recorded specifically as undisturbed; on another 17.9% no record of disturbed or undisturbed was specified. The overwhelming majority of sites, 63.6%, show disturbance by at least one of several processes. Road cuts, logging activities, or road cuts and logging activities account for the disturbance of 51% of the total sites or 79.9% of the disturbed sites. This is not surprising, perhaps, in the light that many sites have been discovered due to such activities in a given area. For the remaining percentage of disturbed sites the following factors are recorded: ORV activity, 6.3%; historical disturbance (farming, cultivation), 5.1%; stream erosion, 4.2%; pot hunter activity, 2.7%; and severe grazing, 1.7%.

Since the federally managed lands involved in this project are "lands of many uses", it may be expected that the processes that create site disturbance and destruction will continue. It is recommended that the current policy of survey and mitigation prior to adverse impact take place whenever possible. In a number of situations avoidance of the site location is the most satisfactory solution. In cases where avoidance is impossible other appropriate mitigation steps must be taken in order to preserve the significant information. Past damages of course cannot be entirely undone, but measures may be taken to reduce further loss of information and site integrity. It is recommended that data recovery be carried out for every site that has incurred substantial impact where it is not reasonable to stop or shift the location of the damage producing activity. Clearly, current
human activity will continue to erode the prehistorical cultural resource base with substantial loss of information, at least 63.6% loss, if protective measures are not taken. (The actual loss may be more than 63.6% since certain environmental factors favor human activity and some of the richest prehistoric sites may already have been the most disturbed.).

Finally, two large water projects which inundated culturally rich lands were constructed long before mitigation measures were required of such projects. These two reservoirs are Lake Pillsbury in what was known as Gravelly Valley and East Park Reservoir in Indian Valley. The latter inundated at least two major villages, Pakalabe and Dahchininchini and possibly some secondary villages within this Hill Patwin territory. Lake Pillsbury also flooded some Yuki settlements. It is strongly recommended that mitigation of these areas be carried out in the next drought or in the event that these reservoirs are drawn down sufficiently to expose the sites. Recent work at Lake Berryessa has demonstrated that such research is richly rewarding (True, Baumhoff and Hellen 1979). (It is recognized that these reservoirs are not under the management of the funding agencies for this report. Nevertheless, they fall within the project area, and it is suitable research for the region.)

Evaluation of Research

Several biases exist in this research, two of which are inherent, yet not so obvious. The first concerns the data cards or site information relative to the Mendocino National Forest lands versus the BLM holdings. These two areas are not represented proportionally; there are five to six times as many cards for the Forest than for the BLM area, while the Forest only comprises two to three times as much land. As a consequence, all the results are strongly skewed in favor of the Forest circumstances. The other important bias is one which emphasizes the western portion of the project area over the eastern portion largely due to the differential amounts of research which have been accomplished in those areas, e.g., the Middle Eel area in contrast to Indian Valley. This is related to the first bias, that is, there has been more work done on the Forest lands than the BLM lands which are considerably more discontinuous and somewhat less amenable to the more intensive treatment of Forest Service lands. These two biases are inherent in the data and therefore unavoidable. Nonetheless, the lands included for this study produced a fairly balanced set of concerns, and presented considerable integrity as a research unit.
REFERENCES CITED

Alt, D. D., and D. W. Hyndman

Angulo, Jaime de

Angulo, Jaime de, and Lucy S. Freeland

Bailey, E. H., M. C. Blake, Jr., and D. L. Jones

Bailey, E. H., Irwin, W. P., and D. L. Jones

Barbour, M. G., and J. Major

Barrett, Samuel A.


Barrett, Samuel A. and E. W. Gifford

Basgall, Mark

Baumhoff, Martin A.

1981 Personal communication with Helen McCarthy, Davis.

Baumhoff, Martin A., and D. L. Olmsted


Bean, Walton

Bean, Lowell J., and D. Theodoratus

Beck, Warren A., and Ynez Haase

Bennyhoff, James A.
1981 Personal communication with Helen McCarthy at colloquium, Davis.
Benson, James R., David A. Fredrickson, and Randy Milliken  
1979 Archaeological investigations at Soldier Ridge, Trinity County, California. Ms. on file, Cultural Resources Facility, Sonoma State University.

Bettinger, R.L. and M. A. Baumhoff  

Bickel, Polly MCW  

Bureau of Land Management, Ukiah District  
1973 Unit Resource Analysis, Bureau of Land Management, Ukiah District, Ukiah.

Callaghan, Catherine A.  


1977 The time-depth of the Miwok family. Paper delivered at the Symposium on Linguistic Archaeology, Houston.


Chartkoff, J. L.  
1969 Archaeological Resources of the West Sacramento Canal Unit. Report submitted to the U.S. National Park Service.

Chartkoff, J. L., and J. Childress  
1966 An archaeological survey of the Paskenta-Newville Reservoir in Glenn and Tehama Counties, California. Ms. on file, Cultural Resources Facility, Sonoma State University.

Chesnut, V. K.  
1902 Plants used by the Indians of Mendocino County, California. Contributions from the U.S. National Herbarium 7(3):295-408.
Childress, J., and J. L. Chartkoff

Clewett, Edward
1977 CA-SHA-475: An interim report on Squaw Creek #1, a complex stratified site in the southern Klamath Mountains. Paper presented at the symposium on the Archaeology of the North Coast Range, University of California, Davis.

Cook, Sherburne F.

Crawford, C. B., and T. C. Brundage

Dasmann, R. F.

Dixon, Roland B. and A. L. Kroeber

Donley, M. W., S. Allan, P. Caro, and C. P. Patton

Drucker, P.
1948 Appraisal of the archaeological resources of Wilson Valley Reservoir, Lake County, California. River Basin Survey, Smithsonian Institution.
1949 Archaeological appraisal of Indian Valley Reservoir, Lake County; Sly Park Reservoir, El Dorado County, and Dry Creek Reservoir, Sonoma County, California. River Basin Survey, Smithsonian Institution.

DuBois, Cora


Durrenberger, Robert W.

Edwards, R. L.
1966 An archaeological survey of the Etsel-Franciscan Reservoir area. Ms. on file, Cultural Resources Facility, Sonoma State University.

1968 A descriptive report on the salvage archaeology of three sites on Thomes Creek, Tehama County. Ms. on file, Department of Anthropology, U.C. Davis.

1970 The prehistory of the Pui'mak Wintun, Thomes Creek, Tehama County, California, including a suggested chronological model of the northern Sacramento Valley region prehistory. MA thesis, Department of Anthropology, University of California, Davis.

Elmendorf, Wm. R.

Ericson, Jonathan E.

Essene, Frank J.

Fenenga, Franklin
1948 Preliminary appraisal of the archaeological resources of Coyote Reservoir, Mendocino County, California. Ms. on file, River Basin Survey, Smithsonian Institution, Washington, D.C.
Flaherty, Jay M.  

Flynn, K., and W. Roop  
1975 Archaeological testing of 4-HUM-245 and 4-HUM-246, Pine Ridge, Humboldt County, California: High altitude seasonal camps near Hupa Mountain, Humboldt County. Ms. on file, Bureau of Land Management, Ukiah District, Ukiah.

Foster, George  

Fowler, Catherine  
1972 Some ecological clues to Proto-Numic homelands. Desert Research Institute Publications in Social Science 8:105-121.

Fredrickson, David A.  
1973 Early cultures of the North Coast Ranges, California. Ph.D. dissertation, Department of Anthropology, University of California, Davis.


1977 Contrasting settlement systems at the Geysers, Sonoma and Lake Counties, California. Paper presented at the symposium on the Archaeology of the North Coast Range, University of California, Davis.


1980 Personal communication with Helen McCarthy, Sonoma State.

Fredrickson, D. A., J. Offermann and S. Patterson  
1978 A cultural resources survey of the proposed SUNEDCO County Line Prospect Geothermal Leasehold, Colusa County, California. Ms. on file, Cultural Resources Facility, Sonoma State University.
Freeland, Lucy

Gatschet, Albert S.

Gibbs, George


Gifford, Edward W.

Gifford, E. M.


Gifford, Edward W. and A. L. Kroeber

Goldschmidt, Walter

Goldschmidt, Walter, G. Foster, and F. Essene

Graf, W.
Port Angeles, Washington.
Griffin, J. R., and W. B. Critchfield

Grinnell, J.

Haas, Mary

Halpern, Abraham M.

Hamilton, W. B.

Hanks, H., and R. Indermill
1974 Preliminary archaeological assessment of the proposed Big Butte timber sale, Mendocino and Trinity Counties, California. Ms. on file, Bureau of Land Management, Ukiah District, Ukiah.

Harrington, M. R.
1948 An ancient site at Borax Lake. Southwest Museum Papers, No. 16.

Heizer, Robert F., ed.

Hughes, Richard

Ingles, L. G.

Irwin, W. P.
Jackson, Thomas L.

1976 An archaeological report of the Middle Eel Planning Unit archaeological survey. Ms. on file, Cultural Resources Facility, Sonoma State University.

1977 Hupa Mountain archaeological project: report of salvage excavations at 4-HUM-245 and 4-HUM-246. Ms. on file, Cultural Resources Facility, Sonoma State University.


James, J. W.
1966 A modified Koeppen classification of California climates according to recent data. California Geographer.

Johnson, Patti J.

Kahrl, Wm. L., ed.

Kaufman, Thomas S.

Kelly, Isabel

King, Thomas
1966 Archaeological survey of the Dos Rios Reservoir. Ms. on file, Cultural Resources Facility, Sonoma State University.


1974b Manos on the mountain: Borax Lake pattern high-altitude settlement and subsistence in the North Coast Ranges of California. Ms. on file, Cultural Resource Facility, Sonoma State University.

Kniffen, Fred


Kroeber, Alfred L.


Kuchler, A. W.


Kunkel, Peter


Latham, Robert G.

Levulett, V.
1977 A third archaeological reconnaissance within the King Range National Conservation Area. Ms. on file, Bureau of Land Management, Ukiah District, Ukiah.

Levulett, V., T. Ruhstaller, and L. Bell

Levy, Richard S.
1980 The linguistic prehistory of central California: Historical linguistics and culture process. Ms. in possession of author.

Lewis, H. T.

Loeb, Edwin


McCullough, D. R.

McLendon, Sally

McLendon, Sally and M. J. Lowy

McLendon, Sally and R. Oswalt
McKern, W. C.

Meighan, C. W.

Meighan, C. W. and C. Haynes

Merriam, C. Hart
1910- (Notes on the Ethnogeography of the Yuki, Huchnom, and Coast Yuki.) (Ms. in C. Hart Merriam Collection, Bancroft Library, U.C. Berkeley.)
1955 Studies of California Indians, edited by the Staff of the Department of Anthropology, University of California, Berkeley. UC Press, Berkeley.

Michels, J. W.

Michels, Joseph W., and I. S. T. Tsong

Milburn, J. W., D. A. Fredrickson, M. Dreiss, L. Demichael and W. Van Dusen

Miller, Virginia
Mohr, A., and D. A. Fredrickson
1949 Appraisal of the archaeological resources of Black Butte Reservoir, Glenn and Tehama Counties, California. River Basin Survey, Smithsonian Institution.

Moratto, M. J., and R. Kelley

Moyle, P. B.

Munz, P. A., and D. D. Keck

Oakeshott, G. B.

Olsen, W., and L. Payen
1969 An archaeological survey of Potter Valley project, Lake and Mendocino Counties, California. Ms. on file, Cultural Resources Facility, Sonoma State University.

Origer, Thomas, J. Quinn, and D. A. Fredrickson
1980 An archaeological survey of Mineral Reserve lands in the Geysers KGRA, Lake, Mendocino, Sonoma Counties, California. Ms. on file, Cultural Resources Facility, Sonoma State University.

Orlins, Robert
1971 An archaeological survey of the Indian Valley Reservoir, Lake County, California. Ms. on file, Cultural Resources Facility, Sonoma State University.

1972 Obsidian hydration analysis from Indian Valley, Lake County, California. Ms. on file, Cultural Resources Facility, Sonoma State University.

Oswalt, Robert

Palmer, Lyman
1881 History of Napa and Lake Counties, California. Slocum, Bowen, San Francisco.

Parker, J. W.
1979 Prehistoric cultural development in Lake County. Chart prepared for the Lake County Integrated Science Project.

Powell, John Wesley

Powers, Stephen

Rice, S. J.

Roberts, P.
1974 An archaeological reconnaissance of the proposed Big Butte timber sale in Mendocino and Trinity Counties, California. Ms. on file, Bureau of Land Management, Ukiah District, Ukiah.

1975 Preliminary archaeological reconnaissance of the proposed Hupa Mountain Timber Sale, Humboldt County. Ms. on file, Cultural Resources Facility, Sonoma State University.


Rogers, Justus

Sapir, Edward


Sawyer, Jesse

1981 Personal communication to Helen McCarthy, Davis.

Sawyer, J. O., and D. A. Thornburgh

Sawyer, J. O., D. A. Thornburgh, and J. R. Griffin

Schoolcraft, Henry R.

Shipley, William F.


Shipley, Wm., and R. A. Smith

Siebert, Frank T.

Smith, C. E., and W. D. Weymouth
1952 Archaeology of the Shasta Dam area, California. University of California Archaeological Survey Reports 18.
Stewart, Omer C.

Stewart, S., and D. A. Fredrickson, eds.
1979 A cultural resources survey of the Round Valley Indian Reservation. Ms. on file, Cultural Resources Facility, Sonoma State University.

Taber, R. D.
1953 Studies of black-tailed deer reproduction on three chaparral cover types. California Fish and Game 39:177-186.

Tamez, S.
1974 An archaeological reconnaissance of the proposed Pinto Ridge timber sale. Ms. on file, Mendocino National Forest, Willows.

1978 An archaeological overview of the North Coast Range and Northwestern California. Ms. on file, Cultural Resources Facility, Sonoma State University.


Taylor, R. E., ed.

Theodoratus, D., D. W. Peri, C. M. Blount, and S. M. Patterson
1975 An ethnographic survey of the Mahilkaune (Dry Creek) Pomo. Ms. on file, Sonoma State University.

Treganza, A. E.
1958 Archaeological excavations in the Coyote Valley Reservoir area, Mendocino County, California. Ms. on file, National Park Service, Western Region, San Francisco.

Treganza, A. E., C. E. Smith and W. D. Weymouth

Treganza, A., and M. Heickson
True, D. L.  
1981  Personal communication to Helen McCarthy, Davis.

True, D. L., M. A. Baumhoff, and J. E. Hellen  

True, D. L. and J. G. West  
1977  An archaeological survey of the proposed Oat Reservoir, Oat Valley, and a portion of the West Valley Canal, Yolo County, California. Ms. on file, Bureau of Reclamation, Sacramento.

Wallace, W. J.  

Webb, Nancy  

West, G. J.  
1981a  Pollen analysis from Tule Lake, Mendocino National Forest, California. Ms. on file, Mendocino National Forest, Willows, California.

1981b  Pollen analysis of sediments from Barley Lake, Mendocino National Forest, California. Ms. on file, Mendocino National Forest, Willows, California.

West, J. G., V. Levulett, and D. L. True  
1975  Archaeological investigation in Colusa County, California: Funks Reservoir. Ms. on file, Bureau of Reclamation, Sacramento.

Whistler, Kenneth W.  


1980  Pomo prehistory: A case for archaeological linguistics. Ms. in author's possession.
1981  Personal communications to Helen McCarthy, Davis and Sonoma State.

Woolfenden, W. B.  
APPENDIX A
NORTH COAST RANGE POINT TYPES
by
Martin A. Baumhoff

Introduction

In archaeology it has long been customary to rely on
time sensitive artifact types as primary dating tools. I
do not intend here to go into a discussion of typology on which
the literature is already too extensive. Suffice it to say
that it is a well recognized fact that for any given area
artifacts having certain formal characteristics occur at some
times but not others.

Since the 1950s the cultural sequences of the Great Basin
have been defined in terms of projectile point types. These
types are clearly time sensitive, at least for a part of the
Basin (Heizer and Hester 1978). In California comprehensive
point typologies have not been much used since the fundamental
sequence has been that of the Sacramento-San Joaquin Delta.
The time sensitive artifacts upon which that sequence is based
are shell beads and ornaments so that not much attention has
been given to the formal variation of projectile points.

One has no argument with this procedure, but it is
quite clear that it simply will not do to rely on shell beads
and ornaments as "index fossils" in the North Coast Range.
There are two very good reasons for this. One is that con­
structing a sequence based on beads and ornaments has been
dependent upon seriation of grave lots. Since it is not now
acceptable to excavate burials in the North Coast Range, it
is not feasible to use this technique. However, even if we
simply wanted to extrapolate the bead-ornament sequence of the
Delta to the North Coast Range, we would be unable to do so
for the reason that shell does not preserve in the rainy and
acid-soil conditions of the North Coast Range. In the Warm
Springs project in northern Sonoma County only two sites out
of the fifty have decent shell preservation, and even in these
instances conditions are much inferior to those of the Central
Valley.

Consequently, it is necessary to abandon shell bead
chronology and substitute something else. Projectile points
and other chipped stone objects are the obvious candidates:
they are relatively plentiful, preserve perfectly, and are
apparently time sensitive.

In the following typology I identify eleven separate
types to which I have assigned names, those already in use
where they exist and new ones otherwise. Some of the types have been recognized previously and have been discussed extensively. Others I have identified for the first time. All the types are essentially intuitive; no one has done enough metrical work for the basis of a typology based on numerical taxonomy, which in any case has not been found to be very successful in dealing with point typology.

Because metrical work has not been done, none of the types will be given more than a brief description, nor will it be possible to provide a key to assign individual specimens to types. To supplement the brief description of each type I have provided a page of illustrations for each. For any archaeologist who has worked a short time in the area I am sure that he/she will be able to assign the majority of new specimens to one or another category with confidence.

**Gunther**

This small, usually barbed projectile point has long been recognized as a marker of one of the later periods of Northern California prehistory, in some areas remaining in use up to ethnographic times. It was originally named by Treganza (1958) after a site on Gunther Island in Humboldt Bay whence it was first illustrated by Loud (1918). Jackson and Schulz (1975:2) give a working definition of it as

"medium to small stone projectile points characterized by trianguloid blades, contracting or parallel stems, pronounced houlders with angles of less (usually considerably less) than 75 degrees, and with base profiles (the proximal border of the blade from shoulder to shoulder exclusive of the stem) concave or indented."

It is not found everywhere in the North Coast Range. There are many fewer in the south than in the north. There seem to be almost none in Lake County and southern Sonoma County.

This type cannot be dated with desirable precision, but a beginning date of A.D.600 seems not unreasonable. Most scholars believe it to be found in Late Horizon, Phase I of the northern Sacramento Valley, making this beginning date reasonable. I know of no radiocarbon dates to confirm the A.D. 600 date, but analysis of three sites makes this seem likely.

The first of these is the well stratified site on Squaw Creek (CA-SHA-475) northeast of Redding. Clewett's sequence here shows the Gunther type (his Type I) as the last of his sequence, extending from the surface of the site down to the level of his first radiocarbon dat given as 1,110 ± 390 years before 1950 or about A.D. 840 (uncorrected). A single specimen is shown to occur deeper, but perhaps that can be disregarded.
Map 1. Sites and Areas Mentioned in Text
This nicely supports the beginning date of A.D. 600. This information is taken from Clewett's oral presentation (1977) and from photos he has kindly furnished.

Within the Coast Range itself we have a partial confirmation of this dating of the Cold Creek site (CA-MEN-584) in east central Mendocino County (Soule 1973). At this site there was a clear "Phase II" component (see section on Rattlesnake Corner-notched). The stratigraphic relationship between this latest phase and the Gunther points indicates that the latter were earlier but only slightly so. If, as seems reasonable, we begin the latest phase at A.D. 1500 or 1600, then the Gunther points can be dated from A.D. 600 to the historic period with plausibility, though without certainty.

The third site to be considered here is that of Gunther Island itself (CA-Hum-67). At this site there is a beginning date of 1050 ± 200 (Heizer and Elsasser 1964:35). The points from the site are illustrated by Hughes (1978:59).

These three sites constitute a reasonable basis for dating the type at least 1000 years before 1950 and make a beginning date of A.D. 500 or 600 quite plausible. There is no doubt that they were made up into historic times—many ethnographic arrows have these as points.

In the Warm Springs project in Sonoma County they are found only in our last phase which I date from A.D. 1500 or 1600. For this reason I am dating them later in the southern part of the region than in the north.

One of the Gunther series has received a different name in the Round Valley Project (Stewart and Fredrickson 1979). This is a smaller and lighter version called Round Valley Tanged. My guess is that this is the latest version of Gunther point and in Round Valley is contemporaneous with the Rattlesnake Corner-notched further south, that is its time range is A.D. 1500 or 1600 up to the present.

Rattlesnake Corner-notched

This name was originated by Stewart and Fredrickson (1979) and is taken from the present name for the island home of the SE Pomo (the town of Elem) where Harrington (1948) first described specimens of this sort. These are very small points, and they are not all actually corner-notched, some would better be called side-notched. This is the same point that Soule (1973:37) calls Rose Spring Corner-notched. There is some resemblance to the Rose Spring series (Heizer and Hester 1978:Fig. 4), although the latter typically is longer and narrower. One objection to the use of that term is there does not seem to be a continuous distribution between the North Coast Range and the Owens Valley. Also this type appears about
1,000 years later in the North Coast Range than in the Great Basin. For these reasons a local name is preferable. Soule's average dimensions for the category seem typical and are given here.

<table>
<thead>
<tr>
<th></th>
<th>Length</th>
<th>Width</th>
<th>Thickness</th>
<th>Weight</th>
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<tr>
<td>21 mm</td>
<td>13.8 mm</td>
<td>3.3 mm</td>
<td></td>
<td>1.0 gr</td>
</tr>
</tbody>
</table>

The geographic distribution of the type is centered in Lake County and seems roughly that given by Meighan (1955:Fig. 8) for his Clear Lake complex of which they form an element. A very few were found at the Willits site (CA-MEN-500). In the Round Valley Project (Stewart and Fredrickson 1979), only a single specimen was found, contrasting with the Warm Springs Project where they were abundant in the latest phase (Baumhoff and Orlins 1979). It would appear to be the case that in the south this is the dominant point type in the latest phase (since AD 1500 or 1600) along with a sprinkling of Gunther type specimens. In the north the Gunther type persists as the dominant point with only a sprinkling of the Rattlesnake type. In Yuki territory Gunther type may undergo the transition to Round Valley Tanged at this time.

Dating of this type is hazardous. It appears to be confined to the latest phase at Warm Springs. We have a series of four radiocarbon dates from that phase: 360 ± 100; <150; 330 ± 100; 380 ± 100. Thus, the earliest date is 1570. I have elsewhere speculated (Baumhoff 1981) that this phase begins about 1600. If so, this would be the beginning date for the point type. At other excavated sites where this type is present it is also clearly late. This is true at CA-MEN-584 (Soule 1973) and at CA-MEN-500 (Meighan 1955), but there are no radiocarbon dates there. It was found in abundance at CA-LAK-702 in east central Lake County (Jackson and Fredrickson 1978). Radiocarbon dates from this site (p. 94) are 435 ± 80, 270 ± 60, and <300. The first of these is the earliest radiocarbon date associated with the type. Elsewhere the type is reported at Upper Lake (Moratto 1973) and Indian Valley (Orlins 1971).

It might have been preferable to separate the side-notched and corner-notched varieties of this type. I have not done so because (a) they grade into one another on a continuum and (b) they appear to be identical in time and space.

**Excelsior**

This is a leaf shaped or lanceolate point first named by Fredrickson from a valley near the southeast end of Clear Lake where he found them at the Houx Site (CA-LAK-261). Fredrickson said "The defining characteristics are a triangular straight-edge body and a convex base, which is frequently ogival in outline; this is, it resembles a pointed arch" (Fredrickson
The size of these points is variable. There are two large collections available for measurement, one from the south end of Clear Lake from CA-LAK-261 and CA-LAK-510 (Fredrickson 1973 and White and Fredrickson 1981) and one from the Warm Springs project (Baumhoff and Orlins 1979). Length of specimen is the dimension most easily dealt with here. I present here the length of all specimens considered.

Warm Springs

2.3, 2.4, 2.4, 2.6, 2.6, 2.6, 3.2, 3.3, 3.5, 3.5, 3.6, 3.8, 3.9, 4.1, 4.3, 4.5
n = 16, mean = 3.28, σ = .7

CA-LAK-261

2.01, 2.2, 2.3, 3.9, 4.3, 4.4, 4.7, 4.9, 4.9, 5.2, 5.6, 6.2, 7.4, 7.9, 8.5, 9.5
n = 16, mean = 4.24, σ = 2.1

CA-LAK-510

4.3, 4.4, 5.2, 6.8, 6.9
n = 5, mean = 5.52, σ = 1.1

Both the CA-LAK-261 and the Warm Springs collections segregate into large and small at about 3 cm in length. Site CA-LAK-510 has no small specimens. The small points are all less than 3.5 gr in weight while the larger ones are heavier than 3.5 gr. According to the usual criterion then, the small ones are arrow points while the larger ones are for thrusting spears or atlatl darts. If we regroup length measurements according to these categories, we have the following.

Warm Springs

Small: n = 6, mean = 2.48, σ = 0.1
Large: n = 10, mean = 3.77, σ = 0.4

CA-LAK-261

Small: n = 3, mean = 2.17, σ = 0.1
Large: n = 13, mean = 5.05, σ = 1.7

CA-LAK-510

n = 5, mean = 5.52, σ = 1.1

This type of point is found most abundantly south of Clear Lake. Fredrickson (1973) indicates that it is an element of
the Berkeley Pattern and is frequently found around the San Francisco Bay between 2000 B.C. and A.D. 300. On the flanks of Clear Lake it is abundant at Warm Springs on the west and Indian Valley on the east. North of this it is less and less frequent. In discussing the Middle Eel, Jackson (1976:112) says "Lanceolate point forms from the Middle Eel Planning Unit (Fig. 8; Plate 18) are notable for their absence of Fredrickson's 'Excelsior' type (although the type is present at Men-500—see Plate 42 i and m)." Yet Jackson's own Figure 9, nos., 567, 893, 901, 981, and 984 seem clearly to be examples of the large Excelsior point.

However, if they are not absent, they are certainly scarce. This is also true for the Round Valley Project (Stewart and Fredrickson 1979:189-190) where they have 18 small and 10 large specimens. Greg White, the author of this section of the Round Valley report, is evidently uncertain as to whether all these should be included as Excelsior points. He notes that the small examples are late in time, presumably post A.D. 600, and are therefore chronologically distinct from "Fredrickson's southeastern Clear Lake-based Houx aspect of 1000 B.C. and A.D. 300." He is, of course, right about that, yet I believe they are the same type with a reduced size for use as an arrow point.

Elsewhere they are found at CA-MEN-500 near Willits. There appear to me to be 10 of these (Jackson 1976:Plate 41 i-p, 42 i, m), all of the large variety. At CA-MEN-584 Soule reports seven of these which he calls "Willow-leaf shaped (1973:40)" which are all of the large variety.

What are the dates for this series of points? Fredrickson (1973:Fig. 18) thought they began somewhat before 1000 B.C. White and Fredrickson now say (1981:VI-12), the Houx pattern may go back to "between 1000 and 500 B.C." Does this mean the point type is also that old? That would certainly seem to be the case at Warm Springs. We have the following series of dates for the Excelsior levels at CA-SON-556: 1105 ± 90; 1630 ± 100; 1820 ± 160; 1830 ± 100; 1900 ± 290; 2020 ± 180; 2110 ± 110; 2190 ± 400; 2300 ± 110; 2540 ± 100. For site CA-SON-547 we have two dates for the Excelsior Phase: 410 ± 80 and 2505 ± 160. It is my tentative conclusion that these last two dates bracket the use of Excelsior points at Warm Springs: 500 B.C. to A.D. 1600. It may very well be, as White suggests, that the small variety are later on the average.

How widely this dating scheme can be applied is not clear. My guess is that it can be applied as far north as Round Valley, but since the large form is not even clearly identified, this is quite speculative. At the southeast edge of Clear Lake, at Warm Springs and in Indian Valley, the Excelsior form is associated with a reworked biface industry and together these more-or-less define Fredrickson's Houx aspect. There is
no mention of this to the north. Therefore, if the Excelsior point occurs in the north, it occurs simply as a type, not a part of an assemblage or pattern.

One other dating note comes from site CA-SHA-475 on Squaw Creek (Clewett 1977). Clewett's Type 6 would seem to be a variant of the Excelsior point. However, it is apparently much older there—about 3000 B.C. to A.D. 1. The specimens seen from there are actually more like those south of Clear Lake than they are like the ones in Mendocino County, nearby. In view of this, as well as the time discrepancy, it seems best to leave these out of consideration for the present.

**Stemmed Points**

A notable North Coast Range projectile point was originally named the Borax Lake point by Harrington (1948:82) and has since been widely known as Borax Lake Widestem (Meighan and Haynes 1970:Fig. 4). Harrington's original description of them follows (1948:81):

"This is the type of dart-point characterized by a relatively long, broad, straight stem, medium to broad shoulders (often barbed), and a rather short blade with straight or slightly convex sides. One or both sides of the stem may show thinning flakes, and the base, usually square, may be concave. Occasionally the edges of the stem are ground smooth, ..."

Some writers distinguish specimens of this type which have basal thinning from those which do not and have devised the term Houx Widestem for those without (White and Fredrickson 1981:V-19). The same writers go on to say (V-21)

"an additional stemmed point from CA-LAK-510 (-611, Figure 34), though similar to some of the stemmed points of the Houx deposit at CA-LAK-261 (LAK-261, -679, -675, -1879, -1679, and -2201) in being contracting-stemmed and square-based, lacks the characteristic broad blade element and pronounced barbs which characterize Houx Widestem points. For these reasons, -611 is not classified here as a Houx Widestem. It is possible that future conceptualizations of the Houx Widestem may include the variations of form seen on points such as -611."

Elsewhere White and Fredrickson (1981:V-19) say "Fredrickson has proposed, on the basis of specimens from CA-LAK-261, that the Houx Widestem is 'possibly derived from the Wide-stem Borax Lake point' (1973:226)." They then go on to suggest as an alternative that it may be independent.
It will be seen from the above that we have several different forms and some contradictory notions about them. Here I will define three forms.

1. Square stem with basal thinning. This clearly conforms to part of Harrington's definition above. These are not numerous but are widely scattered over the North Coast Range. They are evidently the earliest of these forms. Proposed name: Borax Lake Widestem.

2. Square stem without basal thinning. When these are serrated, White and Fredrickson call them Houx Widestem. These may also be typological variants of other square stem points in the North Coast Range. Proposed name: Houx Square-stem.

3. Contracting stem. These are not mentioned by Harrington, but from the CA-LAK-510 and -261 evidence quoted above, it is clear that this form is also present in the Late Borax Lake and Early Houx context. They are generally longer and narrower than 1 or 2 above. Proposed name: Houx Contracting-stem.

The dating of these forms is especially difficult. I presume the earliest form is the basally thinned Borax Lake Widestem. There is no good stratigraphic evidence, but the technique of basal thinning (and also edge grinding) is so much like that practiced on the Clovis-like points from Borax Lake that it can scarcely be unrelated. The evidence of obsidian hydration as shown by Meighan and Haynes (1970:Fig. 4) indicates that it is just subsequent to the Clovis-like forms. Therefore, the date of 6000 to 4000 B.C. assigned by White et al. (1981) seems altogether acceptable for the southern part of our area.

If, as Fredrickson supposed, the Houx Square-stemmed form is derived from the Borax Lake Widestem, the former would run from about 4000 B.C. up until it was replaced by the Excelsior point at about 1000 B.C.

The Houx Contracting-stem point would appear to have been only a minor element in the South Clear Lake region. Elsewhere it seems to have been important. They are the dominant type in the Early Horizon of Central California (Heizer 1949: Figs. 12, 13). There they would presumably date about 2000 B.C. Thus to date them also at about 4000 to 1000 B.C. would not be out of line.

North of Clear Lake all three of these types are found sporadically. Both Houx Square-stem and Houx Contracting-stem points are found at Willits (CA-MEN-500) and at Cold Creek (CA-MEN-584) but in each case comprise only a minor part of the components. Elsewhere all three subtypes are reported from surveys and from individual sites.
The principal dating aid in the north comes from the Squaw Creek site (CA-SHA-475). Consideration of this material recalls a remark of Harrington's (1948:83) that "A number of Borax Lake points resemble a certain Pinto type, not only in chipping, but in form, ...". This is true also of the Squaw Creek collection. If we include the Pinto-like forms, then 4 of Clewett's (1977) point categories (types 11, 14, 15, and 16) are either in Borax Lake Widestem or Houx Square-stem groups and date from before 4500 B.C. to sometime after 2000 B.C. with the Pinto-like specimens being generally later than those having square stems. I cannot tell from the photographs whether or not the stemmed specimens have basal thinning. If we assume that the relationships are similar north and south, then in the north we could have Borax Lake Widestem from 5000 to 3000 B.C. and Houx Square-stem up to 1000 B.C.

Clewett's Type 8 seems to me to be Houx Contracting-stem and runs from about 3000 B.C. to a 1000 B.C.

We can summarize this as follows:

<table>
<thead>
<tr>
<th>South</th>
<th>North</th>
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<tbody>
<tr>
<td>Borax Lake Widestem</td>
<td>6000 to 4000 B.C.</td>
</tr>
<tr>
<td>Houx Square-stem</td>
<td>4000 to 1000 B.C.</td>
</tr>
<tr>
<td>Houx Contracting-stem</td>
<td>4000 to 1000 B.C.</td>
</tr>
</tbody>
</table>

Willits Side-notched

These are large points and usually crudely made, always of chert. They typically have convex bases although some may be flat as in Fig. 8d. They are found occasionally in the North Coast Range. At Warm Springs they are always in the pre-Excelsior phases, thus earlier than 5000 B.C. There are eight of these from CA-MEN-500 (Meighan 1955:Type 11, Jackson 1976:Plate 39 a-i). They are also found at CA-MEN-584 where Soule (1973) calls them Houx Expanding-stem. They occur both in Round Valley (Stewart and Fredrickson 1979:Figure 21, no. 57) and on the Middle Eel (Jackson 1976:Figure 4, nos. 10, 129, and 150), but they seem to be scarce in this northern part of the area. To judge from Clewett's photos they were not found on Squaw Creek.

The dating appears early--perhaps before 1000 B.C., but how much earlier they go is not possible to say.
Concave Base Points

Recently, there has been an attempt to inject some system into the analysis of concave based projectile points in the North Coast Range. To that end White et al. (1981) collected data on 124 specimens from Marin, Napa, Sonoma, Lake, and Mendocino Counties, and their investigations yield a division into 6 subtypes. The type generally is defined as un-notched, un-stemmed projectile points. They propose the following:

1. If they are less than 3.5 grams in weight, they are called **Small**. All other subtypes weigh more than this.

2. If they are greater than 2.5 cm in width, they are called **Wide**. All others have narrower width.

3. If the base is indented more than 5.5 mm, they are called **Deep Base**.

4. If they are shouldered, they are called **Shallow Base Shouldered**.

5. If not shouldered and if maximum width is more than 1.9 times basal width, they are called **Shallow Base Hipped**.

6. If neither 5 or 6, they are called **Shallow Base**.

The subtypes by county and material is as follows:

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<tbody>
<tr>
<td>Marin</td>
<td>2 obs.</td>
<td></td>
<td></td>
<td></td>
<td>1 obs.</td>
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<tr>
<td>Napa</td>
<td>13 obs.</td>
<td>3 obs.</td>
<td>1 obs.</td>
<td>5 obs.</td>
<td></td>
</tr>
<tr>
<td>Sonoma</td>
<td>14 obs.</td>
<td>6 obs.</td>
<td>1 cht.</td>
<td>3 cht.</td>
<td>2 obs.</td>
</tr>
<tr>
<td>Lake</td>
<td></td>
<td>6 obs.</td>
<td>2 cht.</td>
<td>6 cht.</td>
<td>7 obs.</td>
</tr>
<tr>
<td>Mendocino</td>
<td>18 cht.</td>
<td>2 cht.</td>
<td>1 cht.</td>
<td>14 cht.</td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td>18 cht.</td>
<td>29 obs.</td>
<td>6 obs.</td>
<td>9 obs.</td>
<td>8 obs.</td>
</tr>
<tr>
<td>Total</td>
<td>19 obs.</td>
<td>29 obs.</td>
<td>6 obs.</td>
<td>11 obs.</td>
<td>12 obs.</td>
</tr>
</tbody>
</table>

11
Thus, the Small specimens are all to the north (around Round Valley) and are almost all chert. The Wide specimens are all to the south and are all obsidian. The small collection of Deep Base type are all obsidian and all come from around Clear Lake. The Shallow Base subtypes are more variable as to both location and material.

They also did some sourcing and hydration readings on a total of 50 obsidian specimens.

<table>
<thead>
<tr>
<th>Obsidian Sources of Concave Base Points</th>
</tr>
</thead>
<tbody>
<tr>
<td>Napa</td>
</tr>
<tr>
<td>------</td>
</tr>
<tr>
<td>Wide</td>
</tr>
<tr>
<td>Deep Base</td>
</tr>
<tr>
<td>Should.</td>
</tr>
<tr>
<td>Hipped</td>
</tr>
<tr>
<td>Other</td>
</tr>
<tr>
<td>Total</td>
</tr>
</tbody>
</table>

They give the hydration readings from these as follows:

<table>
<thead>
<tr>
<th></th>
<th>N</th>
<th>R</th>
<th>X</th>
<th>σ</th>
</tr>
</thead>
<tbody>
<tr>
<td>Wide</td>
<td>9</td>
<td>1.4-6.4</td>
<td>3.6</td>
<td>1.1</td>
</tr>
<tr>
<td>Deep Base</td>
<td>4</td>
<td>3.5-6.7</td>
<td>5.0</td>
<td>1.2</td>
</tr>
<tr>
<td>Shallow Shoulder</td>
<td>4</td>
<td>2.0-4.9</td>
<td>3.4</td>
<td>1.2</td>
</tr>
<tr>
<td>Shallow Hipped</td>
<td>5</td>
<td>3.3-7.3</td>
<td>5.2</td>
<td>1.1</td>
</tr>
<tr>
<td>Shallow Base</td>
<td>16</td>
<td>3.5-6.7</td>
<td>4.6</td>
<td>1.1</td>
</tr>
</tbody>
</table>

They then analyse them stratigraphically and this combined with the hydration data suggests to them that the Shallow Base Hipped and Deep Base forms are earliest. These are succeeded by Wide, Shallow Base Shouldered and Shallow Base forms. Last comes the Small form. They are unable to give an estimate of the age of each form or subtype.

The stratigraphic and chronological situation as far as I know it, is as follows. At Warm Springs we have about 20 concave based points, none of the Wide subtype, a single one of the Small subtype, and one of the Deep Base subtype. The
remainder are of standard Shallow Base subtype. They are all of chert except the single Deep Base specimen which is of obsidian.

All but the single Small specimen and perhaps one curated specimen occur in components dating from about 2500 years ago. It is clear that they constitute an element of the pre-Excelsior period and were replaced by Excelsior points about 500 B.C. Thus, a date for these points of $3,690 \pm 130$ B.P. as suggested by White et al. (1981) is by no means out of the question.

Meighan and Haynes (1970) did obsidian hydration determinations on concave based specimens from Borax Lake and got readings centering around 6 microns which would probably put them even earlier than the date given by White et al. (1981). Fredrickson (1973:191) dates them 5000 to 3000 B.P., and this would still make perfectly good sense at the south end of Clear Lake. For Warm Springs we would bring the terminal date up to 2500 B.P. This also seems a reasonable guess for Indian Valley, but it is just a guess.

Fredrickson (1973:191) dates them 5000 to 3000 B.P., and this would still make perfectly good sense at the south end of Clear Lake. For Warm Springs we would bring the terminal date up to 2500 B.P. This also seems a reasonable guess for Indian Valley, but it is just a guess.

At Cold Creek Soule (1973) got only 3 of these points but indicates that they are stratigraphically early. At the Willits site Meighan (1955) reports 19 concave based points and White et al. (1981) assign them as follows: Small, 5 specimens; Shallow Base Shouldered, 2 specimens; Shallow Base Hipped, 1 specimen; and Shallow Base, 11 specimens. Presumably the 5 Small specimens are from Meighan's late component while the others are earlier.

Jackson in his Middle Eel report illustrates several concave base points and names them Mendocino Concave-base (1976:68). In terms of the White et al. classification he has both the Small and the Shallow Base subtypes (Fig. 3 and Plate 16g-h).

None of this helps to date them north of Clear Lake. I would furnish the following estimates:

<table>
<thead>
<tr>
<th></th>
<th>South</th>
<th>North</th>
</tr>
</thead>
<tbody>
<tr>
<td>Large</td>
<td>3000 B.C. to 500 B.C.</td>
<td>3000 B.C. to A.D. 500</td>
</tr>
<tr>
<td>Small</td>
<td>almost nonexistant</td>
<td>A.D. 500 to historic times</td>
</tr>
</tbody>
</table>

I suggest we retain Jackson's term Mendocino Concave-base for the two subtypes of White et al. called Small and Shallow Base.

**McKee Uniface**

This is a new name proposed here for an artifact type which may or may not be a projectile point but which seems to
have been in use, where dated, for only a short period of time. It is a small, leaf-shaped "point" made on a blade (in European terminology). The blade is struck from a prepared core at the junction of two flake scars such that it often is triangular in cross section and is therefore said to be keeled. The keeled side is then retouched, and it may also be retouched in some instances on the flat side. Since the above is true, it might be better named keeled rather than uniface. In all cases that I know of they are small, 3 to 6 cm. in length, but because of thickness they can be fairly heavy, up to 8 grams. As I say, this may not be a projectile point but some other kind of tool. They are often called keeled scrapers.

I first became aware of this type more than 20 years ago from work done in northeast California (Baumhoff and Olmsted 1963, 1964). At the time I called these Cascade points after a Plateau type discussed by Butler (1961). This turned out to be a mistake because, although there may prove to be some kinship between the two types, Butler was talking about leaf-shaped points generally rather than a uniface; the Cascade point hasn't much potential for chronology. At the time I dated the uniface type about 4,000 years ago for that area and based on radiocarbon dates that still seems correct.

Elsewhere in the north they are clearly found at Squaw Creek (CA-SHA-475). Here Clewett's Type 5 is obviously the same thing, and this type has a radiocarbon date also right around 4,000 years ago (Clewett 1977).

A few years ago I encountered the same type again, this time in Humboldt County. A private collector visited the camp of Valerie Levulett, then teaching the U.C. Davis field school in the King Range, and he had fair number of specimens of this type. He had obtained them from a site in McKee's Flat (CA-HUM-405) on the Mattolle River just west of Garberville. Levulett subsequently tested the site, and she reports an early radiocarbon date from there at around 4,000 years ago (Levulett p.c.).

These three occurrences form a line running northeasterly across California from Point Delgada on the coast, through Shasta Lake, and onward into Modoc County with the same type and all 4,000 years old. Hence this is likely to be a useful type chronologically.

What about to the south of this? It seems to occur in Round Valley where Treganza et al. (1950:Plate 12i) list it as one of the "common types." In the Round Valley report of Stewart and Fredrickson (1979:Figure 16) only two are illustrated but more of them were included in the category.

South of this in Mendocino County they are also found at the Graves Cabin site (Flaherty 1981:Plate 2h and i), where they are identified as Keeled scrapers. One or two of the
Middle Eel specimens (Jackson 1976:Figure 12-813) may also represent this type.

I am quite certain that this type also can be found in the Harrington collection from Borax Lake (CA-LAK-36). Harrington says (1948:84) of his Willow-leaf type "Sometimes 'willow-leaves' are strengthened by a 'keel' or ridge on one or both sides. When the keel is on one side, the implement is often triangular in section, like a three-cornered file." These are evidently the same type although they may be slightly larger. The one shown here (Fig. 10a) is the smallest one illustrated by Harrington, and it is about 7.5 cm long. It is hard to tell how old it is at Borax Lake. The "bipointed point" cut by Meighan and Haynes (1970:Fig. 4) may have been one. It had a hydration reading of 6 microns or more-or-less intermediate in time. A date of 4,000 years would not fit this badly.

This may also be the same type that Heizer (1949:Fig. 11g and k) illustrates from the Early Horizon although I cannot tell whether his are unifaced. The one shown in Fig. 11k is almost identical to Harrington (1949:Plate xxb), and I have shown them both here (Fig. 10a, b). Again a 4,000 year date would be very reasonable.

I might add one more instance of this type which is in Redwood National Park at site CA-Hum-452. Here King and Bickel (1980:Figure 2) illustrate several examples. This comes from the earlier of two complexes that they identify there. On the basis of obsidian hydration readings they date this roughly 500 B.C. to A.D. 500. It might be even earlier than they think.

Altogether this seems a most satisfactory type for use as a time marker.

Other Types

I will further mention four projectile point types which are present in the North Coast Range for which the dating or attribution is doubtful but may ultimately prove to be useful chronological tools.

Desert Side-notched. It is debatable whether this type actually occurs in the North Coast Range. When I originally defined this type (Baumhoff and Byrne 1959) I was aware of similar specimens from Willits (Meighan 1955:Plate 42, 4A1, and 4B1) but excluded them on grounds of size. Some specimens almost certainly of the same type have now been recovered by Dr. Thomas Layton (p.c.) at a site at Albion on the Coast southwest of Willits. He finds them in contexts suggesting that they are several thousand years old so that they cannot possibly
be Desert Side-notched. On the Middle Eel Jackson (1976: Figure 3, top row) has recorded specimens which may be either Desert Side-notched or in the same category as the Willits-Layton specimens. A single dubious specimen has been recovered from Warm Springs (Baumhoff and Orlins 1979:Figure 28k). It would seem that Desert Side-notched is represented in the North Coast Range, if at all, at the most minimal level.

Mendocino Corner-notched. This type was given a name by Jackson (1976:111) and is illustrated in his collection in Figure 7, nos. 10 and 769. These are large, chert points with corner notches or expanding stems, which amounts to pretty much the same thing. I have a feeling they may grade into Willits side-notched points and, if so, might date similarly, say 1000 to 3000 B.C. The data are not abundant enough, however, to give one much confidence in that conclusion.

Leaf-shaped. There are a good many lanceolates found in the North Coast Range, but I am not confident in dating them. Very likely they will be found to go along fairly closely with the Excelsior point. In fact, the latter may be simply a variant of the general form.

Clovis. The large concave based point with fluting or basal thinning often called Clovis is, of course, well known in the North Coast Range from Harrington's (1948) excavation and later work by Meighan and Haynes (1970). This is no doubt a very ancient type, probably 10,000 years or so. It has not been thought necessary to include it here.

Summary

I present here a summary (Table 1) of the chronological relationships of 11 of the projectile point types outlined in the above and illustrated in Figures 1-10. For this purpose I have divided the area into north and south sections at about the north end of Clear Lake. It will be noted that dashed lines are shown in the north for Houx Square-stem, Houx Contracting-stem and Willits Side-notched. The reason for this is that the only stratigraphic radiocarbon dating we have for the north comes from Squaw Creek (CA-SHA-475) which is far outside the area of concern and therefore cannot be applied directly. Accordingly, although I feel certain these three types continue later in the north than they do in the south, I have no conclusive evidence of this and so indicate it with dashed lines.

The various types are found sometimes together and sometimes with a single type predominant. A notable example of the latter situation is that of the Excelsior point. In at least two major components in Warm Springs (CA-SON-556 and
Table 1. Chronological Relationship of Projectile Points

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<tbody>
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<td>6000</td>
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<td>2000</td>
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<td>1850</td>
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</table>
CA-SON-571) these occur in large numbers and almost exclusively. This appears to be true also at CA-LAK-261 near Lower Lake.

In the latest phase we find examples of both situations. In the south around Clear Lake we find almost exclusively Rattlesnake points while in the north they are mostly Gunther. In a central part of the area at Cold Creek (CA-MEN-584) there are many of both. A mysterious fact relative to this is that at Willits (CA-MEN-500), 20 miles northwest of Cold Creek where one would expect Gunther predominance, there are no Gunther points but a few good Rattlesnake points. One has the impression that the Gunther style is coming to the mountains from the Central Valley to the east rather than up the Eel River drainage from the north.

For most of these types the material from which they are made is that most available locally, either chert or obsidian with almost none of basalt, quartz, or slate. Thus most points in Mendocino County are of chert while those from the south end of Clear Lake are of obsidian.

In the Warm Springs area the situation changes over time. In the early phases the points, mostly Mendocino Concave-base and Willits Side-notched, are almost all chert. In the middle or Houx phases the points are almost all Excelsior points and almost all of obsidian. In the final phase most points are Rattlesnake Corner-notched and are about half and half chert and obsidian. It is perhaps worth while to mention here that when one has a site or component with Excelsior points predominant, and, if they are of obsidian, then one is almost certainly in Fredrickson's Houx aspect. As negative evidence one can note that at Willits (CA-MEN-500) there are points that one confidently assigns to the Excelsior category (Meighan 1955:Plate 4B), but here they are of chert and are clearly not part of a Houx complex. One feels certain that they are imitative, are made, if you will, by non-Houx people in contact with Houx people.

The foregoing constitutes a preliminary classification of the projectile points in the North Coast Range. Some of the types are well defined in form and firm in place and time. Others are more vague. For example, the Rattlesnake Corner-notched is quite variable as to form and its time-span is not clear everywhere. At the south end of Clear Lake sites of the Houx aspect have been dug (White and Fredrickson 1981) and very late sites have been dug (Jackson and Fredrickson 1978). As far as I known, no site with radiocarbon dates between A.D. 500 and 1000 has been excavated, and therefore we cannot tell what was happening at that period with respect to projectile points or anything else.
There are similar lacunae elsewhere. The whole of Mendocino County is lacking in material that can be dated confidently, and the eastern portion of the project, western Tehama, Glenn and Colusa Counties, need a great deal more data collection to define distributions and dating. The next phase of archaeology should bring advances in this respect.
Figure 1. Gunther

a. Sacramento Valley specimens. Jackson and Schultz 1975:Fig. 2. Presumably obsidian.

b. Obsidian. Warm Springs. CA-SON-593. Baumhoff and Orlins 1979:Fig. 24f.

c-e. Chert. East of Round Valley. Holson and Fredrickson 1981:Fig. 18.

c : 80-21-11.
e : 80-24-11.

f-k. Chert. Round Valley. Stewart and Fredrickson 1979: Fig. 18. f, g, and h are the subtype called Round Valley Tanged.

f : 3.
g : 4.
h : 5.
i : 1.
j : 2.
k : 9.

l-s. Chert. Middle Eel. Jackson 1976:Fig. 2. Presumably p-s correspond to Round Valley Tanged of Stewart and Fredrickson.

l : 980.
m : 983.
n : 185.
o : 790.
p : 3.
q : 557.
r : 569.
s : 972.
Figure 2. Rattlesnake Corner-notched

a. Chert. Middle Eel. Jackson 1976: Figure 4-897.

b. Obsidian. Warm Springs CA-SON-553. Baumhoff and Orlins 1979: Figure 26g.

c. Obsidian. Warm Springs CA-SON-551. Baumhoff and Orlins 1979: Figure 29f.

d. Obsidian. Warm Springs CA-SON-584. Baumhoff and Orlins 1979: Figure 25f.


g. Chert. Warm Springs CA-SON-555. Baumhoff and Orlins 1979: Figure 29b.

h. Chert. Warm Springs CA-SON-555. Baumhoff and Orlins 1979: Figure 29e.

i. Chert. Round Valley. Stewart and Fredrickson 1979: Figure 19-44.

j. Chert. Round Valley. Stewart and Fredrickson 1979: Figure 19-46.

k. Chert. Round Valley. Stewart and Fredrickson 1979: Figure 19-47.

l. Chert. Middle Eel. Jackson 1976: Figure 5-75-18-43.
Figure 2. Rattlesnake Corner-notched
Figure 3. Large Excelsior


b. Obsidian. CA-SON-576. Warm Springs. Baumhoff and Orlins 1979: Figure 25i.

c. Obsidian. CA-SON-582. Warm Springs. Baumhoff and Orlins 1979: Figure 24a.

d. Chert. CA-SON-556. Warm Springs. Baumhoff and Orlins 1979: Figure 27e.

e. Obsidian. CA-LAK-510. Lower Lake. White and Fredrickson 1981: Figure 35-418.

f. Obsidian. CA-LAK-510. Lower Lake. White and Fredrickson 1981: Figure 35-603.

g. Obsidian. CA-LAK-510. Lower Lake. White and Fredrickson 1981: Figure 35-490.

h. Chert. Middle Eel. Jackson 1976: Figure 9-984.

i. Chert. Middle Eel. Jackson 1976: Figure 9-567.

j. Chert. Middle Eel. Jackson 1967: Figure 9-901.
Figure 3. Large Excelsior
Figure 4. Small Excelsior

a-h. Round Valley. Stewart and Fredrickson 1979: Figure 16.

  a: 73
  b: 90
  c: 88
  d: 72
  e: 74
  f: 77
  g: 78
  h: 76

i-l. Warm Springs.

  i. Chert. Baumhoff and Orlins, 1979: Figure 25g.
  j. Chert. CA-SON-556.
  k. Chert. CA-SON-556
  l. Obsidian. CA-SON-556.
Figure 4. Small Excelsior
Figure 5. Borax Lake Widestem

a. Chert. Middle Eel. Jackson 1976: Figure 9-968.
b. Chert. Middle Eel. Jackson 1976: Figure 8-745.
c. Chert. Middle Eel. Jackson 1976: Figure 8-888.
d. Chert. Middle Eel. Jackson 1976: Figure 8-974.
e. Obsidian. Indian Valley. In U.C. Davis collections.
Figure 5. Borax Lake Widestem
Figure 6. Houx Square Stem

a. Obsidian. Lower Lake CA-LAK-510. White and Fredrickson 1981: Figure 34-616.

b. Obsidian. Lower Lake CA-LAK-510. White and Fredrickson 1981: Figure 34-435.

c. Obsidian. Lower Lake CA-LAK-510. White and Fredrickson 1981: Figure 34-506.

d. Obsidian. Lower Lake CA-LAK-510. White and Fredrickson 1981: Figure 34-694.

e. Chert. Round Valley CA-MEN-1469. Stewart and Fredrickson 1979: Figure 14-67.


g. Chert. Middle Eel. Jackson 1976: Figure 8-791.

h. Chert. Middle Eel. Jackson 1976: Figure 8-905.

i. Chert. Middle Eel. Jackson 1976: Figure 8-976.
Figure 6. Houx Square-stem
Figure 7. Houx Contracting-stem

a. Chert. Round Valley. Stewart and Fredrickson 1979: Figure 20-60.

b. Chert. Round Valley. Stewart and Fredrickson 1979: Figure 20-63.

c. Obsidian. Early Horizon. Heizer 1949: Figure 12m. 2/3 natural size.


f. Obsidian. Early Horizon. Heizer 1949: Figure 12n. 2/3 natural size.

g. Obsidian. Lower Lake CA-LAK-510. White and Fredrickson 1981: Figure 35-468.

h. Chert. Middle Eel. Jackson 1976: Figure 6-838.

i. Chert. Middle Eel. Jackson 1976: Figure 6-14.
Figure 7. Houx Contracting-stem
Figure 8. Willits Side-notched

All specimens chert.


c. Warm Springs CA-SON-559. Baumhoff and Orlins 1979: Figure 27i.

d. Warm Springs CA-SON-572. Baumhoff and Orlins 1979: Figure 23i.

e. Warm Springs CA-SON-556. U.C. Davis collections specimen 70-356-3093.

f. Warm Springs CA-SON-556. U.C. Davis collections specimen 70-556-2541.

g. Middle Eel. Jackson 1976: Figure 4-129.

h. Middle Eel. Jackson 1976: Figure 4-10.

i. Round Valley. Stewart and Fredrickson 1979: Figure 21-42.

j. Round Valley. Stewart and Fredrickson 1978: Figure 21-57.

k. Round Valley. Stewart and Fredrickson 1979: Figure 21-40.

l. Round Valley. Stewart and Fredrickson 1979: Figure 21-58.
Figure 8. Willits Side-notched
Figure 9. Mendocino Concave-base

All chert

c. Warm Springs CA-SON-559. Baumhoff and Orlins 1979: Figure 27h.
d. Lower Lake CA-LAK-510. White and Fredrickson 1981: Figure 37-649.
e. Round Valley. Stewart and Fredrickson 1979: Figure 15-102.
f. Warm Springs CA-SON-547. Baumhoff and Orlins 1979: Figure 28i.
g. Warm Springs CA-SON-556. Specimen number 70-556-2727, U.C. Davis collections.
h. Warm Springs CA-SON-556. Specimen number 70-556-3487, U.C. Davis collections.
i. Warm Springs CA-SON-544. Specimen number 70-544-636, U.C. Davis collections.
j. Warm Springs CA-SON-553. Specimen number 70-553-125, U.C. Davis collections.
k. Round Valley. Stewart and Fredrickson 1979: Figure 14-83. May be stem of Borax Lake Widestem.
Figure 9. Mendocino Concave-base
Figure 10. McKee Uniface

b. Obsidian. Early Horizon CA-SJO-56. Heizer 1949: Figure 11k. 2/3 actual size.
c. Chert. Round Valley. Stewart and Fredrickson 1979: Figure 16-79.
e. Chert. Middle Eel. Jackson 1976: Figure 12-813.
i. Chert. Round Valley. Stewart and Fredrickson 1979: Figure 16-79.
j. Chert. Middle Eel. Jackson 1976: Figure 12-858.
Figure 10. McKee Uniface
REFERENCES CITED

Baumhoff, M. A.

Baumhoff, Martin A. and Robert I. Orlins
1976 An Archaeological Assay on Dry Creek, Sonoma County, California. Contributions of the University of California Archaeological Research Facility No. 40.

Baumhoff, M. A. and J. S. Byrne

Baumhoff, M. A. and D. L. Olmsted

Butler, B. Robert

Clewett, Edward
1977 Squaw Creek: A Multi-Component Site in Shasta County. Paper read at Davis, California.

Flaherty, Jay M.

Fredrickson, David A.
1973 Early Cultures of the North Coast Range, California. Ph.D. dissertation on file at Department of Anthropology, University of California, Davis.

Harrington, M. R.

Heizer, Robert F. and Thomas R. Hester
Heizer, R. F. and A. B. Elsasser
1964 Archaeology of Hum-67, the Gunther Island Site in Humboldt Bay, California. University of California Archaeological Survey Reports, No. 62:5-122.

Heizer, R. F.

Holston, John and David A. Fredrickson

Hughes, Richard E.

Jackson, Robert J. and David A. Fredrickson

Jackson, Thomas L.

Jackson, Thomas L. and Peter D. Schulz

King, Ann G. and Polly McW. Bickel

Loud, L. L.

Meighan, C. W.

Meighan, Clement W. and C. Vance Haynes
Moratto, Michael J.
1973 Sam Alley: Excavations at 4-LAK-305 Near Upper Lake, California. *Treganza Anthropology Museum Papers* No. 11.

Orlins, Robert I.

Soule, William E.
1973 Archaeological Investigations at MEN-584, Mendocino County, California. M.A. Thesis, California State University, Sacramento.

Stewart, Suzanne B. and David A. Fredrickson

Treganza, Adan E.
1958 Salvage Archaeology in the Trinity Reservoir Area, Northern California. *University of California Archaeological Survey Report* 43.

Treganza, A. E., C. E. Smith and W. D. Weymouth

White, Greg, and D. A. Fredrickson

White, Greg, Terry Jones, James Roscoe, and Lawrence Weigel
APPENDIX B
LINGUISTIC EVIDENCE CONCERNING POMO MIGRATIONS

by

D. L. Olmsted

Whistler (1980) has recently reopened the question of Pomo origins. His attempts to link historical linguistics with archaeology in the search for an answer are entirely laudable, though one may want to withhold judgment on particular points of detail.

Whistler's proposals may be summarized as two hypotheses about Pomo origins and migrations: First, the short-term, suggests possible movements of Pomo speakers after the group (or the ancestors of the group, the Proto-Pomo) had reached roughly its present location. Second, the long-term hypothesis suggests a possible route of migration for the Proto-Pomo as they approached and eventually occupied historical Pomo territory. We consider these separately below.

The Short-term Hypothesis

Investigators of the Pomo have split into three groups on the question of short-term migrations: 1) those who opt for a Russian-River point of dispersal and who see the NE, E and SE Pomo as having migrated to the east; 2) those who take the Clear Lake area to have been the point of dispersal and who therefore regard the Russian River group as having migrated west; and 3) those who take neither position. In the first group Whistler puts Powers, Kroeber and Webb, while to the second he assigns Oswalt, Halpern and himself. The third group includes all others, notably Barrett and McLendon.

Whistler first considers the evidence from plant names that may be reconstructed in Proto Pomo, basing his treatment on McLendon's published work (1973) and Oswalt's unpublished cognate sets. He is confident that "...the overall pattern implies that the Pomo have occupied the California foothill oak woodland for a long time, with access to chaparral and marshland communities." He sums up: "Unfortunately, however, it is difficult to find crucial floral differences between the Russian River and Clear Lake areas which might pin down a homeland more closely on the basis of plant terms." (pp. 9-10).

Whistler then turns to the terms for fish as likely to reveal differences between the Russian River, where salmon was an important resource, and the Clear Lake drainage, where salmon were quite rare and the main dependence was on blackfish and Sacramento perch. I assume that, since he had access to the best work (both published and unpublished), Whistler's data are as dependable as we are likely to have at present.
There are two problems presented by these data. One concerns the appearance in SE of /nxa/ 'salmon', a form apparently cognate with the Kashaya and Southern forms for 'salmon'. The other turns on the forms for 'blackfish', where Northern and Central retain sequences cognate with those of E and SE. These data are not in dispute, but it is possible to take exception to Whistler's interpretation of them. Devotees of the "Clear Lake origin hypothesis" can point with pride to the "retention" of apparently cognate forms for blackfish in N and C, though they must explain away the SE form for salmon. For advocates of the "Russian River origin hypothesis", the SE /nxa/ is a trump card, while the N and C words for blackfish are an embarrassment requiring explanation.

Let us first look at Whistler's interpretations. After noting that the terms for 'blackfish' are shared by E and SE, he says that it

"would still be possible to interpret the data as not requiring a Clear Lake homeland, but that would imply that E and SE form a group in contrast to the rest of Pomo, as Webb (1971) in fact maintained. However, the other Pomo linguists unite in agreeing that Eastern and Southeastern Pomo do not form a subgroup, based on the very different innovations in phonology, lexicon and grammatical structure in those two languages. If they are right then the application of Occam's razor leaves us with Clear Lake as the prime candidate for the Pomo homeland, on the evidence of the fish terms alone."

That is a curious statement, embodying a line of reasoning that seems faulty to me. First, the fact that E and SE share forms for 'blackfish' is only part of the evidence: N and C have them too. Second, if one assumed that Clear Lake was not the homeland, that would not imply that E and SE form a sub-group. They might simply have moved to Clear Lake without undergoing a period of common linguistic history, even as English and Africaans, both now transplanted in South Africa, do not form a sub-group within Germanic. So one may avoid the controversial question of Webb's sub-group. However, it is necessary to point out that Whistler's method of doing so is not convincing. After all, Webb's postulated sub-group was based on close argumentation concerning complex patterns of linguistic retention and innovation on the part of the Lake languages as opposed to the others. To refute that, it is necessary to come to grips with the evidence, not merely refer to "other Pomo linguists" who are not cited or quoted as refuting the hypothesis on linguistic grounds. Such argument from authority will simply not do. Even if we assume that they are right, it is not necessary to assume that there was a Proto-Lake, as pointed out above; Occam's razor is simply irrelevant in such a connection.
Whistler now goes on to take up the SE term for 'salmon':

"the Southeastern term for salmon seems to be cognitive with the Russian River term. That could be construed as evidence for a Russian River homeland. On the other hand, the term may be an early borrowing in Southeastern Pomo. It may even be possible that the word is a hold-over from a Pre-Proto-Pomo stage."

Of course, one cannot rule out the possibility of an early loan word into SE. And it is true, my colleague M.A. Baumhoff assures me, that there were occasionally salmon in Putah Creek, though they were certainly rare. However, the notion that "hold-over from a Pre-Proto-Pomo stage" as a way out is untenable. Hold-overs from Pre-Proto-Pomo are, quite simply, cognates. Unless, that is, we assume that Proto-Pomo speakers coined, at one fell swoop, all those words later to show up as cognates, eliminating all other material from the languages they were speaking at the time. Such an assumption runs counter to the dearest postulates of comparative linguistics. If we make no such assumption, we have to agree (by Whistler's favorite razor) that "holdovers" from the earlier stage that show up in widely-separated members of a language family and are characterized by regular phonemic correspondences are indistinguishable from cognates and, indeed, are what are usually defined as cognates.

So we are left with a SE cognate for salmon and N and C ones for blackfish. Actually the latter two, /sak'al/ and /saq'al/, respectively, are close enough to E /sa-xal/ to be suspected of being borrowings. Were there circumstances which might have permitted such borrowing (or retention, if they are cognates)? The ethnohistory and sociolinguistics of the situation suggest that there were. In the first place, the Northern Pomo territory extended to the shores of Clear Lake where they bordered the Eastern Pomo and used the same piscatorial resources, including the blackfish. Thus, retention of a cognate (or borrowing of the item) is easily explained. It would require explanation if the Northern Pomo had no term for blackfish. As for the Central Pomo, the term Whistler gives is said to have been "reconstructed by Oswalt". Does that mean it was not actually obtained from an informant? Be that as it may, there were ample opportunities for Central Pomo to borrow terms for Clear Lake fish.

There were a good many possibilities for language mixture as Barrett (1908) points out (p. 49). More than that, there was an event of potentially great importance for Central Pomo lexicography. It was described by Barrett some 38 years after it took place. It was a great ceremonial conclave, presumably of the Ghost Dance religion, which was situated within the
territory of Eastern Pomo at about 1870. Some 3000-4000 persons assembled and those from the west on the coast were particularly mentioned. Those people must have included substantial numbers of Central Pomo, whose territory is directly west and southwest of the lake, though not abutting on it, and extending to the coast. Many of these people stayed at the site for a year, during which time they had to eat. It is reasonable to assume that, in the absence of great quantities of stored food, they supported themselves on the main resources of their hosts, e.g. lake fish. That there were manifold opportunities in such a situation to borrow fish names from their hosts is evident. It is not impossible that such borrowings were reshaped in accordance with known correspondences between the two languages. It is possible, of course, that the same conclave might have served as an occasion for the introduction of a loan from the Russian River group into SE to designate salmon. It seems somewhat less likely, for two reasons: the word looks like a cognate of great time depth so that if it started as a recent loan, much more reshaping would have been required than in the case of E/ësa-xal/ to C/Baq'hal/; moreover, the participants were living off Lake fish, not salmon, so the frequency of words for the former must have been much greater than those for salmon. There is one other, admittedly weaker, point to be made: if a lexeme for 'salmon' were to have been borrowed into either of the Lake languages, it would have been much more likely to have been into Eastern, rather than Southeastern. After all, the Eastern speakers were in constant contact with the salmon-eating Northern Pomo and the great conclave was held in the middle of Eastern territory, so that more E than SE speakers would have been exposed to fish stories told by the Russian River anglers. Arguments from non-existent data are rightly considered weak, so this point can be no more than supportive.

In summary: it is a little easier to explain why words for Clear Lake fish might appear in N and C than it is to explain why a cognate for salmon might appear in SE (and not in E). It therefore seems that neither the plant nor the fish terms are decisive for choosing between Russian River and Clear Lake origin theories. If anything there may be a slight tilt toward the former, but, on balance, one is tempted to agree with McLendon that the data do not suggest that the Pomo were ever elsewhere than where they were at first contact. So much for the short-term hypothesis.

**The Long-term Hypothesis**

With respect to the long-term hypothesis, Whistler associates the appearance of "millingstone cultures" in Northern California with movements of prehistoric Hokan-speakers. He then continues:
"For the southern North Coast ranges, the early Borax Lake Pattern presumably represents a northern extension of a stream of movements by Hokan peoples from Southern California and/or the Great Basin starting ca. 7500 B.P., moving through the Central Valley and entering the Clear Lake area from the east or northeast by ca. 7000 years B.P."

The identification of prehistoric archaeological data with languages spoken in the recent period is of course, as Whistler knows, speculative. He then goes on to hypothesize Pomo migrations up Putah and Cache Creeks from the Sacramento Valley in much the same way that the Patwin moved some 5000 years later. While there is some evidence for Whistler's suggestions concerning the Penutian speakers, there is little or none for his speculations about Pre-Proto-Pomo movements. There is no reason at all, as far as I know, to assume that the Pomo migrated to their present territory from southern California. The Hokan phylum of languages, spread as it is from the Klamath and Pit Rivers of Northern California to the Pacific Coast of Central America, has not been investigated for a determination of its homeland as have Indo-European and Algonquian, for example. Since the various Hokan groups are well assimilated to the cultures of the surrounding societies in all the places where they have been found within historical times, it seems likely that their dispersion took place at a very early time and that therefore there has been much semantic change to adapt cognate items to local species of both plants and animals. In such circumstances, homeland studies of the usual type may not be definitive.

In such a setting, it is unclear why Whistler assumes the Pomo came from the south by way of the Central Valley. If one believes in the hypothesis that the New World was peopled from Siberia via the Bering land connection, it is simpler to assume that the Hokan peoples spread out from north to south. There must be especially strong evidence to make one assume that they first went south and then turned and migrated north. I see no such evidence for Whistler's long-term hypothesis and therefore am unable to accept it, pending further research.

1. An early attempt at this sort of investigation in California was Baumhoff and Olmsted (1963) and (1964).
References Cited

Barrett, Samuel A.
1908 The Ethnogeography of the Pomo and Neighboring Indians, UCPAAE 6. UC Press, Berkeley and Los Angeles.

Baumhoff, M.A. and D.L. Olmsted

McLendon, Sally

Webb, Nancy M.

Whistler, Kenneth W.