SUBSISTENCE, SETTLEMENT AND TRIBELET TERRITORIES ON THE EASTERN SAN FRANCISCO PENINSULA

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ABSTRACT

This paper[1] proposes one possible approach for investigating relationships between the locations of prehistoric sites and of contact-period tribelet territories. First, the general concept of tribelets is discussed, followed by the ethnohistoric record of Costanoan or Ohlone groups on the San Francisco Peninsula. After evaluating available data for prehistoric settlement patterns on the eastern Peninsula, based on 180 reported sites, comparisons are made between clusters of archaeological sites and probable tribelet locations. Subsistence data are summarized for several Late Period sites in the San Francisquito watershed, an area which may have been inhabited by from one to three separate tribelets. Apparent differences in subsistence strategies at these sites are discussed and are used to formulate preliminary hypotheses about relationships between the sites and tribelet areas within the watershed.

INTRODUCTION

A long-term goal of the San Francisquito Archaeological Project at Stanford is to understand the interrelationship of settlement patterns and subsistence strategies in the prehistoric Bay Area. This preliminary paper examines current evidence for settlement pattern and resource use at prehistoric sites on the eastern San Francisco Peninsula. While subsistence and settlement data may be used to test a broad range of hypotheses about San Francisco Bay Area prehistory, this paper will evaluate whether patterns of Late Period resource exploitation reflect territorial divisions similar to those of contact-period Costanoan tribelets on the Peninsula. If territories incorporated different microenvironments, and if territorial divisions limited access to resources, common local animal species would have been hunted in varying proportions, based on the total resource mix available within each territory. The same should be true for plant foods and lithic raw materials as well.

Determining the presence or absence of a given resource is a straightforward process, but evaluating relative abundance at different Peninsula sites is difficult due to varied excavation, analytical and reporting methods. Interpreting the results is complicated, potentially involving theories about mobility, subsistence and social organization. I employ two strategies in this preliminary paper. First, I compare prehistoric occupation site distribution on the eastern Peninsula with contact-period village and tribelet locations. Second, I focus on the San Francisquito watershed, and evaluate whether patterns of Late Period resource use at bayshore, middle-elevation and upland sites appear to correspond to contact-period tribelet locations.

Because resource proportions may reflect many factors in addition to territorial boundaries, it is important to recognize alternative explanations for the observed distributions of shellfish and vertebrate remains reported below. For example, with dating based on radiocarbon, "contemporaneous" sites may be separated by several hundred years' time; differing shellfish proportions may reflect creek channel shifting and changing bottom conditions during that time period. Varying proportions may also reflect dietary preference, rather than access to resources. Access may not have been strictly controlled by territoriality if resource rights were extended to kin groups or trading partners. Excavation sampling strategies and site formation processes may also explain apparent differences -- in proportions of shell and bone, or of remains of different sizes.

TRIBELETS

The San Francisco Peninsula lies within the region occupied at contact by the Costanoan or Ohlone Indians (Galván 1968; Kroeber 1925; Levy 1978). The Costanoan region, reaching from San Francisco and the Carquinez Straits 200 km south to Point Sur, was inhabited in 1770 by approximately fifty autonomous tribelets. At the time of European contact, the estimated total population for this 13,000-km^2 area was more than 10,000 individuals. At least 2,000 people -- ten or more tribelets -- inhabited territories on the Peninsula (Figure 1; see Levy 1978).

In using the term "tribelet" to describe contact-period Peninsula social organization, I follow Kroeber who first used the term in 1932 to replace his earlier concepts of "little tribe" and "village community" in central California (Kroeber 1925:830-831, 1932; Gifford and Kroeber 1939; see Slaymaker 1974 for discussion). Tribelets were independent polities consisting of 50 to 500 people who shared a common dialect, a political identity, and economic rights in the resources of a closely defended territory. Territories were small, averaging a few hundred km^2, and especially so on the Peninsula where the range was 60 to 120 km^2 (Milliken 1983). Settlement patterns varied greatly, but can be described as sedentary given that tribelet members shifted residence infrequently, and then between village sites located only a few km apart (Bocek 1990).

Territorial boundaries were well-known and were usually

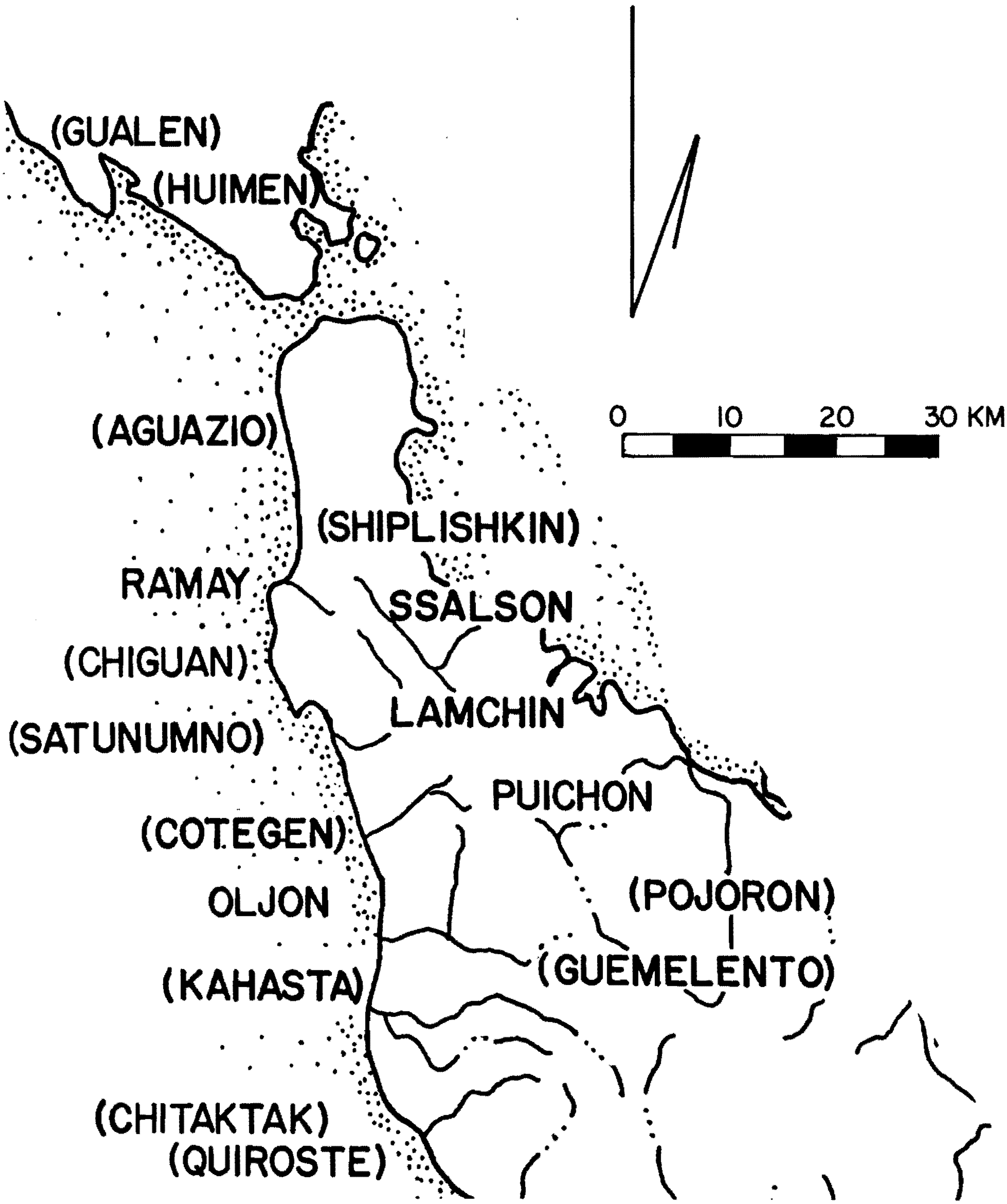

Figure 1. Map of the San Francisco Peninsula showing probable tribelet locations, after Levy (1978) and Milliken (1983). Names in parentheses indicate that sources disagree about location or tribelet status.

defined by watersheds or other natural features. Members of neighboring tribelets could seek permission to hunt or gather in another's territory; permission was usually granted. However, tribelet borders were taken seriously throughout native California, at least by contact times. Territorial infringement was the primary cause of intergroup conflict, and in addition, trespassing placed strangers at the mercy of foreign supernatural powers. "A rock or pool might be dangerous to strangers, though not to the residents of the territory..." (Kroeber 1962:57). Expecting human and supernatural reprisals, and enjoying sufficient local resources, people rarely ventured across tribelet boundaries except for trading, or for ceremonial or political gatherings.

Despite small area and population sizes, tribelets were fully autonomous and were the largest self-governing and land-owning units in central California. There is extensive documentation of ethnographic tribelets, but thus far, the antiquity of this form of political organization is unknown. Archaeological data indicate that social groups of equivalent size and complexity may have been present in central and southern California as early as three to four thousand years ago (Bean and King 1974; Chartkoff and Chartkoff 1984; King 1969; Ragir 1972). If the existence of tribelets or some equivalent form of sociopolitical organization could be confirmed for pre-contact times, this would provide a valuable model for archaeological data.

ETHNOGRAPHIC/ETHNOHISTORIC SOURCES

Three sources of written records are available for the Costanoan area, and these provide the basis for reconstructed tribelet territories. The earliest records date to the period of Spanish exploration, including the 1769 Portolá expedition and the Anza expeditions of 1774 and 1776 (Bolton 1930; Crespí 1927; Palóu 1926). For the second, or mission period (1776-1834), journals and church records are the primary sources, including mission registers and responses to questionnaires (for example, Duran and Fortuny 1958). The third group of sources, dating to the early 1900s, includes ethnographic or historic records based on work with surviving Costanoan informants (Barnes 1894, 1895; Harrington 1921-1938; Merriam 1966-1967).

Ethnographic analogy is a fourth potential source. Although this paper focuses on the San Francisco Bay Area, most detailed information about tribelet organization comes from studies of the Costanoans' northern and eastern neighbors. By the early 1800s, the Costanoan area had been thoroughly disrupted by the mission system, but in other parts of the state, extensive ethnographic studies were conducted more than 100 years later. For example, Barrett's (1908) Pomo ethnogeography was based on field research conducted between 1903 and 1906. Similarly, Dixon's (1905) study of the Maidu was based on 1899-1903 research. Two more recent models are provided by Bennyhoff's (1961) Plains Miwok ethnogeography, based on archival sources, and Slaymaker's (1974) Coast Miwok study, which relied heavily on ethnographic data from other central California groups.

It is clear that the available literature is incomplete, but in addition, it has serious limitations where settlement pattern reconstructions are concerned. Between 1776 and 1797, while seven missions were established in the Costanoan area, people moved or completely abandoned villages to avoid detection by missionaries. Disease and forced resettlement reduced the native population from 10,000+ in 1770 to below 2,000 in 1832 (Cook 1943). For the Peninsula, Brown (1974) and Milliken (1983), have made extensive use of mission records to reconstruct contact-period settlement patterns. But missionaries were working with unfamiliar languages, and native peoples often used one term for both a village and its occupants -- which were called different names by neighboring groups (see Bennyhoff 1961).

Incomplete and contradictory records notwithstanding, there is ample evidence to suggest that at contact, two or three tribelets may have shared the San Francisquito area in the southern Peninsula (Figure 2; Brown 1974; Milliken 1983). The Puichón tribelet apparently held lower San Francisquito Creek. Milliken (1983:92) suggests that the contact-period village of Ssiputca may be one of two destroyed mounds (possibly the Hiller Mound, SMA-160) near the bayshore in East Palo Alto. Milliken notes that the Puichón also held some of the upper watershed area although the exact location is unclear (1983:94, 97). Mission registers indicate that at least two other tribelets may have been associated with the San Francisquito headwaters. The names Guemelento and Olpén are mentioned as inhabiting the San Francisquito headwaters and the main tributaries, Los Trancos and Corte Madera Creeks.

The latter areas may not have included sufficient resources to support two tribelets (Milliken 1983:97-98). On the other hand, there may have been a dense population here at contact. San Francisquito Creek was described as a rich and well-populated area, chosen as the border between lands belonging to the missions at Santa Clara and San Francisco. The native population, along with the creek's resources, were heavily exploited by both missions (Hoover et al. 1966).

To understand how these possible tribelet locations might relate to the incidence of coastal resources, we must rely on ethnographic analogy regarding resource access. Some types of resources -- an oak grove, a seed-collecting area, a fish pond -- could be owned by individuals or by families. But more frequently, all tribelet members exploited local resources on a "first-come first-serve" basis as long as they lay within the traditionally recognized lands (Gifford 1923; Kelly 1932; Slaymaker 1974:43). For example, Barrett (1908:16-17) states clearly that in hunting, fishing, and food-gathering, each Pomo

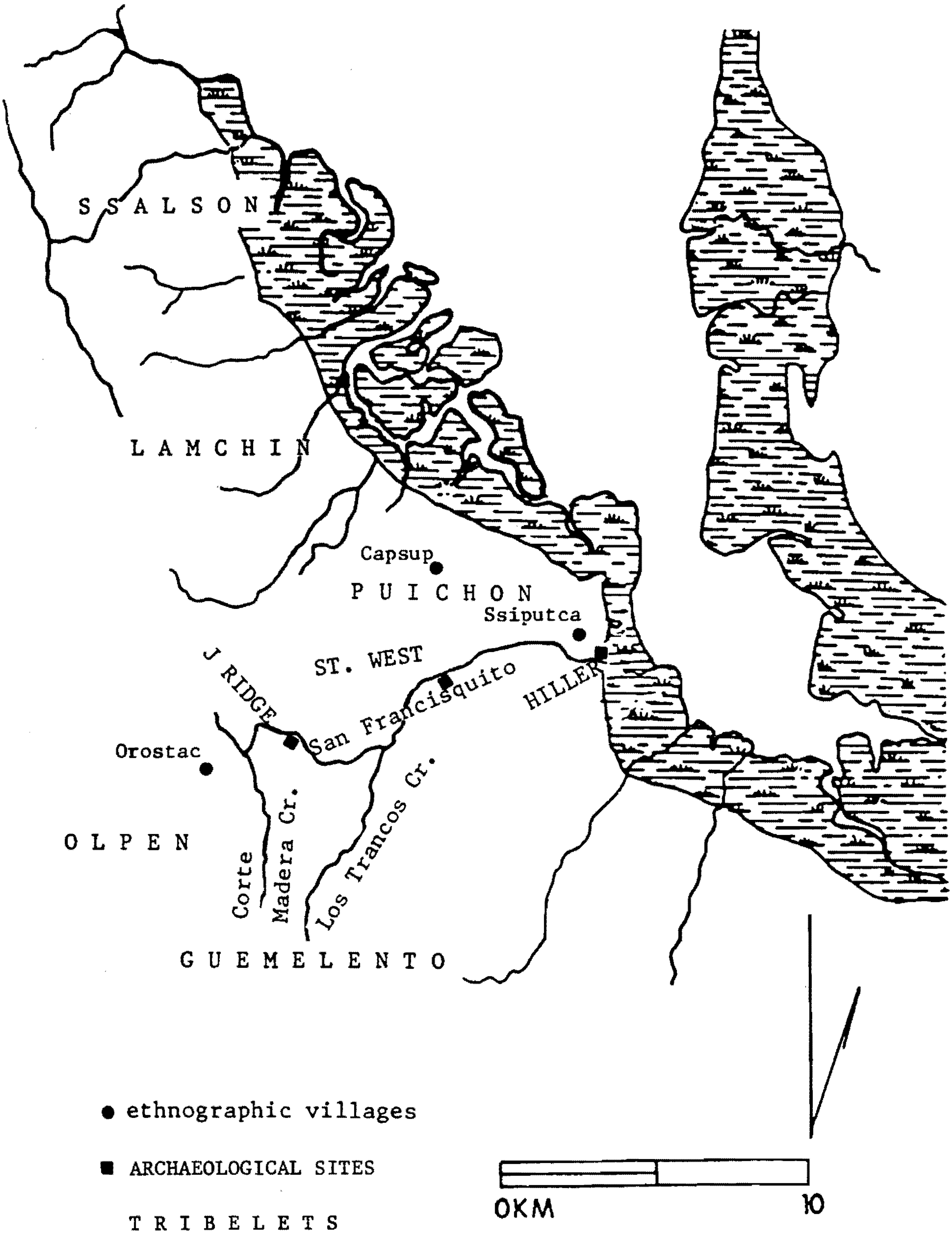

Figure 2. Map showing southeastern Peninsula tribelet locations, with selected contact-period villages and archaeological sites.

community confined itself strictly to the lands adjacent to its villages and permitted no trespassing by others. Thus a tribelet at the mouth of a creek on the San Francisco bayshore should have had greater access to coastal resources than a group based inland on the creek's upper tributaries.

ARCHAEOLOGICAL SOURCES

To investigate whether tribelet territoriality can be identified in the archaeological record of the eastern Peninsula, I have reviewed site records and excavation reports for east San Francisco County, northeast San Mateo County, and contiguous northern Santa Clara County, including all areas on the bayshore side of the Santa Cruz Mountains summit (Figure 3). Site locations for the San Francisquito watershed and adjacent areas are based on surveys confirmed by the author. Site locations well outside the watershed have been similarly confirmed but were based on data provided by the Northwest Information Center at Sonoma State University. In many cases, unpublished historical manuscripts provided additional detail on sites that were still intact in the early 1900s (for example, Hamilton 1936).

Nelson's (1909) shellmound study found that most mounds were located on the central and northern shores of the Bay. He attributed the South Bay shortage to lack of food -- specifically, the lack of rocky-littoral shellfish habitats in the South Bay's extensive salt marshes (Nelson 1909:330-331). Nelson identified only one site -- the Castro or Ponce Mound (SCL-1) -- in the mid-Peninsula area near San Francisquito Creek. No systematic survey of the entire Peninsula interior has been undertaken, but our records are increasingly complete as sites continue to be identified and recorded.

I had originally hoped to review excavation data from areas throughout the eastern Peninsula, but like the Castro Mound (see Barnes 1894; Beardsley 1954; Gifford 1916), most results have not yet been systematically reported. One recent exception is SFR-112, whose excavation is well documented by Pastron and Walsh (1988). Among four other bayshore sites are the Crocker Mound (SFR-7), excavated in 1910 by Nelson; the North San Francisco site (#417, by Nelson); and two mid-Peninsula sites, San Mateo (#372) and San Mateo Point (#418). Samples from the latter three are included in Gifford's (1916) midden analysis.

Inland sites from the eastern Peninsula include Filoli (SMA-125), a Late Phase 1 site excavated by Squires in 1935 and later by J. Dotta, who also worked at SMA-111 (Moratto and Singh 1971). Other than an analysis of the burials from SMA-125 (Galloway 1976) these sites have not been published. The San Bruno Mound (SMA-23), in the foothills on Crystal Springs Creek, was excavated in the early 1940s by Robert Drake (1948). In a brief summary of his results Drake describes some fascinating features of the site such as "masses of fish scales with fins and

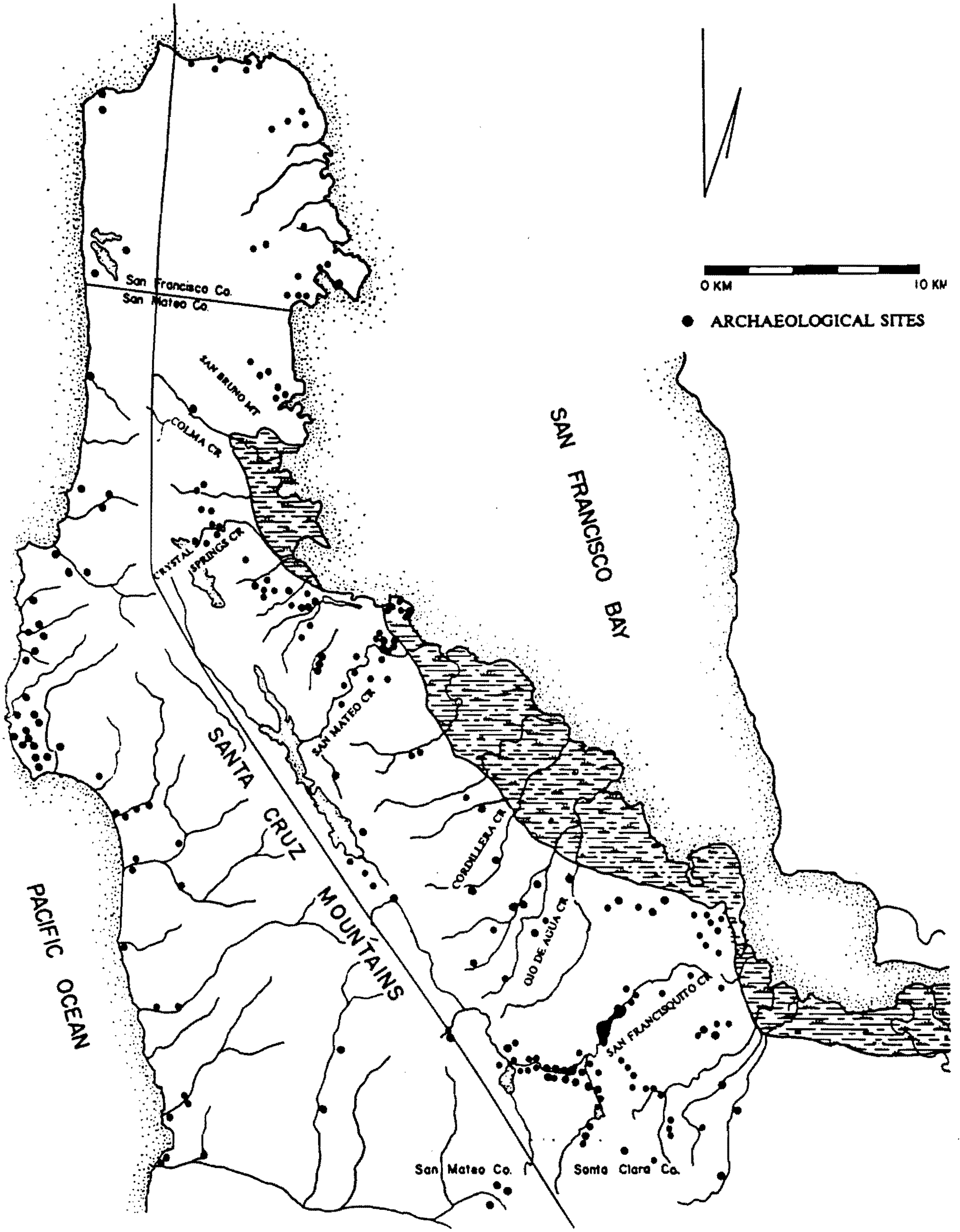

Figure 3. Map of the Peninsula, showing recorded archaeological sites as of October 1990 and major watersheds in the area east of the Santa Cruz Mountains summit.

backbones adhering to rocks from fire pits" (1948:320). He says that bird and mammal bones were numerous, but mentions no shellfish remains other than Haliotis and Olivella ornaments. These sites' recorded locations are useful for comparison with contact-period tribelet locations. However, except for Pastron and Walsh's thorough reporting of SFR-112, most available Peninsula excavation data are of limited use in assessing resource exploitation.

Because excavation data from the rest of the eastern Peninsula are scarce I chose to focus on San Francisquito Creek, at the border of Santa Clara and San Mateo Counties, for the coastal resource part of this study. As early as 1922, what archaeologists then referred to as "Indian signs" (Loud, in Heizer and McCown 1950) were noted here along the creekbanks. Archaeological discoveries continued to be made during the 1920s, 1930s, and 1940s (Caldwell 1949; Heizer and McCown 1950; Willis 1922). Also, during this period, several local citizens salvaged beads, mortars, charmstones, and other artifacts from construction projects and donated their collections to the Stanford Museum.

In retrospect, despite Nelson's reported lack of shellmounds in the South Bay, the number of inland finds should have suggested an early human presence in the eastern mid-Peninsula. Certainly Brown's (1974) and Milliken's (1983) research has since ascertained that numerous Ohlone or Costanoan villages were present in this area at contact. However, after Loud's early work at Castro, no excavation projects were undertaken in the mid-Peninsula region until the 1950s, when Bert Gerow joined the Anthropology Department at Stanford. In addition to University Village in 1951-1952 (Gerow with Force 1968), Gerow directed student excavations at several local sites between 1950 and the early 1970s. Elsewhere, site survey continued intermittently during the 1940s and 1950s with University of California researchers recording several local sites. Since the 1980s, San Francisquito research has continued under the direction of Stanford's Campus Archaeology Program.

EASTERN PENINSULA SITE DISTRIBUTION

Implicit in this paper are some assumptions about the Peninsula environment, presented in more detail elsewhere (Bocek 1987). Several conclusions relevant to the present paper may be drawn from this previous study. First, the eastern Peninsula can be divided into five environmental strata generally parallel to the bayshore (Figure 4). Second, local resources were sufficiently reliable, productive, and diverse to support a year-round, permanent tribelet-sized population on each major Peninsula watershed. Third, resource seasonality would encourage semi-annual residence shifts between lowlands and foothills. Finally, while tribelet organization could have existed long before European contact, settlement options would have been

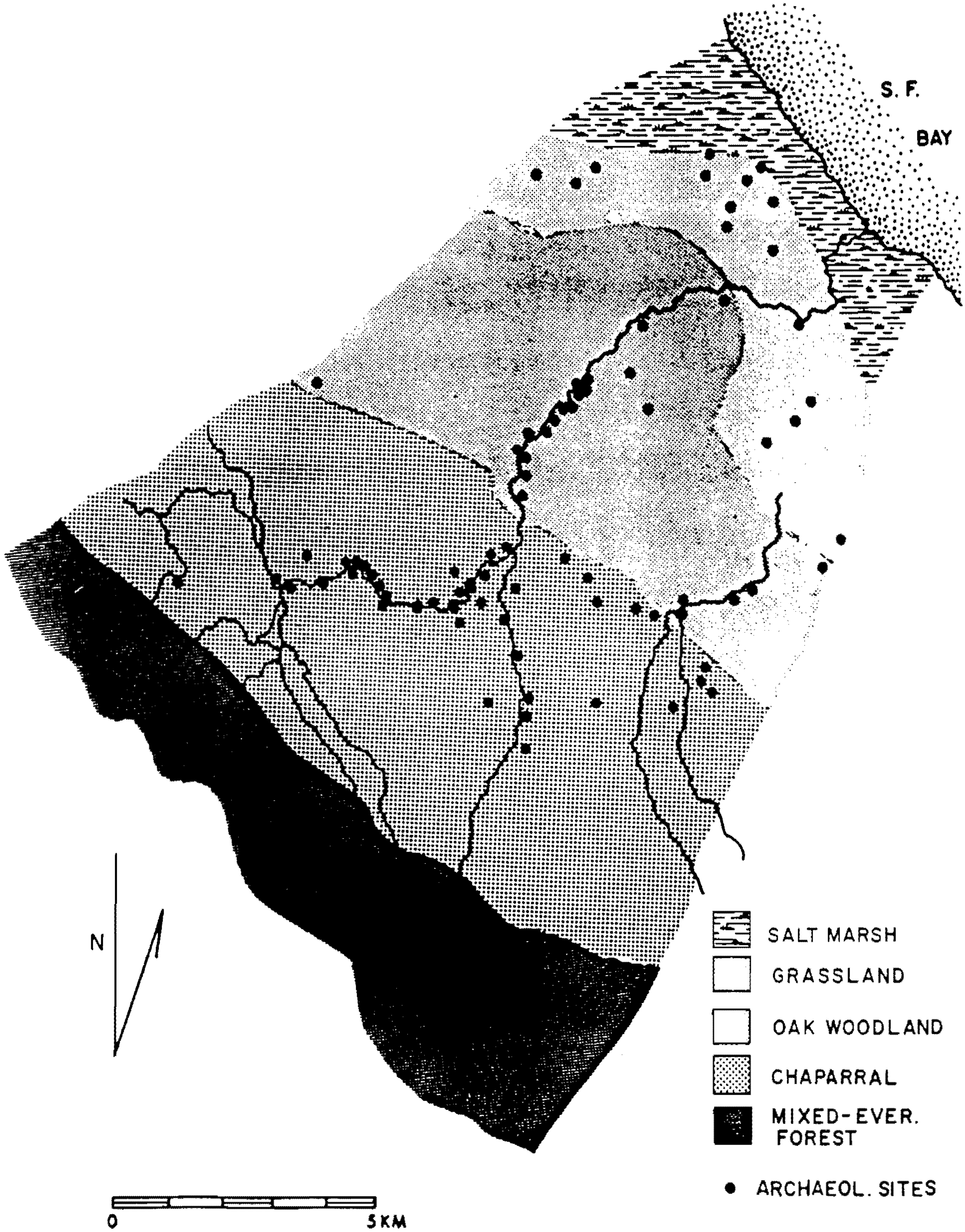

Figure 4. Map of the San Francisquito Creek watershed, showing recorded archaeological sites as well as tributary streams and environmental strata.

restricted by water availability, especially during the multi-year droughts typical of central California.

Any assessments of settlement pattern need to take into account the sources of survey bias associated with each of the Peninsula's environmental zones. The bayshore and adjacent grassland and oak woodland zones (elevations 0 to 50 meters) have been severely affected by modern development. The visibility of creekside sites in this elevation range has also been reduced by extensive alluvial deposition from creeks. At higher elevations, in the chaparral mosaic zone of the foothills (50-200 m) much of the mid-Peninsula is still relatively undeveloped, with large tracts used for grazing or agriculture. Also, there is less overbank deposition by creeks at upper elevations. Finally, the mixed-evergreen forest zone on the upper slopes of the Santa Cruz Mountains is steep and inaccessible. Huge areas are heavily forested and lack roads or even trails.

Despite incomplete survey data, several patterns emerge from the 180+ site locations shown in Figure 3. First, more than 75% are found within 100 m of a creek or former creek bed. Remaining occupation sites lie within a kilometer of the former bayshore (see Nichols and Wright 1971). Access to freshwater and salt-water products must have influenced the choice of village locations within the available territory.

Second and more surprising given records of high pre-contact population density is that many watersheds lack recorded archaeological sites. A southern Peninsula site group appears to be centered on San Francisquito Creek although the numerous sites here in part reflect intensive Stanford University investigations in this area. Immediately to the north, there are comparatively few sites in the Ojo de Agua and Cordillera watersheds. The next major site group is found in the mid-Peninsula area on San Mateo and Crystal Springs Creeks. Moving north, the Colma watershed appears almost uninhabited. One small site (SMA-299) on Colma Creek may be the remnant of a series of villages; "Colma Loam" was apparently mined from middens in this area and sold to local gardeners from the 1930s until the 1950s. Finally, at the northern tip of the Peninsula, there are small site groups on the north slope of San Bruno Mountain and at three points on the San Francisco shore.

A third observation compares the numbers of site groups and contact-period tribelets. Clearly, we will never be able to reestablish the boundaries of any specific tribelet territory. However, our two main sources for tribelet locations, Levy (1978) and Milliken (1983), concur on the general placement of three tribelets: the Puichón on lower San Francisquito Creek, the Lamchín in San Carlos along Pulgas and Cordillera Creeks, and the Ssalsón on San Mateo Creek.

The distribution of clusters of archaeological sites only partly corresponds to the ethnohistoric record for tribelet locations. For the archaeological sites in the northern Peninsula, no tribelet has been clearly identified. On San Mateo Creek there is clear evidence for multiple villages in what would have been the Ssalsón area at contact. Near Cordillera Creek, there are few sites although mission records definitely locate the Lamchín here. On San Francisquito Creek, numerous village sites have been recorded, while three tribelet territories may have existed within parts of the watershed. These inconsistencies may be dismissed as simply reflecting inadequate ethnohistoric or archaeological data. However, the correspondence between such data in the San Mateo and San Francisquito watersheds suggests that further research is needed in areas where sites have not yet been found.

In the San Francisquito watershed, intensive archaeological survey has identified approximately 90 sites (see Figure 4), of which 50 represent villages or probable village occupations. These are sites where size and contents imply intensive and repeated residential use. Specific criteria for occupation sites include the remains of houses, hearths and other features; associated cemetery areas; midden deposits at least a meter in depth; and surface areas greater than 4,000 m^2. Material remains include a range of functional types of flaked and ground stone tools, vertebrate and invertebrate dietary remains, exotic raw materials, and non-utilitarian artifacts.

The San Francisquito survey has identified occupation sites along the creek in all five previously mentioned environmental zones except the steep upper slopes of the Santa Cruz Mountains. Since site distribution is almost continuous along the creek bank, it is difficult to correlate groups of sites with one, two or three tribelet locations. There are major site concentrations in four places: along the bayshore; on the creek in the oak woodland at the base of the foothills; and on the creek in the chaparral zone in two different parts of the foothill region. Late Period sites from the bayshore, the oak woodland, and two from the foothills will be used to provide a comparison of site contents relevant to local resource use.

SAN FRANCISQUITO SITES

This section evaluates the role of certain resources within the San Francisquito watershed, using available data from Late Period components of the four sites described below. Excavation and analytical methods varied considerably between sites, but still allow limited comparisons to be made.

Hiller Mound (SMA-160)

The Hiller mound is located on the edge of the former bayshore in east Menlo Park. Gerow directed excavations totaling more than 200 m^2 at Hiller in the 1950s and in 1969, and more recently, Archeological Resource Management and other firms have done additional testing (for example, Cartier 1981). Cultural layers are at least 2.1 m deep. The central part of the site covers at least 8,000 m^2, where shell, flakes, and fire-cracked rock are present on the surface. Dispersed materials can be found throughout an area twice that size. Six radiocarbon dates range from 660 to 1,660 years ago. Overall the data available from ARM testing suggest that Hiller represents a major habitation site of the Late Middle through Late Phase I periods.

Stanford West (SCL-464)

SCL-464 is a large, stratified occupation site located on the inside curve of a deep bend in the creek, 6 km upstream from the Hiller Mound (Bocek 1988). The site's 28-m elevation places it within the oak woodland zone of the San Francisquito watershed. In the site's central area, there are high densities of shell, animal bone, and fire-cracked rock, especially in levels near the 1-m depth. At greater depths, overall density sharply decreases, but numerous features are preserved intact including the remains of three houses, an oven, and many hearths.

Total depth of the site is unknown. It is at least 3.3 m, as test excavations have reached that depth without encountering sterile soil. Ten radiocarbon dates range from 400 to 3,200 years ago, such that Stanford West spans part of the Early, Middle and Late periods of Bay Area prehistory. The site was excavated by Stanford University archaeologists between 1984 and 1989. Work started with a 1% random sample, and then a large centrally-located excavation of 5x12 m. Unpublished data from Transitional and Late levels, now in analysis, are used below to compare resource use with that of bayshore and foothill sites.

Jasper Ridge (SMA-204)

Both Jasper Ridge and the fourth site, SLAC 2, are located 6 km upstream from Stanford West on opposite sides of another deep bend in San Francisquito Creek. Jasper Ridge is another village site from Phase I of the Late Period, with radiocarbon dates averaging about 1,000 years ago. A randomly selected 1% sample of this 4,800-m^2 site was excavated in 1980-1982 (Bocek 1987), and data from these excavations are reproduced below.

SLAC 2 (SMA-256)

This site's total area is only about 1,540 m^2, but considerable area has probably been lost to erosion since the deposit now extends to the creek bank. An area of about 23 m^2 in the center of the site was excavated by Gerow and his students in 1973 and 1974. Materials recovered included animal bone, bay and ocean shellfish, Franciscan and Monterey banded chert flakes and tools, worked shell and bone artifacts. University archaeologists are currently investigating an additional 14 m^2 excavation at SLAC 2. Three radiocarbon samples have yielded dates ranging from 670 to 810 years ago; Late Period age is also indicated by Olivella bead types.

Density of Shellfish Remains

Within the San Francisquito watershed, bayshore site Hiller produced much more shell per m^3 than inland sites (see Table 1). This is predictable; however, we might also have expected the density of shell to decrease with distance from the bayshore. Our data conflict with this expectation because the foothill sites, farthest from the bay, contained more than twice as much shell per cubic meter as contemporaneous levels at Stanford West. The differences are too large to attribute to sample size or recovery methods alone.

Table 1. Comparison of shell density per unit[1].

	Hiller		St.West		SLAC 2	J. Ridge	
	min	max	avg	max	avg	avg	max
kg/m^3	6.30	14.34	0.34	0.64	2.39	1.16	1.44
sample m^3	0.70	1.10	1.30	1.50	1.20	1.20	3.00

[1]Lowest and highest densities from three 1x1-meter Hiller units; average and maximum densities per 1x1-meter unit at Stanford West; average densities per 1x2-meter unit at SLAC 2; average and maximum densities per 1x2-meter unit at Jasper Ridge.

In addition to density, an increase in shell weight relative to that of bone might reflect different dietary contributions from shellfish and vertebrate sources at bayshore and inland settlements. Table 2 shows total shell and bone weights recovered and the bone/shell ratios for all four sites. The ratios of bone to shell are much lower at Hiller; Stanford West and Jasper Ridge are identical in this respect.

Table 2. Comparison of total shell and bone weights.

	Hiller	St. West	J. Ridge	SLAC 2
	kg	kg	kg	kg
Bone Wt	0.8	12.2	10.4	3.4
Shell Wt	23.4	33.2	27.9	21.6
Bone/Shell	0.03	0.37	0.37	0.16
Volume m^3	2.80	42.60	50.60	8.50

Shellfish Species Representation

As suggested in the introduction to this paper, differences in shellfish species composition may reflect microenvironmental variation in the littoral habitats exploited by shellfish collectors from each site. Table 3 shows the list of species identified at Hiller, Stanford West, and Jasper Ridge, which was similar to SLAC 2. The most striking difference is between Hiller and the inland sites in terms of number of species. Except for Cerithidea, ubiquitous in South Bay sites, and Haliotis and Olivella, used for bead and ornament production, the Hiller invertebrate fauna is limited to bivalves. Common South Bay species predominate: native oysters and bay mussels in addition to horn snails, but the proportions are somewhat different (see Table 4, Figure 5). Other significant differences between Stanford West and Jasper Ridge are the proportions of boring clams, bent-nosed clams, and crab claws.

Since all four sites are Transitional or Late Phase I, shellfish of similar littoral habitats were present in the local environment. The different proportions of common species most likely represent differential access to particular collecting grounds. Other explanations exist, including dietary preference, site disturbance, or seasonality -- for example, if changing salinity or bottom conditions affected gathering efficiency of one or more species.

Bay vs. Ocean Shellfish

The foothill sites, about 12 km closer to the Pacific Ocean than bayshore sites, might be expected to contain greater amounts of shell from ocean species. As shown in Table 4 and Figure 5, Hiller did not contain any remains of ocean shellfish. At inland sites Stanford West and Jasper Ridge, about 10% of the shell is from ocean species, although the relative proportions of sea mussels and turban snails (the two major ocean shellfish) are very different. SLAC 2 contained relatively little ocean shell. Overall, these data seem to confirm that the inhabitants of bayshore sites had less frequent contact with the ocean coast, at least for shellfish-collecting purposes.

Vertebrate Species Representation

Because analysis of Stanford West and SLAC 2 vertebrate fauna is not yet complete, comparisons here will be limited to the relative abundance of elements of each identified species at Jasper Ridge, Stanford West and Hiller. Table 5 gives the percentage of identified elements for each taxa at each site; Table 6 and Figure 6 summarize these data. Only a partial list of species is available thus far for SLAC 2, but this will be expanded once current excavations are completed.

The major difference between Hiller, Stanford West and Jasper Ridge is in the proportion of bird bone. Birds comprise 28%, 5% and 2% of the total collections, respectively (see Figure 6). The vast majority of the Hiller Mound birds are waterfowl. Among these are many seasonal visitors, suggesting to faunal analysts Hall and Westbrook (in Cartier 1981) that the site was inhabited in the winter. The proportion of birds at Stanford

Table 3. Shellfish diversity at Hiller, Stanford West, and Jasper Ridge; total number of identified fragments.

Taxa[1]	Hiller	St. West	Jasper Ridge
--- ECHINODERMS			
Strongylocentrotus purpuratus (urchin)		0	5
--- MARINE SNAILS			
Haliotis rufescens (red abalone)		2	
H. cracherodii (black abalone)		4	
Undifferentiated abalone	*	176	60
Acmaeidae (limpets)			
Lottia gigantea (owl limpet)		2	13
Calliostoma (top snail)		0	2
Tegula brunnea (brown turban)			
T. funebralis (black turban)		111	358
Cerithidea californica (horn snail)	*	28099	10519
Crepidula sp. (slipper snail)		0	3
Muricacea (gastropod superfamily)		10	29
Olivella biplicata (purple olive)	*	46	26
--- BIVALVES			
Mytilus californianus (sea mussel)		7219	5606
M. edulis (bay mussel)	*	22363	24445
Ostrea lurida (native oyster)	*	137361	105743
Hinnites giganteus (rock scallop)		5	5
Clinocardium nuttallii (cockle)	*	81	62
Saxidomus sp. (butter clam)	*	19	10
Protothaca staminea (common littleneck)			
P. tenerrima (thin-shell littleneck)	*	2	31
Tresus sp. (gaper-clam)		4	13
Macoma nasuta (bent-nosed clam)	*	985	3728
Barnea subtruncata (mud piddock)			
Zirfaea pilsbryi (rough piddock)			
Parapholas californica (scaley pid.)	*	2830	1148
--- CHITONS			
Ischnochitonina (small chitons)		1	
Cryptochiton stelleri (giant chiton)		3	
Undifferentiated chitons		23	265
--- ARTHROPODS			
Balanomorpha (barnacle suborder)	*	558	395
Brachyura (true crabs; several taxa)		298	112
Freshwater clams (cf. Margaretifera)		0	6
Land snails	*	35	40
Unidentified fragments	*	19	89

[1]Taxonomic order follows Morris et al. 1980. Weights, not counts, available for Hiller; * indicates that species was present.

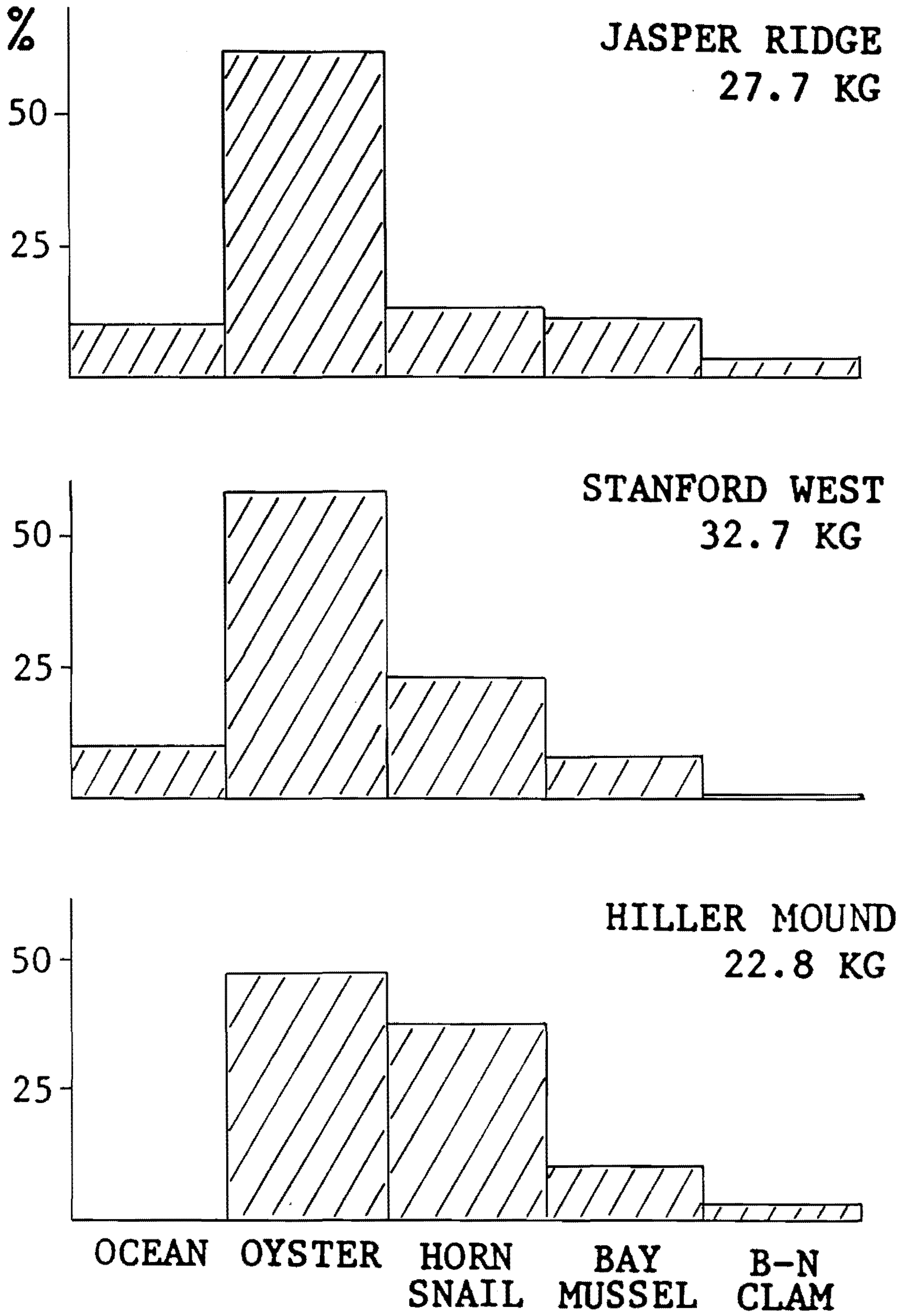

Figure 5. Graph of the percentage contribution by weight of the major shellfish species at Jasper Ridge, Stanford West and the Hiller Mound.

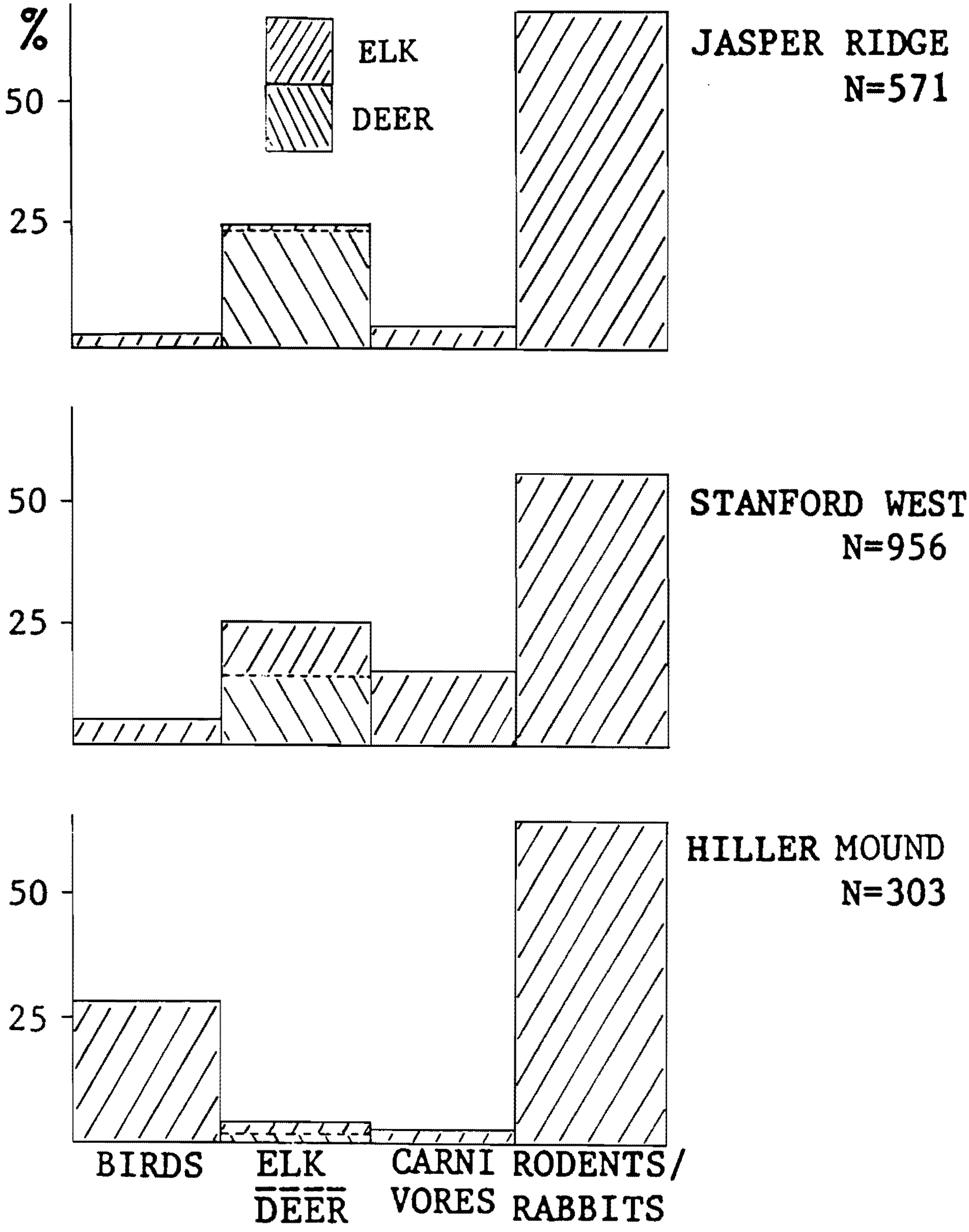

Figure 6. Graph of the percentage contribution by number of elements of birds, deer and elk, carnivores, and small mammals (rodents and rabbits) at Jasper Ridge, Stanford West, and the Hiller Mound.

Table 4. Predominant shellfish species, percent by weight.

Taxa	Hiller	St. West	SLAC 2	Jasper R.
Ostrea lurida	47.3	57.8	70.3	61.9
Cerithidea	37.2	23.3	11.3	12.8
Mytilus edulis	9.6	7.5	14.2	11.4
Macoma nasuta	3.1	0.7	1.5	3.0
Bay Spp. %	97.2	89.3	97.3	89.1
Ocean Species[1]	0	9.5	2.0	10.0
Other[2]	2.8	1.4	0.8	0.9
TOTAL Kg:	(23.4)	(33.2)	(21.6)	(27.9)

[1]Primarily M. californianus and Tegula, plus other marine snails
[2]Species not identifiable as exclusively bay- or ocean-dwellers

West is not significantly greater than at Jasper Ridge. However, among the Stanford West waterfowl are two winter visitors: the Canada goose (Branta canadensis) and the white-fronted goose (Anser albifrons). Similar evidence of winter occupation is totally lacking at Jasper Ridge.

Small mammals (insectivores, rabbits, and rodents) contribute similar proportions to the three sites except for the exceptional number of ground squirrel remains at Hiller. As is typical, there are more pocket gophers (Thomomys bottae) represented in all three sites than any of the species we consider to be game animals today. Few fish, amphibian, and reptile bones have been identified for the Hiller Mound. Scales identified as jacksmelt (Atherinopsis californiensis) or topsmelt (Atherinops affinis) have been found in one Hiller hearth feature as well as in features at the other sites discussed here. Stanford West and Jasper Ridge have strikingly similar fish faunas -- flat-bellied, bottom-feeding estuary species that are still common in the South Bay's shallow waters. Stanford West and Jasper Ridge reptiles are nearly all gopher snakes (Pituophis melanoleucens) with an occasional rattlesnake (Crotalus virdis) or pond turtle (Clemmys marmorata).

Because many small mammals live and die underground, dealing with their numbers -- and those of snakes, their predators -- is difficult. One way to evaluate whether animal bones are cultural or natural midden constituents is to compare the proportions that are burned (see Table 7). At both Stanford West and Jasper Ridge, small mammals had the lowest proportions (except for frogs at Stanford West). Reptiles and birds are second lowest and contrast significantly with deer and elk, carnivores, and fish.

For terrestrial carnivores, both Jasper Ridge and Hiller

Table 5. Vertebrate species - percentage by number of elements.[1]

Taxa	Hiller[2]	Stanford W.	Jasper Ridge
Acipenser (sturgeon)		(1)	(1)
Alopias (thresher shark)		(2)	
Atherinidae (smelt)[3]	*	*	*
Triakis (shark)		(2)	(3)
Mustelus (dogfish)		(2)	(3)
Myliobatis (bat ray)		8.2	4.1
Bony fishes - all		(4)	
Bufo (western toad)		(4)	
Rana (frog)		(3)	
Snakes - all		7.3	19.2
Clemmys (turtle)		2.2	3.1
Birds - unidentified		1.7	(6)
Anatidae (ducks)	22.4	(5)	(6)
Anser (goose)		(1)	
Ardea (heron)		(1)	
Aythya (duck)	0.3		
Branta (goose)		(3)	
Buteo (hawk)	0.7	(7)	
Butorides (heron)	0.7		
Callipepla (quail)	0.7	(5)	(2)
Chen (goose)	1.3		
Columbiformes (doves)		(1)	
Falconiformes (hawks)		(1)	
Larus (gull)	0.7		
Lunda (puffin)	0.3		
Melanitta (scoter)	0.3		
Passeriformes (songbirds)	0.3		(1)
Phalacrocorax (cormorant)		(1)	
Strigiformes (owls)		(1)	(1)
Tyto (barn owl)		(5)	
Scapanus (mole)		1.9	(7)
Lepus (jackrabbit)		1.5	(3)
Sylvilagus (rabbit)	7.9	4.4	7.4
Citellus (ground squirrel)	16.8	3.3	2.2
Mice - various	7.6	(3)	(8)
Neotoma (woodrat)	0.9	(5)	
Sciurus (grey squirrel)		2.2	(5)
Thomomys (gopher)	31.6	28.8	36.6
Canidae (dogs)	1.7	6.1	1.3
Lynx (bobcat)		1.6	(5)
Felis (mountain lion)		(6)	
Ursidae (bears)		2.2	(6)
Enhydra (sea otter)		(8)	
Mephitis (skunk)		(1)	
Mustela (weasel)		(1)	(1)
Procyon (raccoon)	0.7	(6)	
Taxidea (badger)	0.3	(1)	
Sea mammals - all		(3)	(4)
Cervidae - undet.		2.7	
Cervus (elk)	2.0	6.9	(7)
Odocoileus (deer)	2.0	11.9	17.2
TOTAL COUNTS:	(303)	(1123)	(784)

[1]Actual count indicated by (#) when percentage is less than 1.0
[2]Fish and snake bone not systematically identified at Hiller
[3]Scales identified as jacksmelt or topsmelt

Table 6. Summary data percentages of vertebrate remains.

	Hiller	St. West	Jasper Ridge
Birds	27.7%	5.0%	2.8%
Small Mammals	64.8	55.2	67.6
Carnivores	2.7	14.5	4.4
Ungulates	4.0	25.2	25.2
TOTAL COUNT:	303	956	571

Table 7. Percentage of bone which is burned.

	Stanford West	Jasper Ridge
Fish	71%	48%
Carnivore	37	30
Ungulate	35	29
Bird	15	13
Reptile	14	7
Sm. Mammal	7	2
Amphibian	0	--

have low total percentages comprised primarily of coyotes (Canis latrans) and/or domestic dogs (Canis familiaris). Stanford West has much more carnivore bone. While coyotes/dogs are the most numerous carnivores at Stanford West, black bears (Ursus americanus) and grizzlies (U. horribilis), bobcats (Lynx rufus), and mountain lions (Felis concolor) are more abundant here than at Jasper Ridge. This is somewhat surprising since we associate these animals more with foothill habitats than with open grasslands or the shores of the bay.

Sea mammals are very scarce in San Francisquito sites although they were definitely present in the bay this far south. Sea lions (Zalophus californicus), harbor seals (Phoca vitulina), and especially sea otters (Enhydra lutris) are well-represented at ALA-12, ALA-13 and ALA-328 (Whalen 1967), a few km across the bay from the Hiller Mound. At Hiller, no sea mammals were identified in the ARM sample. Sea otter bone has been mentioned by Gerow's students as an occasional occurrence in the Hiller midden although Hall and Westbrook (in Cartier 1981) note that none was recovered at the nearby Early Period site of University Village. Only eight sea otter elements were found at Stanford West; the other sea mammal remains were of the sea lion and of unidentified seals. Jasper Ridge had one fragment of fur seal bone (Callorhinus ursinus) and several unidentified sea mammal remains. The absence of sea mammals is not surprising at inland sites, but it seems unusual for the Hiller site on the bayshore.

Deer (Odocoileus hemionus) and elk (Cervus nannodes) are typically considered the large game sources in California's prehistoric diet. Greater proportions of elk remains might be expected at bayshore sites, and deer at upland sites, because elk prefer grassy bottom or marsh land to the woodland habitats favored by deer. Nearly all Jasper Ridge large mammals were identifiable as deer. Stanford West has elk and deer remains in what seems like a reasonable 3:5 ratio. However, the Hiller data are equivocal because only six elements of each were found. This small amount of ungulate remains is surprising especially considering that sea mammals are absent, as well. Hiller inhabitants could not have lived by birds (and ground squirrels) alone. In general, these data contrast with those of other researchers (for example, Simons 1990) who have found high proportions of marine mammal remains in Late Period bayshore sites.

Lithic Materials

Ocean shellfish proportions suggest that inhabitants of tribelets situated in the foothills were more involved with ocean coastal trade or travel than were people living on the bayshore. We might therefore expect more Monterey banded chert to be found in foothill than in bayshore sites. Monterey banded chert is only found along the Pacific Coast; a major source is located at Point Año Nuevo, about 40 km southwest of Jasper Ridge. Franciscan chert, on the other hand, is found throughout the hills of the Peninsula and is present in cobbles in the streams.

While the locally available Franciscan chert predominates at all sites, Monterey banded chert turned out to be much more abundant at Stanford West and SLAC 2 than at either Jasper Ridge or Hiller, where it was quite scarce (see Table 8). Clearly, different processes affected the use of ocean-coast food and non-food resources on the bayshore side of the Peninsula. Thus far, 232 samples of obsidian from Jasper Ridge, SLAC 2, Stanford West, and two other local sites have been sourced, both visually and by x-ray fluorescence. In each case approximately 80% of the samples originated at Napa Valley sources (Jackson 1987; Origer 1988-1990; Wilson 1990). The predominance of Napa sources is typical of San Francisco Bay Area sites, especially for Late Period contexts.

Table 8. Comparison of lithic raw material, percent by count (tools and flakes).

	Jasper Ridge		SLAC 2		St. West		Hiller
	T	F	T	F	T	F	T & F
Franciscan	85.0	91.8	57.6	80.3	67.5	79.0	91.8
Monterey B	7.6	7.6	18.2	18.7	21.0	17.6	5.3
Obsidian	7.4	0.6	24.2	0.9	11.5	3.4	2.9
Total Counts:	(456)	(7567)	(33)	(2882)	(461)	(8414)	(209)

CONCLUSIONS

Based on currently reported archaeological site locations, there were high densities of sites in two eastern Peninsula areas -- near San Mateo and San Francisquito Creeks. These groups of sites may represent the prehistoric record of two or more tribelets which occupied those territories at the time of contact. Outside of these areas, however, there is no clear relationship between ethnographic tribelet locations and groups of archaeological sites. As yet, there are insufficient data to confirm whether watersheds lacking recorded sites were actually uninhabited.

Ethnographic tribelet organization in central California was complex and highly variable. Therefore, investigations of prehistoric tribelets require archaeological data not only on site locations, but also on the chronology and contents of multiple sites within each supposed tribelet territory. The lack of systematic survey information for the Peninsula beyond San Francisquito Creek is currently a serious drawback, for which reason this paper must be considered a preliminary venture. One important conclusion has been to identify specific watersheds as crucial areas for continued research on possible tribelet locations.

Focusing on San Francisquito Creek, several lines of archaeological evidence support the ethnohistoric documentation for two or more tribelets in this watershed. Faunal remains from foothill, woodland, and bayshore sites tend to represent immediately local rather than watershed-wide resources, to the extent that these can be differentiated. Good examples are the different proportions of elk and deer at Stanford West and Jasper Ridge, or the waterfowl found at Hiller. Results so far demonstrate that additional bayshore faunal data are needed; a large sample from the Hiller Mound are now under study. Also, bay shellfish are present in much reduced quantities at the inland sites. Distinctive species compositions in bay shellfish suggest that inhabitants of contemporaneous inland and bayshore sites were foraging in different bayshore microenvironments.

Much higher proportions of Pacific Coast shellfish are found in the woodland and foothill sites. The bayshore may have been part of a separate settlement system; alternatively, shorter distances may simply have encouraged more frequent visiting between the Coast and the foothills. The low incidence of Monterey banded chert at Jasper Ridge is difficult to explain, especially given the high percentage at Stanford West and at SLAC 2. One possible explanation is that an as yet unidentified Franciscan chert source exists somewhere near Jasper Ridge, and that people used it instead of Monterey banded chert. Presently, the nearest known Franciscan chert sources are located on Palo Alto's Coyote Hill, which is somewhat closer to Stanford West than Jasper Ridge.

According to Milliken's (1983) reconstruction based on mission records, Hiller and Stanford West would be located within the Puichón tribelet territory, while Jasper Ridge and SLAC 2 would lie within that of the Guemelento or Olpén. The excavation data presented above are inadequate to confirm (or reject) this hypothesis. While some resource proportions tend to support the multiple-tribelet hypothesis for the San Francisquito watershed, one problem with this explanation is resource seasonality. It is difficult to imagine the watershed divided into separate territories in the foothills and on the bayshore, when seasonally complementary resources would have encouraged early occupants to exploit both areas at different times of the year.

In addition, while water is more reliably available in the foothills, the bayshore and woodland environments provide more food, more stable food supplies, and greatest food variety (Bocek 1987). Exchange or marriage relationships may have provided sufficient access to important food resources for foothill and bayshore tribelet members. However, droughts occur with unpredictable frequency and may continue for three or four years, during which time little or no running water is available below the foothills. Probably, tribelets would not restrict themselves to lowland areas where water was not reliably available throughout the year.

Earlier models of Bay Area subsistence and settlement have postulated seasonal movement between winter settlements on the bayshore and summer settlements in the foothills. For example, King (1974) proposed variations of this pattern for the Peninsula as well as the East and North Bay areas. King's model was based on ecological data and the relatively few site locations then reported. Now that many more sites have been recorded, it is clear that archaeological data -- like ethnohistoric tribelet locations -- do not easily fit a biannual seasonal model, at least on the Peninsula. Comparisons of the Peninsula with East and North Bay settlement strategies will be another important area for future research.

NOTE

1. A shorter version of this paper was presented at the 24th Annual Meeting of the Society for California Archaeology, Foster City, under the title "Coastal Influences in Prehistoric Resource Use on the Eastern San Francisco Peninsula".

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