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Department of Anthropology
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by

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Department of Anthropology
Berkeley

This publication is dedicated
with respect and gratitude
to the late Professor
Theodore D. McCown

EDITOR'S PREFACE

The present work is the unrevised doctoral dissertation of Zenon S. Pohorecky, now Professor of Anthropology at the University of Saskatchewan, Saskatoon, Canada. It was finished and filed in 1964.

Zenon took graduate work under my direction and carried out fieldwork in the Cosumnes River valley. When it came time for him to write his dissertation we decided that a general review of the archaeology of the south Coast Ranges would be a challenging topic. The Mnt-281/282 sites, excavated earlier first by myself and later by R.K. Beardsley, had never been reported, and this offered an opportunity to realize that desideratum.

I guided Zenon's initial analysis but while he was in the middle of his work I went to Europe for six months. Professor T.D. McCown kindly agreed to take my place as principal thesis advisor, and Zenon completed his dissertation under him.

While it would have been good to update the dissertation, now twelve years old, this has not been possible, and the reader will thus know that no findings made in the last dozen years are contained herein.

Robert F. Heizer

PREFACE

This study could not have come to a state of completion in 1964 without the assistance of numerous individuals and institutions, and I wish to acknowledge my indebtedness to at least a few of the major contributors. The Canada Council was generous in sponsoring material assistance for the year that it took to analyze and document the materials in this thesis. Also, a graduate student grant from the University of California Patent Fund made it possible for me to conduct field operations in the South Coast Ranges during December, 1963. This, in turn, made meaningful areal and chronological correlations possible, since the archaeological literature for these purposes is too limited to have been productive.

Professor R. F. Heizer, who discovered and excavated the key sites in this project (Mnt-281 and Mnt-282), also initiated this project and guided research between June, 1963 and January, 1964, revising 2 preliminary drafts. Professor T. D. McCowan devoted many hours to careful guidance during the spring semester, 1964. This has resulted in several major revisions, extensive reorganization of materials, and further development of fundamental points in this final version. Professor M. Baumhoff (Davis Campus) has added valuable comments, and Professor S. F. Cook has examined the manuscript.

Dr. James Bennyhoff helped to guide the study during its initial stages, while James T. Davis and Albert B. Elsasser have offered helpful information at various times during this research. Drs. K. P. Emory and Y. H. Sinoto of the Bishop Museum in Honolulu have corresponded with me regarding the problematical fish-hooks which occur in the South Coast Ranges and in Oceania. Clarence Ruth and Ernest Dalidio are 2 collectors who should be singled out for special mention, although there are others who have given freely of their time. Among these are Mrs. Hilda Hagne, Artifacts Chairman of the Monterey Historical Society, and Mrs. Jessie Plaskett of Salinas. At Gorda, near Willow Creek, I enjoyed the hospitality and help of Roland Chivers and Vina Frame. Added to these, at Salinas alone, might be Mr. and Mrs. Lawrence Vera, John Ward, John Williams, Mr. and Mrs. Ben Gerbrandt, Mrs. Lois Koolwyk, Louis Schneider, William Jeffery, and Chris Hall.

Mrs. Edna Flood of the Archaeological Research Facility at the University of California in Berkeley has been particularly accomodating in allowing me to refer to the voluminous records and to otherwise take advantage of the facilities in this office. Thanks are also due to Professor William Bascom for permitting me access to the archaeological collections from Willow Creek in the storage quarters of the Robert H. Lowie Museum of Anthropology in Berkeley.

Mr. Vernal L. Yadon, curator of the Pacific Grove Museum of Natural History in Monterey County, was cooperative in showing me his archaeological files and specimens, and the librarians at the Santa Barbara Museum of Natural History were very helpful in making available for my study certain materials under their jurisdiction.

To all of these, and many more, including my patient wife, Stephanie, who helped me check and recheck the more mechanical portions of this study, I extend my gratitude and hope of satisfying here.

CONTENTS

CHAPTER I

OBJECTIVES

The principal goal of this study is to describe the archaeology of the coastal and coast range mountains from Monterey Bay to San Luis Obispo and to relate the culture historical phenomena to that of other parts of California.

The realization of this goal will fill a gap in our knowledge of prehistoric California, since it is not yet clear whether this coastal area was a center for culture or a provincial reflection of the rich culture that was flourishing over a thousand years ago farther south in Santa Barbara County. The realization of this goal might also hint at some solution to the problem whether Playano was a distinct tribe, a visiting inland group or a fiction.

The Willow Creek sites Mnt-281 and Mnt-282 along the coast of southern Monterey County will be shown to be crucial to a solution of the major problems of the area. These sites are in a distinctive archaeological area, but the area is among the lesser known in California, because archaeological work farther south around Santa Barbara and farther north around San Francisco has been relatively more intensive than in the South Coast Ranges. The information here presented alleviates in part our uneven knowledge about prehistoric populations that lived on or visited this part of the California coast.

Clearly, however, the focus must be fixed on the small locale at the mouth of Willow Creek in Monterey County. An archaeological context for all subsequent correlations here occurs only at Willow Creek. A full description of all the evidence at Mnt-281 and Mnt-282 is included in Chapter III.

This is hitherto unpublished information about the 2 most important archaeological sites in the area, almost all excavated in 1951 and 1952 by 2 summer field classes of the Department of Anthropology, University of California, Berkeley. Prof. R.F. Heizer organized and supervised the students in 1951 and Prof. R.K. Beardsley continued this work in 1952. Two radiocarbon dates have already been derived from wood-charcoal samples obtained from the bottom of the buried site Mnt-282: 72 A.D. $\pm$ 250 years (Arnold and Libby, 1951: 111-120); and 112 A.D. $\pm$ 400 years (Libby, 1952: 673-681). However, to date, no report has been made available, aside from a few general observations by Heizer (1956: 3) who has noted that "the culture disclosed at site Mnt-282 shows significant connections with the Santa Barbara channel between 1800 and 1900 years ago." This is correct, but a more detailed statement is now possible.

Chapter III, then, is necessarily the longest, although much of the data are tabulated and illustrated in Appendices 1, 2, 3 and 4. This yields the basic data which are pivotal to areal correlations in Chapter IV and chronological correlations in Chapter V. Conclusions are summarized in Chapter VI. Relevant background information

is given in Chapter II.

The major goal, then, is to isolate some list of traits that may be unique to the Willow Creek sites, or shared with other regions, so that wider relationships can be documented in the clearest possible terms. Generalized reconstructions of the ecological patterns and tribal relations in the South Coast Ranges are attempted mainly in Chapter V, based on the archaeological context which is established in Chapter III, and on areal correlates established in Chapter IV. The plan has unity, with the more interpretative aspects restricted mainly to the concluding Chapter VI, where it is clear that this research has at least 10 archaeological objectives:

1. To describe and analyze original data from 2 major archaeological sites in the Willow Creek vicinity of Monterey County, namely Mnt-281 and Mnt-282, so that a chronological and cultural context might be set up for the areal and temporal correlation of artifacts, throughout the South Coast Ranges and nearby facies;

2. To correlate undocumented artifacts in private local collections within the South Coast Ranges with those archaeological contexts that emerge from both sites;

3. To correlate such a local chronology of cultures with those of nearby locales, or, where such chronologies may be inadequate, to use this local sequence as the cross-dating device for undated distant assemblages;

4. To select the most appropriate mode of analysis that can cope methodologically with the pecularities and problems which are implicit in the stratigraphic and artifactual data;

5. To employ ecological contexts as aids in identifying the functions of problematical artifacts;

6. To suggest at least a tentative reconstruction of an areal sequence which would reflect the ranges of the cultural influences whose home-bases can be fixed in the southern or northern parts of this coastal area;

7. To argue, on the basis of our limited evidence, that the orientation of burials in this area might relate to the location of a group's home-base, particularly since transhumance seems to characterize the region;

8. To check the archaeological reconstruction of events in this area against the ethnological record, and if incongruities emerge, then to check the ethnology as well as the archaeology, since there is no reason to assume <u>a priori</u> that either is superior to the other;

9. To refer to ethnohistory and natural setting in this mountainous coastal region in order to infer how the aborigines could have moved within this area and how

they could not have moved in their quest for abalone shells, because physical barriers and trade barriers could impose significant limitations upon movements;

10. To trace trait distributions to more distant areas, with suggestions for further study.

CHAPTER II

BACKGROUND

Most of this background information has been tabulated, mapped or illustrated in the appendices. What is presented here is a summary of those salient features which are needed for a meaningful areal correlation of cultural elements with a chronological context. This context emerges in Chapter III from an anlysis of the archaeological complex at Willow Creek, and the areal correlations follow in Chapter IV. Chronological correlations in Chapter V are associated with observations that can be appreciated best in terms of the following background information about natural features and ethnohistorical facts. The actual archaeological background of the entire area has been incorporated into the concluding Chapter VI where it may be appreciated best in the light of the preceding analyses.

Natural Features

Physical Relief

The South Coast Ranges have been classified by Fenneman (1928) as a subsection of the section known as Coast Ranges of California. These South Coast Ranges extend almost 60 miles inland from the Pacific Ocean between Point Sal in the south and San Francisco Bay in the north -- a distance of 200 miles. The area covers 12,000 square miles.

This rugged terrain is included generically within that Pacific Border Province which forms part of the extensive Pacific Mountain System. The altitudes of South Coast Range mountains average about 3 or 4,000 feet and some peaks attain elevations of 5 or 6,000 feet. These are generally about 8,000 feet lower than those which lie farther east beyond the California Trough section in the high snow-capped Sierra Nevada section of the huge towering Sierra Cascades Province.

Map 1 in the appendix indicates that physical relief is an important factor in deciding seasonal rainfall, some long distance trade routes used by natives, and tribal densities.

Climate

Temperatures rarely reach freezing point even on the highest peaks of the South Coast Ranges during the winter rains, so persistent ice or snow is virtually unknown here. Between December and February, downpours lash this coast, but the spacing is fairly regular -- about once a week and usually at night. During these 3 months, then, there appears to be a predictable pattern of rainfall.. Residents ready themselves for about 10 good downpours during the winter season. Each is expected to average 2 inches.

Dennoyer-Geppert (1958) records much annual rainfall for this area -- 10 to 20 inches. However, this is a record of winter precipitation, because little of this is evident during the 3 other seasons. The summers here are rainless, but they are neither dry nor hot, since the coastal fogs drift inland and add just enough humid shade to make outdoor activities both comfortable and pleasant.

Fogs usually lift by noon unveiling bright and clear skies during most of the year. Here, then, is a mild and predictable climate which varies little with the seasons. Aboriginal populations probably loved this gentle climate which supported an abundance of animals that remained in the region on a year-round basis, and rich plant resources which were accessible here during every season.

If this climate must have a name, then it may assume one from Koppen's scheme, namely, Mediterranean. Indeed, the plant life in this region has been called this so the climate which nourishes it may be Mediterranean. Russell (1926, 1931) and Thornthwaite (1931) have written much on California climate. Their data confirm our observations.

Flora and Fauna

Only those plants and animals which the aborigines saw fit to use and name may be noteworthy here. Ethnobotanical and ethnozoological lists for this area are incomplete and rare, but several of these for San Juan Costanoans in San Benito County and Migueleño-Salinans in San Luis Obispo County may be most relevant, so they have been tabulated in Appendix 1 (Tables 2,3,4) along with appropriate ethnographic footnotes. Major distributions are summarized in Map 2, so only a few general observations remain to be made regarding some ecological implications of the wild-life in this area.

Kroeber (1939: 206) is among the first anthropologists to have noted that this region provides a greater variety of wild-life food resources than may have been exploited by aborigines whose tastes were often influenced by tradition. So we should study the selected parts as well as the whole. A striking feature emerges. Two historically inland groups (San Juan Costanoans and Migueleño-Salinans) have native terms for marine mollusks which occur only on a rocky coast. These linguistic items suggest a likely relationship between inland groups and sites such as Willow Creek.

The list of recent works by botanists and zoologists, about the mammals, birds, fishes, mollusks, insects, trees, grasses, etc., would fill a fairly large library, even when restricted only to those works which deal specifically with California wild-life. Rather than embarrass the text with a mass of references, the volumes which may be most useful in identifying local species are set aside in the bibliography so that anyone wishing to pursue this farther may find some of those source materials which I have found to be helpful.

Ethnohistory

Table 1 and Map 3 provide most of the ethnographic data which are pertinent to this study.

Mason's ethnographic notes are not being ignored, since they do provide the main source of information about Salinan groups. Mason's notes have been footnotes in Tables 3 and 4 which have been cited already, because the tabulations focus on ethnobotanical and ethnozoological aspects of the Salinan groups in San Luis Obispo County. Harrington's ethnological list is tabulated in Table 1, and an abbreviated version has been tabulated in Table 5, where a few imperishable items of material culture are highlighted for archaeological studies.

Again, then, only some general summary statements need to be made about the 2 major tribal groupings which occupied the area around Willow Creek: Costanoans in the northerly portion, and Salinans in the southerly portion. Both are tribal entities which are well documented in the literature and present no such disturbing problems as do such entities as the "Playanos" (Spanish for "beach-people") who, if Merriam (Ms. map) is correct, were a distinct sub-group of the Salinan grouping. This problem is particularly relevant here, because both Willow Creek sites occur in this coastal strip which Merriam has allocated to the "Playanos" about which nothing is recorded, except that the early Spaniards noticed some aborigines on the beach and called them "Playanos."

Related to this, the ethnohistorical reality of the "Esselen" grouping might also be challenged, particularly in the light of Meighan's archaeological findings (1955), but it is not the purpose here to dignify such an issue with anything but a critical examination and evaluation of the available evidence, pending more convincing data.

In concluding this characterization of the Costanoan and Salinan groupings as well as an examination of the evidence for 2 rather minor groupings in this area, there is a brief discussion on the interdependence of ethnology and archaeology, since this will pertain to the rest of the thesis where reference will be made to "proto-Salinan" and "proto-Costanoan" influences in the archaeological record of the Willow Creek sites.

Salinans and Costanoans

There is a kind of general cultural homogeneity among all of the historic tribes in the South Coast Ranges. The essential unity is suggested even in Harrington's list of culture elements (1942), which is summarized in Table 1. At least 40 such culture elements are shared by both the Salinans and Costanoans, while each group is shown to have only 2 distinctive culture elements each: twined boiling baskets and prominence of female shamans characterize the Costanoans, while musical rasps and tule mats used as house-covers characterize the Salinans. Otherwise, if the lists compiled by Harrington (1942) are complete, there is very little to distinguish Salinans from

Costanoan except perhaps about 10 other culture elements which the Salinan groups shared with other southern tribes like the Chumash, Serrano and Gabrielino.

These 10 southern culture elements in the Salinan culture are: menstrual huts, grooved steatite arrow straighteners, sewn as well as twined tule mats, feather ornaments held in the hand during a dance, coiled basket caps for carrying loads, net-sack carried in hand, coiled boiling baskets, coiled baskets on hopper mortars, the use of nettles (Urtica) for string-making, and measuring beads around the hands.

Earlier accounts of the Salinan groups may be found in the works of Fages (1775), Cuesta (1821), Hale (1845-1853), Henshaw (1884), Kroeber (1908) and Perouse (n.d.). Yet the major monograph about Salinans has been written by Mason (1912) whose ethnographic findings are summarized in the footnotes of Tables 3 and 4. Taylor (1860a) has left an account of Salinan garb, while Ascension (1861) has noted balsa rafts among some coastal group around Willow Creek.

Ascension's use of the term "Playano" (in 1602) is the earliest that I have been able to trace. It may be this offhand reference to some "beach-people" (in Spanish) that led Merriam (Ms. map) to propose a distinctive Salinan subgroup. This seems plausible, especially since Merriam has even retained Ascension's Spanish term for such a group.

There is more information about the Salinan generally than about the Costanoans who are so far known mainly through the Mission Records, Kroeber's translation (1908) of a few of these Mission Records, and Harrington's (1942) informants. Merriam (Ms.), of course, has collected many word lists from Costanoan informants. One of these is tabulated in Table 2 (in the appendix). However, for the most part, these are unpublished field notes. Therefore, available information about Costanoans is even more limited than our documented information about the Salinans.

The prominence of women as shamans among the Costanoan groups is itself a feature which may loom very large in the general character of this tribal grouping vis á vis Salinan groups where women were not so prominent in ritual roles.

This feature, in addition to a completely different language, may have served as a kind of boundary-maintaining device by contributing to tensions between these tribes. Costanoans speak a language which has been grouped within the Penutian linguistic family, while Salinans and their southerly neighbors speak variants of a language which has been grouped within the Hokan linguistic family (Powell, 1861). However, the actual evidence for such strictly maintained tribal boundaries is largely negative, because there is no evidence at all for the Costanoans having had friendly trade relations with the neighboring Salinans.

On the other hand, there is an abundance of evidence for friendly trade relations between each of these tribes and their other neighbors. This documentary evidence

is to be summarized within this chapter, in a section that is entitled Tribal Relations, because it is an important observation which is relevant to an interpretation of the archaeology of the South Coast Ranges.

In summary, then, the ethnohistorical accounts of the Costanoan and the Salinan tribes indicate that the Salinan tribe shared more culture elements with southern neighbors (Chumash) than with northern ones (Costanoan). This is in spite of the essential cultural homogeneity characterizing the South Coast Ranges. Furthermore, the boundary between the Salinans and Costanoans marked a kind of trade barrier as will be documented more fully in another section here.

It should be emphasized that the boundary between the Costanoans and the Salinans is not visualized as a kind of political boundary, as has motivated power politics in the European continent. If a paralled must be drawn, then it may be with studies of infrahuman primates and their using home bases and home ranges. The boundary here seems to be peripheral to the home ranges of Costanoans and Salinans.

It appears reasonable to suggest that differences in language and in the ritual status of women in the shaman activities could have contributed to such strict boundary maintenance. Yet it is unlikely that these differences were actually instrumental in initiating any of the overt bodily conflict which will be shown to have occurred at the Willow Creek sites (according to burial pathology). It is more likely that such differences provided only the general atmosphere of inter-tribal tension. This tension might be triggered into conflict by issues regarding maybe territoriality or rights relating to natural resources.

Aboriginal Values on Mollusc Shells

So far, one of our themes has been focused upon the relationship between inland and coastal peoples. There is considerable ethnographic evidence that some groups may have alternated between some inland living sites and others on the coast. Whatever else may have drawn people to the coast, it is a reasonable inference that acquisition of valuable mollusc shells could have been among the prime motivations for such grueling treks over rugged terrain.

Kroeber (1908) records the use of shell beads as money which might accumulate interest when loaned out among those Migueleño-Salinans living 30 miles southeast of Willow Creek. Mission period records from Santa Cruz (translated by Kroeber, 1908) describe how the coastal Costanoans "paid" for their brides by using "snail shells" for matrimonial transactions, and how they made ritual offerings to their dead by interring an abundance of shell ornaments with the deceased. It is clear how prized such shells were within the South Coast Ranges.

The broad distribution of shell ornaments throughout California (Bennyhoff and Heizer, 1958) suggests that the shells were important and portable luxury items used for

long-distance inland trade. The motivation for trips to Willow Creek, then, may have been very strong, if these archaeological notes (and the ethnographic observations) accurately reflect how highly prized these shells were among the aborigines of California.

Playano Problem

Having suggested a probable motive, the next step is to determine who these visitors to Willow Creek and other coastal locations might have been. Mission period records from San Antonio (translated by Kroeber, 1908) are vague, but suggest that "some" Salinan groups were in the habit of visiting the coast occasionally. The account is not specific regarding tribal affiliation or the frequency of visits. It leaves undecided the question of whether these groups were Antoniaño-Salinan and whether the visits were regular or sporadic. The very vagueness may be significant.

Such vagueness suggests to me, at least, that the coastal strip around Willow Creek was not firmly claimed by the Antoniaño-Salinan as a portion of their territory. Otherwise, it seems to me that the account might be less vague about this crucial point here. In any case, the home bases of the Antoniaño-Salinan are all inland, and it is quite apparent that Willow Creek was peripheral to the home range of the Antoniaño-Salinans.

Reference to Mason's monograph (1912) indicated that the inland Salinans may have been the same people as those which have been called Playanos ("beach people") by such Spaniards as Ascension (1861) and later by such a linguist as Merriam (Ms. map). This reference does not specify the exact tribal affiliation, but it occurs in a context where some of the migratory movements of the Migueleño-Salinan group are discussed. This suggests, of course, that the Migueleño-Salinans might have been the so-called Playanos.

Such neat convergence of circumstantial ethnographic evidence is consistent with the idea advanced previously about how closely related the inland people were to this coast. Even a wary individual might feel tempted to concede that the Salinans and Playanos were the same people living at 2 locations. The coastal Playano strip might have been shared by both Salinan groups (Antoniaño and Migueleño). This may help to account for the vagueness of the ehtnographic accounts regarding which Salinan group might have visited this coastal strip.

However, my own impression is that there might be something else which could be very special about this so-called Playano strip. This coastal strip is very rocky, and abounds with molluscs (especially abalone) whose shells were apparently so widely prized throughout California. My question is whether this strip might not have been too rich in abalone shells to have been monopolized peacefully by any single inland tribe, especially if the strip was located at the edge of home range boundaries, where there might be a certain degree of overlap between territories claimed by 2 (or more) tribal groupings.

The sense of "private territory" was very deep among the Salinans, according to mission period records from San Luis Obispo (translated by Kroeber, 1908). Yet it never seems to have extended to this Playano strip where there were more riches in shells than anywhere else in Salinan territory. This strikes me as rather curious. It is as if the Salinans regarded the Playano strip as a kind of No Man's Land, which, according to the accounts already cited, was apparently visited by some Salinan groups but not definitely claimed by either Antonianos or Migueleños.

The problem is particularly relevant to this thesis, because both archaeological sites at Willow Creek are set within this controversial Playano strip. Some linguistic manuscripts of Merriam (in files of the Archaeological Research Facility in Berkeley) suggest that the Playanos might have spoken a Salinan dialect, and, indeed, on his map, he classifies the Playanos as a Salinan sub-group. However, he does not offer a single vocabulary list to substantiate this interesting hypothesis.

It will be shown that the archaeological evidence at the Willow Creek sites indicates an alternation of proto-Salinan and proto-Costanoan occupations. Furthermore the latest inhabitants at the Willow Creek sites were not the proto-Salinans, but the proto-Costanoans. This evidence, then, contradicts the more traditional view of ethnology.

Thus, Merriam (Ms. map) may be mistaken on 2 points: first, in dignifying the so-called Playano strip with the identification of a distinctive "tribelet" (or tribe); and second, in allocating this territory to the Salinan groups.

Assuming for the moment that Merriam just may have been in error on both these points, it may be interesting to suggest likely reasons for such errors. At least 2 possibilities seem relevant here. First, Merriam's innate tendency to "split" (rather than to "lump") groups is well evidenced in his published classification of bears. This zoological treatise recognized many species of bear, but recent researchers have revised his classification so that far fewer species are currently recognized in North America. This "splitting" tendency may have spilled over into his linguistic classification. Thus, Merriam, faced with the vague ethnohistorical accounts already cited as well as Ascension's (1861) reference to Playanos using balsa boats, was probably tempted to recognize a distinctive grouping.

Second, Merriam may have examined the ethnographic evidence, already cited, and noted that there really was no documented evidence for either the Costanoans or the Salinans ever having claimed the so-called Playano strip as their territories. However, there are vague references, already cited, which suggest that the Salinans visited the coast. Therefore, it seems to me that Merriam (Ms. map) was inclined to feel that the weight of the very limited evidence was in favor of calling Playanos a Salinan group.

The above reconstruction, of course, is conjectural in that it assumes, first, that Merriam was mistaken, and second, that there were probably very good reasons

for his errors in judgement. There is not enough evidence presented yet to raise this beyond the level of conjecture. However, after the available evidence from Willow Creek has been analyzed and correlated with that in other parts of the South Coast Ranges, it is to be hoped that the additional archaeological evidence may raise the level of attempts to solve this problem beyond conjecture and onto a far more empirical level.

Incidental to this, there is the possibility that the coastal territory around Willow Creek may not have been claimed by any tribe. It is conceivable that the area was overlapped by the outer limits of several home ranges of several tribes, who had their home bases farther inland.

It is possible, then, that Merriam (Ms. map) may have been reflecting only the usual ethnographic procedure of his times in mapping tribal territories (e.g. Powell, 1891). This procedure involved identifying a tribal territory with some local group that might claim it, regardless of overlap in some cases and (what seems to be the case here) disputed territories. It has been shown already that there is no documented evidence for the two neighboring Salinan groups (Miguelenos and Antonianos) having claimed the coastal strip. The 2 neighboring Costanoan groups (Soledad and Monterey) might have claimed the coastal strip just as readily, since the documented evidence in this regard is just as weak.

Merriam may have been only a victim of a theoretical bias of early ethnography, which may have made it unthinkable that the rights to such a rich mollusc region as this coastal strip had not been claimed by some tribal group in the immediate vicinity. At least, in my readings of early ethnography, I have not come across any maps which indicate home bases and home ranges of tribes. In every case, "political boundaries" have been drawn by ethnographers, in the style of Old World.

This very innocent kind of bias recurs in many ways throughout the history of the American frontier. For example, it was not unusual for a government official to assign a chief to a tribe in order to facilitate his own communication with the tribe, even when the tribe itself recognized some other individual as its leader. Here, it is as if an "extinct" tribe had been assigned to a coastal territory by a linguist although the territory had not been claimed by any of the documented local tribes. Kroeber (1925) and Heizer (1958) do not map any Playano grouping. This implicitly suggests a question which can be raised explicitly here. The question is whether any "extinct" Playano tribe ever existed at all.

Tribal Relations

Davis' (1961) study of aboriginal California trade relations suggests that the Salinans probabably traded with only 2 tribes, the Tulare Yokuts and the Mainland Chumash. Gayton (1946: 7,9) indicates that a Yokuts visitor was able to obtain shell beads and unworked whole shells from the Salinan tribe. Mason (1912: 179-180) notes inland Salinan groups receiving steatite bowls and columella beads from a few of the

Mainland Chumash peoples.

There is no evidence for friendly trade between any of the Salinans and their northern neighbors -- the Costanoans. However, the Costanoans had friendly trade relations set up with their other neighbors. Pilling (1950: 438) shows that Yokuts brought piñon nuts to the Costanoans in exchange for dried abalone, abalone shells, mussels and salt. The inland Miwok received Olivella shells from the Costanoan (Barrett and Gifford, 1933: 251-252). This is significant, because it demonstrates that the Salinans and the Costanoans had no friendly trade relationship established between themselves, although each traded with its other neighbors.

Mission period records from Santa Cruz (translated by Kroeber, 1908) describe a Costanoan party returning from a war raid somewhere with a few trophies that are described as "skull-caps placed on pikes." There is always the possibility that these skull-caps might have belonged to other Costanoans, but there is no documented evidence for such intra-tribal conflict. Therefore, since the Costanoan tribe had friendly trade relations with all its neighbors except the Salinan tribe, I suggest that these skull-caps may have belonged to the Hokan-speaking Salinans rather than to any other group, especially because, probably quite significantly, 2 of the burials at Willow Creek (Burials 2 and 8-4 in Mnt-281) have been decapitated.

These two graves suggest to me that the proto-Costanoan groups in the Willow Creek region may have been responsible for the decapitation of these 2 proto-Salinan individuals. In any case, such pathology, as well as the pathology of a proto-Costanoan female (Burial 6 in Mnt-281), tend to support the view that this area was probably a historic battle zone.

It is most likely that the reason for such rivalry between the Costanoans and the Salinans was commercial. Both tribes seem to have been competitors for that rich inland trade-market, where marine shells were a premium commodity. Willow Creek was not only a source of these molluscs but also near the boundary of the Penutian and Hokan linguistic groups. It seems to me that this would have been a very sensitive location, because there is evidence at Willow Creek that proto-Costanoans and proto-Salinans alternated in occupying this particular region.

There are many places along the coast controlled by the Costanoans in historic times which yield mollusc shells. However, a scarcity of the black-backed abalone species (Haliotis cracherodii) farther north could have tempted some Costanoans to exploit richer sources farther south, expecially since this is a low-tidal species which is more common in warmer waters farther south.

By crossing into the Willow Creek region, the proto-Costanoans would have crossed both a tribal and a linguistic kind of barrier which was enough to nullify any friendly trade relations between Salinans and Costanoans in historic times. As has been indicated already by the pathology of at least 3 burials at Willow Creek, such a meeting

of rival groups was probably met by violent resistance.

Incidental to this evidence for a strict boundary maintenance between the Costanoans and the Salinans, it may be noted that neither the archaeological nor the ethnographic accounts suggest any trade relationships between Hokan-speaking Chumash and Penutian-speaking Costanoans. No direct ties can be traced between a Santa Barbara center and a San Francisco Bay center. These lie at both ends of the South Coast Ranges.

Costanoan trade-partners have already been listed. The Chumash had direct trade relations with 5 tribes. These have been recorded by Mason (1912: 180), Kroeber (1925: 613, 630). Voegelin (1938: 52), Latta (1949: 65, 66, 274-275), Heizer (1955: 151, 154), Stewart (1927: 391), Taylor (1860-1863: vol. 13), Curtic (1924: 14-154), Eisen (1905: 12) and Bolton (1931: 272). These include:

Salinan - (already mentioned above in this section)

Kitanemuk - traded piñon nuts to the Chumash in return for wooden vessels inlaid with Haliotis shells.

Southern Valley Yokuts - traded obsidian, salt from salt grass, seed foods, steatite beads, herbs and vegetables. In return, they received from the Chumash: shell beads, whole Pismo Clam shells, Olivella shells, keyhole limpets and cowrie shells as well as dried starfish (and probably even a few crude sea urchin shells)

Tübatulabal - traded piñon nuts to the Chumash in return for shell beads, shell cylinders, asphaltum, steatite and sea shells

Yokuts - traded clam shells, asphaltum, buckskins, obsidian, and abalone (!) to the Chumash. In return, they obtained finely made shell ornaments from the Chumash.

No mention is made of any direct economic contact between a Chumash or a Costanoan group. It is apparent, then, that the most important intermediaries between these northern and southern tribes were, according to the evidence already cited, not the intervening Salinans but the Yokuts in the San Joaquin Valley, east of the South Coast Ranges. This seems adequately documented.

In summary, then, the evidence for historic tribal relationships in the economic sphere of trade is relevant here in demonstrating: a) that the north-south links for the South Coast Ranges lay east of these ranges; and b) that the boundary between Salinan and Costanoan ranges was a kind of battle zone or barrier that need not be restricted only to the thin coastal Playano strip.

Esselen Problem

The preceding analysis of tribal relations within the South Coast Ranges tends to support the conclusion that is already indicated by our analysis of the Playano problem -- that both Willow Creek sites occur within a No Man's Land, which probably also subsumes the territory that is usually allocated to an "extinct" tribe known as Esselen.

Meighan (1955) is apparently somewhat puzzled when required to document the reality of an Esselen group after excavating a cave cache in the remote Isabella Meadows area, which is situated in the very heart of a so-called Esselen territory: "So far as the published information goes, the Meadows Cave offers more solid facts than any other available source, meager though the archaeological data are" (page 24). Meighan concludes that "the few scraps of evidence available suggest that the Esselen were culturally more similar to the Costanoan than to the Salinan" (page 26).

Might they not be Costanoan? Why should the archaeologist call materials which look Costanoan something other than Costanoan? Is the archaeologist being misled by some produce of an ethnological bias into arguing for the very existence of probably nonexistent tribal groups?

If the archaeologist were to argue that the Esselen are probably just a Costanoan group, then he would contradict an opinion among linguists that the Esselen were Hokan-speaking like the Salinans, and not Penutian-speaking like Costanoans farther north. If it is assumed that some congruity between culture and language should be expected in this area, then a serious incongruity can be discerned between the evidence of the archaeologist and the traditional opinion of ethnography regarding the classificatory status of the Esselen grouping.

No vocabulary or grammar is available for the Playanos, and the Esselen grouping fares little better. A grammar for the Esselen language is suggested in only a single sentence, which Kroeber (1904) transcribes. It is about a bear. This is a favored topic among Costanoans who regarded the Old Man who walked on hind legs as a kind of object for reverence. In fact, it is a topic which is popular throughout the South Coast Ranges, so the substance of the sentence is not quite so important as its odd construction.

The structure of the sentence is apparently unlike that of the Costanoan or Salinan group. It suggests a difference in grammatical systems. However, a proper evaluation of the controversial sentence would have to come from linguists. A single word list for the Esselen language (Pinart, 1952) has been published, and 10 manuscript pages (Ms. #34984, 34986, 35053) listing Esselen words are also available in the files of the Archaeological Research Facility in Berkeley. It may be more than enough to suggest some dialect, but why a tribe?

The word lists were gathered many years ago from people who claimed to come from the so-called Esselen territory. A few of these informants may have been only peripherally from the area being investigated by the early ethnographers. The earliest observers did not actually visit the desolate area, or, if they did hazard a trip into this rugged terrain, then they certainly did not report having seen any Esselen sites.

Apart from differences in phonetic transcription of the Esselen words by these early observers, it is possible that, if there was any Esselen dialect, then it may have been used not by any tribe that claimed a territory but by individuals who traversed this No Man's Land and may have incorporated a few nouns from various tribes with which they had contact in their wandering. The word lists, after all, include nouns -- and little else. Nouns are most susceptible to word-loaning and to a phonetic restructuring within grammatical systems.

The archaeological evidence from this Esselen territory does not support the ethnologist's view that people actually had their home-bases in this inhospitable locale. Available archaeological evidence, on the contrary, would support some other view -- that people only passed through this region and did not remain for any length of time. Meighan (1955) shows that the Ventana Cones locale yields all of the hallmarks of very transitory occupation: caches, petroglyphs, earthbound mortars, cairn-covered burials, and general lack of the kind of debitage which might indicate prolonged visitations here.

Meighan's conclusions are consistent with those drawn in Chapter V of this study and are just as inconsistent with alternative reconstruction suggested by earlier ethnologists. The archaeological interpretations are based on "solid facts" while the ethnological ones are theoretical extensions of the limited linguistic data. Even granting the existence of some Esselen dialect, it need not be assumed that this implies any existence of a distinct Esselen tribe or that the speaking of this dialect was restricted to the so-called Esselen country.

Ethnology and Archaeology

A. L. Kroeber (1957: 193) depicts the interdependence of ethnology and archaeology in terms of their ultimate purpose:

"It has become clear that in this matter of a reconstruction of the larger and long-range movements or developments in global human culture, the ethnographer or ethnologist needs the help of the archaeologist. The ultimate purposes of the 2 are the same: to discover the history or evolution of culture; but their instruments and methods are quite different... The 2 approaches supplement each other so gratifyingly because they approach a common purpose with quite distinct methods."

It is in this spirit of interdisciplinary responsibility that the archaeologist can aspire to contributing toward some solution of the Playano and Esselen problems without feelings of infringing on either discipline's integrity, since methods still differ in each discipline, despite the common purposes.

The problems arise not from the data but from an attempt by early ethnologists to fill an ethnological atlas with some tribes that has a classifiable linguistic reality. It was an attempt to order the available evidence into meaningful units within a geographical context. There were several attempts.

R.G. Latham (1856) coined the term Salinan to include a number of unrelated groups: Salinan, Esselen, Costanoan, and the Pomo Gioloco group. Then J.W. Powell (1891), showing an appreciation for the priority of nomenclature, used this term to identify the linguistic family of which Esselen was a very prominent member, namely the Salinan family of the Hokan stock.

It is not our purpose to question a classification. Powell's competence in linguistic analysis was profound enough to withstand any serious revisions of his results for the past 70 years. Nor is there any attempt to question the linguistic data, since even limited factual evidence is better than none at all. What is questioned is the ethnologist's assumption that the existence of an Esselen dialect need imply existence of an Esselen tribe which in turn implies the necessity of tribal territory.

This is in spite of ethnographic and archaeological facts which clearly contradict the view that the Esselen territory harbored home-bases for a distinct but extinct tribe about which nothing except a dialect is now known.

To confound matters more, C.H. Merriam (Ms.) notes that the Rumsen dialect of the Olhonean family is spoken by a Costanoan tribe that refers to itself as Esselenes. The very name of the tribe contradicts the view that the Esselen tribe actually spoke Salinan.

So far our analysis of tribal relations (preceding) has relied on ethnohistorical data. Meighan (1955) uses archaeological data. Thus, without reference to Esselen word lists, ethnographic and archaeological data seem to be in accord. Both suggest that Esselen Land was really No Man's Land. If the archaeological reconstructions in Chapter V here can demonstrate why it was No Man's Land, then early ethnological inferences should be reassessed.

Chapter Summary

To recapitulate, briefly, here are the crucial points:

1. Physical relief is a vital factor in deciding the long-distance trade-routes that were used by the aborigines.
2. It rains mainly during winter in the South Coast Ranges and this is relevant to accounting for those landslides which buried site Mnt-282 at the mouth of Willow Creek.
3. Inland South Coast Range tribes can name a sea-mollusc, so some relationship with the Pacific coast is implied.

4. Mollusc-shells were prized throughout early California, indicating the reason for conflict between rival groups in the No Man's Land surrounding the Willow Creek sites.

5. Playanos are myths born from an early theoretical bias, which requires one tribe per unit of territory, without regard for the possibility that the boundary of 2 big linguistic groupings might be a disputed No Man's Land, especially since it is rich in abalone shell resources.

6. The Esselen tribe may be a myth, too, due to this bias, as well as the assumption that evidence for dialects is enough to postulate tribes and even tribal territories.

7. Shell trade rivalry pitted Costanoans against Salinans.

8. The Costanoans decapitated the Salinans at Willow Creek (as evidenced by Burials 2 and 8-4 in the site Mnt-281).

9. Cultural homogeneity characterizes the aborigines of the South Coast Ranges, but Salinans share more elements of culture with their southerly neighbors than with their northern neighbors, the Costanoans.

10. The aims of ethnology and archaeology are similar in this area, although both disciplines differ in the methods they use in arriving at solutions to the problems which concern, here, the South Coast Ranges.

CHAPTER III

WILLOW CREEK COMPLEX

Introduction

Six purely descriptive categories have been employed to organize the enormous mass of hitherto unpublished and original information in this very long analytic chapter: 1) Setting; 2) Stratigraphy; 3) Burials; 4) Lithic Artifacts; 5) Bone Artifacts; 6) Shell Artifacts.

The organization of the Chapter Summary is necessarily dictated by the results of the analysis done in the body of this very detailed and technical chapter. The analysis has suggested phases and sub-phases at both Willow Creek sites.

Phases

The phase here has a local flavor which refers to this region's natural and ethnographic setting rather than to an a priori classificatory scheme of larger dimension. Phases here are intended to provide a local archaeological context which can be used later for broader areal and chronological correlations. The implications of these correlates are the most meaningful, but have to be inferred from the evidence.

It is not enough to describe the data nor to draw only the most obvious or the vaguest implications. It would be tantamount to rejecting the full potential of both the data and the method, and would involve a waste of work and data. However, a regard for current literary styles recommends an allowance for caution, too, so the phrasing here might tend to be defensive or guarded, obfuscating perhaps many of the implications suggested by the very definition of the phase.

Defining a phase here is the crucial intermediate step in a standard "three step" procedure. It is crucial in the sense that the programming of an I. B. M. computer is crucial in determining what can and what cannot be solved by simple processing of data. The 3 procedural steps are simple:

1) A preliminary analysis of artifacts here is conducted with no regard for other classes of artifacts, which are not being studied at the time, and without regard to other sites in the region. It is a procedure commonly used by archaeologists at an initial stage of analysis, and involves sorting specimens. Such myopic and microscopic studies of only a single class of artifacts (like lithic artifacts) in vacuo at any single time are intended to provide only those basic units of some phase. Disconnected in this way, the evidence makes no sense at all.

2) Such units are called categories (like chipped points) and types (like stemmed points). Here are building blocks for an archaeological phase. It is defined by grouping

categories or types that share any or all of these 3 essential features:

a) similar depth, accounting for any horizontal stratification
b) similar stylistic distinctions in any artifact category and
c) ecological homogeneity as opposed to cultural heterogeneity.

The phase as defined here, then, should have some chronological, cultural and/or ecological import. A phase so defined is only a very tentative construct with a fragile arbitrary quality.

3) The final step is to distinguish finer sub-divisions, such as sub-phases. The sub-phase may reflect a greater reality so it is defined here, but mainly to allow the exact correlations that are required in subsequent chapters. This is the best or at least the most useful unit here, because it also happens to be the smallest and maybe the most fine.

Alternative Analytic Modes

1) The clarity of the boundaries in a phase depends to a large extent on the stratigraphic segregation of the units within a site. Lacking clear stratigraphy, it is unlikely that the concept of the phase would be very useful for any reliable analysis. It might even be misleading, since the boundaries suggested by the analysis of nonstratified data would blur the boundaries of such phases into one another. Stratigraphic controls here, however, are adequate enough, so it is perhaps most appropriate to employ "phase modes."

2) The substitution of a kind of "half-stratigraphy" for actual stratification as if it also incorporated some kind of seriation would be another alternative mode of analysis but it neglects horizontal locations as it favors vertical distributions, so it is rejected here, although it has had currency in California archaeology. Its shortcomings will be demonstrated in this chapter by contrasting its results against those of the method that relies on stratification.

3) Seriation can suggest a sequence of cultural items in a site. This is an alternative mode of analysis which can be useful in defining phases, but any segregation of units requires painstaking statistical manipulation of elements. Even then, as in the seriation of burials here, it may not be possible to distinguish clearly between phases and sub-phases without reference to data fixed by stratification.

Functional Correlates of Artifacts

The purpose of the foregoing analysis is at least two-fold: 1) to segregate the artifacts which are described in such a way as to group each within some phase, and 2) to infer the most likely function of an artifact in the context of other artifacts within the same phase. Thus, the ascription of functional correlates to artifacts is a vital

interpretative task, as attested by Taylor (1948: 113-151) and Clark (1952), which must intrude upon the actual description of the physical attributes of the artifacts. The "contextual" method, which employs the context of each phase as the "context" in which the likely function of an artifact might be most apparent, is probably the most appropriate one here.

The alternative method, of course, would be one that might be termed "typological." Here, the physical traits of an artifact are compared with those of artifacts which have been attributed functions in other contexts at other sites maybe hundreds of miles away. The similarities in general physical appearance, then, are assumed to be enough to allow a transference of functional correlates. This alternative method seems to be methodologically weaker, and is perhaps most useful when dealing with surface collections rather than with artifacts that have very precise stratigraphic contexts.

In any case, where context alone does not seem to help much in arriving at a decision regarding the most likely function of some artifact, then some appeal might be made to the alternative method, since these are not mutually exclusive methods. However, the "contextual" method is given priority here over the "typological" method, because it does seem to be methodologically sounder for our purposes here.

Alternative Modes of Inference

The term a podictic may be unfamilar to some scholars. It is a term employed by logicians to refer to a distinctive mode of inference which differs from deduction (a priori) and induction (a posteriori). In effect, it is most consistent with the "contextual" methods of analysis which have been selected already as the most appropriate in this study, because it involves a valid mode of inferring some proposition about particulars on the basis of random sets of propositions about other particulars.

Logic, naturally, has nothing to do with truth, but only with validity of reasoning. Given true propositions, then it is likely that inferences which rely on the a podictic mode of inference would also be true, even if the actual physical evidence for the conclusion is not yet available.

The other 2 modes of inference have been more usual in the literature dealing with archaeological problems. However, in this particular study, they do not seem to be appropriate:

a) Induction involves inferring general propositions from a set of propositions about particulars. It is a tool used by scientists to argue for the concept of cause, so that causal relationships might be postulated. The validity of this mode of inference is more statistical than absolute, so the predictions have to be qualified by some reference to probabilities. This would not be the most appropriate mode of inference for our limited evidence. The available sample of artifacts is small, so an alternative mode of

inference is required. Yet there are several general propositions which can be suggested for likely revision and reformulation. These would be hypotheses set up for testing rather than theories which might pretend to have been adequately demonstrated. The available evidence is not yet quite so extensive as to rely solely on this mode of inference.

b) Deduction involves inferring a proposition about a few particulars from a series of more general propositions about these particulars. This mode yields an absolute conclusion, but adds nothing to our stock of knowledge about the particulars. The mode is not appropriate to the nature of our evidence, nor is it likely to attain any of the objectives listed in Chapter I, because the mode requires that kind of proven general propositions which occur only in abstract geometry but not in the sphere of cultural phenomena. However, there are at least a few characteristics which appear to be as true for infrahuman primates as for humanity generally, and the concepts of home base and home range, insofar as they involve the more general notion of home, might be useful in making sense of the orientation of the burials. This would add nothing new to the concept of home, but would add something to the interpretation of burial orientation.

In summary, then, the a podictive mode of inference employs a "context" (consisting of a random set of many propositions about particulars) which alone may provide meaning for a proposition, if the proposition somehow fits the entire configuration. It is a valid mode which differs from deduction and induction, and which appears most consistent with the nature of our evidence as well as with the nature of the selected methods of analysis.

Incidentally, this is a kind of garden variety so far as modes of inferences are concerned, because it is used daily by every reasonable person in ordinary ways: in learning the meaning of a word (by hearing it repeated in various contexts, without actually referring to any dictionary); in learning the personality or character of another individual (by observing this individual's reactions in various situations); and in learning most of what he knows. It is a way of learning nuances.

Setting

The setting of the Willow Creek sites is relevant to providing extra evidence for a theoretical context. Such information is relevant to interpretation, rather than to methodology, and is able to support inferences that are to be drawn about the nature of any objective relationships which may be detected in later chapters.

These Willow Creek sites are located on a terrace along the rocky coast of the Pacific Ocean. They rest on the south bank of a spring-fed creek which flows in a steady year-round cycle -- slow in summer but fast in winter -- over a pavement of large stream-worn cobbles. The creek water is drinkable, being fresh, clear, cool and always running. This supply of drinking water may have been enough to support big aboriginal populations.

Looking down from the high cliffs near the sites, one is struck by the softer texture and color of water between two rocky points jutting into the ocean. Both sites seem to be set like tea-leaves, at the base of a natural cup, suggested from above by the shallow cove. This cup-like cove is almost completely drained during low tide.

During low tide, an abundant supply of shell-fish is exposed on the boulder-strewn beach. Even the deep tidal zone molluscs are readily accessible under large boulders in a subterranean gully along the north shore of the cove. A number of nearby coves tend to be more sandy and not rocky enough for the abalone to flourish there. The very rockiness of the beach at Willow Creek would be quite an important feature if it were shown that aborigines collected molluscs here. This would be especially important when combined with the known tidal pattern which virtually drains most of the dove during low tide.

Wild Life

Molluscs, however, are not edible throughout the entire year. Beginning about May 1, first mussels, then many other shell-fish absorb a highly toxic substance which does no harm to them, but may cause paralysis or death to the humans that may consume them. The source of this poison is a microscopic protozoan (Convaulax catanella) which reproduces so much during the warm summer weather that even the tidal waters are often discolored by their abundance.

Shell-fish, which absorb such protozoans in the plankton that they consume, are inedible for humans until about October 1. Then the weather becomes cooler. Even cooking cannot destroy many of these toxic protozoa which discolor the meat of the mollusc.

Fishing in the surf is a constant occupation of the many sea gulls along this entire coast, but local sportsmen prefer to angle for trout in some of the deeper stream reserviors up a few thousand feet in the coastal mountains, just 4 miles from the mouth of Willow Creek, where the bird life is varied enough to allow for an identification of hundreds of species.

Seasonally migrating whales pass very close to the shore during December when they move southward. Such local observers as Chivers and Frame, who live year-round at Gorda, 2 miles south of Willow Creek, have counted 40 in a single school.

Today, Willow Creek is one of the few places that a very nearly extinct species of sea otter survives. These peaceful animals can be seen from the shore, basking on a huge boulder which looks like a pyramid, near the southern tip of the cove.

It is unlikely that the aboriginal people in any way contributed to this virtual extinction of the sea otters. It is more likely that the species was almost annihilated during the 1700's for the Oriental trade, probably by groups of Russians, Spaniards and

Yankees. Only about a thousand of these sea otters exist now. Half a dozen of these are near Willow Creek, where they feed on local sea urchins, abalone and crabs. They are protected by federal law in this Los Padres National Forest Preserve.

Many other faunal species inhabit this rugged coastline. Sea lions are very common up and down the coast, usually herding under the high sea cliffs. They do not seem to have been hunted by the aboriginal populations around Willow Creek. According to the archaeological evidence from Willow Creek, the game which prehistoric populations around Willow Creek preferred was a local species of black-tail deer.

The black-tail deer is still plentiful all along almost very valley in the South Coast Ranges. Most deer hide in a shady thick underbrush which gluts each valley bottom, during a hot day, but in the cooler twilight hours, they venture onto the chaparral covered slopes or grassy clearings. At night, they are attracted to lights. These habits are well known to the local residents and were probably known to aboriginal hunters.

Hunting deer with bows and arrows may have been easiest within the inland valleys where the terrain is ideally suited for hunters who like to wait in ambush. Stalking these deer through forests or clearings does not seem to have been necessary in this region where ample brush cover is given to a hunter in the numerous little groves that occur near winding deer trails on the open grassy slopes.

During aboriginal times, there were large bears here in the inland mountain caves. These have been destroyed by the white men in historic times. Now, wild boars roam the whole countryside. These were brought in from abroad by local men who were fond of Old Country boar hunting. The wild boar is alien to the American continent, so it was not available for hunting to the prehistoric inhabitants of this rugged region.

Any attempt to classify this area botanically, in terms of local vegetation, would seem to be futile. The mountains rise abruptly from sea-level to 3 or 4,000 feet within a span of only 4 miles here and in the immediate vicinity. The plant-life varies with altitude. A box-canyon, just a few miles from Willow Creek, yields tropical orchids, high desert cactus and the northern coast redwood (Sequoia sempervirens), along with the more common broad-leafed woodland chaparral. Even many of the shallower valleys look like botanical gardens, rich in the plants that seed-gathering aborigines might have used in preparing their food.

Geology

The center for rock collectors along this coast occurs at Gorda, just 2 miles south of Willow Creek. A small lapidary museum here is operated by Roland Chivers who, along with other experts on the geology of this locale (e.g., Chesterman, 1950: 204-208; Crippen, 1951: 1-10; Rogers, 1941: 202), regards Willow Creek among the most geologically diversified regions in North America.

The intensity of geological processes in the Willow Creek region is evident in the very extreme warping of strata between myriads of fault-lines in some sheer cliffs over 1000 feet in height. Earthquakes were probably quite frequent here. A few miles northeast, in the Ventana Cones area, there is physical evidence for volcanos having erupted.

The extent of subsidence along this coastal beach would be an important item of information. It might suggest the possibility of ancient coastal archaeological sites having sunk below sea-level. However, the known geological processes in this region are enough to induce so much instability that the calculation of some uniform rate of coastal subsidence would serve little purpose.

Willow Creek is one of the few places in this nation that has nephrite jade. Another source is located in Lander in Wyoming and 2 others occur in California, near Porterville in Tulare County and near Petaluma in Marin County (Crippen, 1951: 4). The formation of nephrite jade presupposes intense geological and chemical processes.

At Willow Creek, local nephrite jade was used for hammerstones by the aboriginal populations. This is an unusual material which requires rather specific conditions for formation (Cf. Plate 1). Incidentally, it may be mentioned that at Willow Creek this nephrite jade is associated with gray schists and massive recrystallized mylonites which emerged through metamorphosis from the local shale, sandstone, calcareous graywacke and siltstone of a Franciscan (Upper Jurasic) Age. These cataclastic rocks have been affected by the intrusion of peridodite, now serpentine. Apparently (Cf. Crippen, 1950: 1), the magnesia metasomatism in this peridodite was essential to the chemical process of reconstitution which formed the nephrite jade under epizonal temperature and pressure. This summary of the genesis of nephrite jade at Willow Creek has been offered as further evidence for the unusual geological situation in this vicinity.

Gold and copper are still exposed on many surfaces in the Willow Creek vicinity. These might be profitable to mine if processing plants were closer to this area. The old Gorda and Melville mines, just a few miles inland from Willow Creek, are now abandoned, because it was too costly to transport the ore inland over the winding trails that meander into the Nacimiento Valley.

Inland Trails

The trails leading to Willow Creek are inland ones from the east rather than coastal ones from the north or the south. No trail is known to have followed the coastline for any length in this coastal area where the Santa Lucia Range rises abruptly from the sea, often without any passable beach. The modern coastal highway (Cabrillo or U.S. No. 1) does not follow any known aboriginal trails.

This modern coastal highway had to be blasted out of solid rock. It is impassable during much of the rainy season, because the winter downpours generate landslides onto this highway. Incidentally, it is likely that such a slope-wash landslide may have deposited the thick layers of gravel which bury the early shell midden (Mnt-282) at the mouth of Willow Creek.

Road connections between this modern coastal highway and the inland freeways exist only in the form of narrow single-lane gravel or dirt trails which do follow the aboriginal trails. They twist and turn at an average altitude of 2000 feet across the Santa Lucia Range into the Nacimiento and San Antonio Valleys (Cf. Map 7).

Ed Plaskett, who still lives just north of Willow Creek, traversed these hazardous trails on mule-pack to inland Jolon before the modern coastal highway had been completed. His daughter Jessie Plaskett is now in Salinas and still has the chipped chert points which were collected by the Plasketts along these trails between the Plaskett homestead and Jolon.

There is a feature regarding Willow Creek's very strategic position for inland communication which emerges from the study of elevations within this part of the South Coast Ranges. Farther north or south of the upstream reaches of Willow Creek, the mountains rise to heights that are over 2000 feet above those that occur just inland from Willow Creek. This natural dip in the coastal wall of mountains known as the Santa Luica Range is an item which was probably known to the transhumant aborigines who wished access to the ocean beaches by the easiest possible routes.

This natural pass is cradled between Chalk Peak (3636 feet) to the north and Alder Peak (3747 feet) to the south. Trails in the pass tend to skirt along the slopes almost 2000 feet above the thick underbrush in the canyons and over 1000 feet below the ragged mountain ridges. A hike from the mouth of Willow Creek to the inland Nacimiento Valley is only 10 miles, but it takes about a day, with stopovers for resting at several of the springs which occur enroute. It need not be a very tiring trek, because this winding trail is almost level for about half of this short journey.

The Nacimiento and San Antonio River Valleys are set within a plateau of gently rolling hills. This plateau blends into the Salinas Valley which lies about 25 miles farther inland.

Davis (1961) records no prehistoric trade routes between the Salinas and Nacimiento Valleys, but he traces a major trade route within the Salinas Valley. Willow Creek would be only 35 miles or less than 3 days walk away from this major trade artery which links several tribes during the historic period: Costanoan, Yokuts, Chumash and Salinan. The Salinas Valley, then, would have been at the cross-roads for many of the prehistoric aboriginal traders.

Stopover Areas

The shallow Nacimiento and San Antonio drainage basins are heavily wooded. Bed-rock mortars are so abundant in these valleys just inland from Willow Creek that the map of archaeological sites within these plateaus lists virtually nothing else but bed-rock mortars.

Pilling (1955) has indicated that it might be more accurate to refer to these as "earth-bound mortars," because many of these mortar holes have been ground into large boulders which had separated from bed-rock. However, the current usage for this general kind of feature in other parts of California will be retained here, because it seems to me that these large boulders are at least portions of original bed-rock and are still far too large to be very portable.

The ecological import of the bed-rock mortar may be related to seed-grinding, of course, but this need not imply any sedentary occupations here or elsewhere. Nor need it be regarded as a kind of "tribal" culture element, although, generally, bed-rock mortars are more common in northern Monterey County than in San Luis Obispo County.

The process of harvesting, cracking, grinding, powdering, leaching, and cooking acorns need not take long, nor is it a process which varies much in its fundamental elements from one culture group to any other in all of California. A few days would suffice to do what has to be done in preparing acorn flour.

Availability of bed-rock mortars along a quite frequently travelled trail would allow travellers to travel more lightly, because they could leave their mortars and the tools with which to carve mortars at their home-bases. Mortars and pestles are heavy.

Here, then, the routes were probably between the coastal sites at Willow Creek and some inland regions beyond either the Nacimiento or the San Antonio Valleys, since nothing in the valleys suggests a sedentary homebase occupation site. In fact, the rolling plateau formed by these valleys may be just another natural passage from the Salinas Valley to the coast through the more inland belts of very high mountains.

The steep mountain ridges between the Salinas Valley and the coastal Santa Lucia Range are about 2000 feet higher than even the highest peaks around Willow Creek. North of Jolon, near the headwaters of the San Antonio River, a high barrier of sheer cliffs rises ominously from the plateau. Pinyon Peak (5264 feet) and Junipero Serra Peak (5844 feet) dominate the northern landscape of this entire region around the town of Jolon.

Such topographic features suggest that the area of Jolon may have been mainly a stopover area for groups that were in transit to the ocean beaches from far more inland home-bases. Such a conclusion is also suggested by a consideration of the many diverse culture elements which occur archaeologically near the mouth of Willow Creek. It is

apparent that many groups from distant inland homes were drawn to visit the ocean beach near Willow Creek in order to gather the precious abalone shells which the very rocky ocean beach at the mouth of Willow Creek yielded in bulk.

If any of these visitors also ate the meat of any of the molluscs, then, since meat is seasonally toxic, it would be possible to claim that such visits were seasonal, between October and May. This also coincides generally with the time that acorns and pine-cones might be ripe for harvest farther inland.

Summary of Setting

This, then, is the setting. It is unique. Nothing here is typical of any other region in California. However, there is already a strong indication that the mouth of Willow Creek attracted many groups from very distant inland places, so the site may have been well known in aboriginal times as a center of precious mollusc shells, pine-cones, and beautiful sights.

The question is whether there was anything about Willow Creek's environmental resources which might have limited some more sedentary mode of subsistence. The answer is negative.

1. The water supply is adequate to have supported large aboriginal populations in prehistoric times. It did not constitute any limiting factor on sedentariness.
2. The mollusc resources are rich, due to the rockiness of the beach. Natives could gather valuable mollusc shells at any time of the year. This may have drawn people to Willow creek initially. However, the meat could not have been eaten between May and October by such mollusc-gatherers, because the meat is toxic in the summer. This may have been a limiting factor if the region could provide no alternative food supply.
3. Hunting is possible year-round in this whole region. Fishing is not restricted to any season either. The ecological alternative of hunting and fishing may be inconsistent with sedentariness unless more reliable modes of food gathering can be found in this region.
4. Gathering acorns and pine-cones is seasonal, but the ripe seeds can be processed into flour and stored in bins for use on a year-round basis. There are ample seed resources in the Willow Creek vicinity.

The next question would be why Willow Creek was not a home-base for any group until the most recent sub-phases at Mnt-281. This was not due to limiting environmental factors. It was due to a cultural factor. This may have consisted of a sense of territoriality or range. If Willow Creek was at the boundary of 2 territories which had their home-bases far from Willow Creek, then, in spite of the mollusc resources which could attract exploitation, the sites would not have been occupied permanently. The ethnographic data confirm this definition of tribal boundaries, territories and ranges.

The last question here would be whether it is correct to speak of "visitors" at Willow Creek. Would it be wrong to be so specific in reference to the nature of the more objective relationships between Willow Creek and other areas? This is a problem of interpretation, after a relationship of an objective nature has been established by the areal correlation of diagnostic elements. It goes beyond methodology into the realm of meaning. Would it be incorrect?

The alternation of distinct cultural elements in the various phases at Willow Creek indicates that people with different cultural traditions alternated in exploiting the mollusc resources at the site. The topography suggests that both groups, probably proto-Salinans and Proto-Costanoans, came from inland regions. It may be more scholarly or cautious to speak of influences from these areas being represented in the assemblage of some group which remained at Willow Creek, but why assume such a sedentary group?

Stratigraphy

A complete stratigraphic record has been illustrated in Figures 1 to 6, Plates 2 to 4, and Map 8 in the appendices. This is a full pictorial presentation that is annotated here.

Horizontal Stratification

"Horizontal stratification" is defined here as the evidence for sloping strata in a profile cut which has been cleared along a horizontal plane, rather than along a vertical plane (as is usual).

Both shell middens at Willow Creek are made up of large mounds which slope downward from several centers. Each mound has a base, of course, but each also varies in thickness, being thicker near the center than at the edges, so it is technically incorrect to speak of an occupation floor. It is more correct to refer to the mounds as the proper stratigraphic units, taking into account the sloping surfaces and the variable thicknesses of these stratigraphic units.

There is no term in the literature which can convey this technical concept unambiguously, so I have adopted one which Dr. James Bennyhoff coined in conversations with me about the stratigraphic situation at Willow Creek. If a clearer or shorter term can be found to express this concept, then I would willingly substitute it for the one which is used here, because it seems to me that "horizontal stratification" sounds almost like a contradiction of terms and may appear more esoteric than the concept really is.

The Lower Midden (Mnt-282)

The lower midden (Mnt-282) is about 7 feet thick at the west-facing wall of

Trench B, 10 feet east of the sheer face of the cutbank where it is only 6 feet thick. See Figures 1 and 2, Plates 2 and 3. This indicates that the upper surface of the midden slopes upward from the beach, because the base is virtually level and rests upon the original rocky beach. The slope in turn, suggests that the center of the upper shell-midden in this series of superimposed mounds had its center over 10 feet inland from the cutbank.

A center needs 2 directional co-ordinates, of course, and the records suggest that this center of the uppermost mound was probably in the vicinity of Pit B9. This must not be interpreted as the center for the entire series of superimposed mounds in site Mnt-282.

There is over a foot of gravelly midden on the base here. The midden extends no farther than A12 so this may be only the western edge of a larger midden which is over 3 feet thick and at least 30 feet in diameter.

Aside from this original lowermost mound of gravelly shell-midden, there are 2 other kinds of midden deposit at site Mnt-282. Each has lenses of ash, shell, or charcoal. However, one has a vaguely banded and very rocky texture, while the other has a darker appearance, more shell, and far less rocks.

The odd thing about these 2 middens is that they are not laid horizontally, one over the other. Most of the upper one is in a deep channel which has been cut into the lower midden. Thus, each is alonside the other. Nothing could be farther removed from the kind of layer-cake stratigraphy which is normally assumed for California mounds.

Reconstruction of Mnt-282

This reconstruction is not based solely on stratigraphy but also refers to the artifactual evidence which is analyzed in this chapter, especially regarding such characterizations as "abalone collectors." This anticipates the limited cultural data which are grouped within the basic stratigraphic units here ("mounds" or "phases"). The paucity of the artifactual evidence does not allow a finer sub-division of the stratigraphic units according to depth. Otherwise, stratigraphy suffices here in reconstructing the history of the more physical aspects of the site Mnt-282.

If abalone meat was eaten, then, since abalone meat is only seasonally edible, one might infer that abalone collectors might have revisited this site only during the winter months, when abalone meat was not toxic. However, there is no evidence that the abalone meat was actually eaten, while there is ample evidence that the shells were worked, so seasonality need not be assumed, in spite of the abundance of debitage consisting of abalone shells.

An examination of the debris indicates that some abalone occurs in each of

the 3 major stratigraphic unit ("mounds" or "phases"). The lowermost mound is the most compacted and differs from the others in being darkest, most shelly and least rocky. This mound can be correlated with cultural Phase 1.

An examination of the debris of cultural Phase 2a indicates that heavy rains mixed a good deal of this occupational debris with rocks and silt which had washed dwon from a slope adjoining the site. During such rains in this region the slope wash is still a major hazard, especially if the normal drainage systems are somehow blocked. The thick mound which was built up by these abalone collectors of Phase 2a was probably enough to dam up a few of the natural channels which had drained the steep slopes.

It is possible that these people might have dug the ditch in order to drain the waters which were blocked at the southeastern edge of this growing midden. Alternatively, natural erosion could have gouged this channel with each downpour. Either alternative would account for the channel in this mound. Perhaps both natural and human agencies were responsible.

Then, as this channel was filled with debris left by people who consumed mussel meat, probably during a drier season like late autumn, before the winter rains came. These people dumped a finer and darker kind of shell debris into the convenient garbage pit which was already gouged into this mound. No slope wash is evident during this occupation, so it is assumed that the occupation was during the drier seasons. This mound can be correlated with cultural Phase 3.

There is evidence that the abalone collectors of Phase 2 returned. The ditch was now filled with the debris of other people, so the slope wash was again gathering between the mound and the high hill near the site.

Finally, over 10 feet of sterile gravels were washed over the whole site during the seasonal downpours. According to field observations made during 1963, these water-worn gravels were derived from the steep hill that adjoined the site. The gouged or pitted surface of the entire midden site Mnt-282 indicates that the initial landslide had enough force to deform the top of the mound. The subsequent bands of gravel in the sterile layers indicate that deposition was more gradual after this initial avalanche of slope washed rocks.

Summary of Mnt - 282

The stratigraphy of site Mnt-282 suggests at least 4 successive occupations ("phases" or "sub-phases"), which are consistent with the stratigraphic units:

1. The lowermost layer of gravelly midden contains a fine gravel which is mixed with rotted refuse and a great number of hunting tools. Diamond-shaped (Type 1) chipped lithic points are the most common kind of artifact within this stratigraphic unit which can be correlated with Phase 1 of the cultural sequence.

2. The vaguely banded, rocky, abalone-shell midden has a center about 5 feet thick. Its diameter is about 100 feet. Stemmed points (Type 2), fishing gear and industrial tools associated with basketry are scattered throughout this stratigraphic unit which is correlated with cultural Phase 2a.

3. The dark mussel-shell midden has a few rocks, and contains an eared obsidian point which is triangular in shape. This point occurs deep within the channel that is 5 feet deep and 10 feet wide. Part of this mound skirts the southern edge of the ditch, and its refuse fills the adjoining ditch. A lanceolate obsidian point is virtually level with the top of this deep channel. However, the physical composition of this stratigraphic unit is homogeneous both within the pit and around the top of it, so the artifacts may be regarded as part of the same Phase 3 in the cultural sequence. Therefore, the lanceolate obsidian point which is virtually level with the top of this ditch is regarded as coeval with the other obsidian point which occurs about 6 feet deeper at the base of the deep ditch. This would be consistent with a respect for the integrity of each stratigraphic unit.

4. The rocky abalone-shell midden (#2 above) recurs, but only long enough to add a layer a foot thick on top of the mussel-shell dump (#3 above). The brief occupation is interrupted by the landslide which has now buried the site.

The midden surface is contorted, especially evident in Pits A13 and A14. Falling boulders had apparently smashed into the top of the midden from the southeast, ripping off most of the midden north of Pit A14. The debris may have dammed up the slope wash even more than the mound itself could have, and this would account for the many layers of apparently water laid sterile gravels which now completely cover site Mnt-282.

This reconstruction appears to be correct, because it is consistent with all the physiographic factors that have been observed in the immediate vicinity of Willow Creek.

The Upper Midden (Mnt-281)

Two kinds of midden, one superimposed over the other, seem to characterize the stratigraphy of site Mnt-281. See Figures 1, 3, 4, 5 and 6, and Plates 2 and 4. The following features may be noted:

a) An underlying midden is very dark grey and almost black in places. It is damp and sandy with a medium consolidation. Here are many rocks but very few shells scattered throughout a layer that is thicker at the easterly and southerly extremities of the excavation. This suggests that the center of this lowermost mound was around Pit SE6, and may have been 5 feet thick there.

The midden virtually disappears in the NW section of the excavation.

Therefore, the "horizontal stratification" (as defined on page 62) may be said to be quite extreme. This is consistent with the analysis of incised ground slate objects, which lie upon the upper surface of this lowermost, dark, damp and sandy mound.

b) The overlying midden is light grey and friable in texture. It is dry and has a very loose consolidation of ash mixed with crushed shell. Here is a great abundance of shell, but very few rocks. Many large lenses of mussel shell occur throughout this very friable layer which is over 5 feet thick near the NW section of the excavation. This indicates that the center of the mound was just north of Pit NW13.

Another 2 distinctive features suggest that the center was near the northwestern edge of this large excavation:

1. The lenses of mussel shell have a tendency to slope down from the northwest. See Figure 4 for the profile elevation of the west-facing wall of the W-trench.
2. The overlying layer is only about 1 foot thick at the southeastern rim of the excavation. See Figure 5.

Summary of Mnt-281

Two major stratigraphic units almost completely displace each other at opposite ends of the excavated area of this site:

1. Most of the earlier mound occurs in the southeastern portion of the site. It is correlated with cultural Phase 2, since there is a kind of cultural continuity evident between Mnt-282 and Mnt-281.

2. The northwestern portion of the site contains almost all of the later mound, and is correlated with cultural Phase 4, although certain cultural affiliations with the earlier Phase 3 are evident here.

The level of demarcation between these two superimposed mounds slants diagonally from the southeast downward to the northwest. It is not any very horizontal line. Such evidence for a tremendous "horizontal stratification" (as defined above) indicates that horizontal distributions must be as vital as vertical distributions in the analysis of the artifactual content of the site.

Summary of Stratigraphy

Although sterile gravel intervenes, continuity between Phases 2a (Mnt-282) and 2bcd (Mnt-281) is indicated, since the physical composition of these layers is similar, and at least 8 artifact categories recur. In the Chapter Summary, hunting-fishing is noted during Phase 2a, but seed-grinding is added during Phase 2bcd. This shift in ecology may be related to a shift of home-bases.

Mnt-281 has ecological cohesion, but culture elements suggest at least 7 sub-phases based on largely a burial sequence which cannot be fixed firmly by regard to stratigraphy alone, since pits were dug. In the case of burials, then a seriation mode of analysis is employed.

A standard procedure, recognizing 2 major criteria (known stratigraphy and distinctive artifacts), has been employed in allocating specific specimens to the gross stratigraphic units which represent phases. Referring to known points of division between layers within those pits which have stratigraphic data, hypothetical lines have been drawn joining these known points. The lines have been refined by reference to the horizontal distributions of distinctive artifacts with little or minimal time depth (e.g., incised ground slate objects). Careful checking and rechecking has accompanied each decision, and may be re-analyzed since pit and depth data for each specimen in both sites are included in this analysis.

Burials

Data on burials are given in Table 8, Figure 7, Map 8, Plates 5 and 6. The condition of the burials is very poor. Only half the 14 individuals have associated objects. Flexure varies from tight to loose. The bodies lie on both right and left sides, and one is seated, cremated and associated with red ocher. Orientations appear indiscriminate and 5 burials have cairn-covers. Such apparent heterogeneity suggests at least 2 alternative kinds of explanation here.

If the variability is a function of change through the temporal dimension, then the seriation of traits would be valid. If these differences reflect diverse cultural traditions of contemporary groups visiting this locale (maybe seasonally), then a classification of the culture groups would be vital.

Such alternatives need not be mutually exclusive. The possibility of a conciliation need not be overlooked. This possibility suggests a rather original articulation of some methodological constructs, namely, the use of seriation and stratigraphy so that one might be employed in order to check the results yielded by the other. Such a model would be the compromise which could yield an adequately realistic appraisal of the available data. Even more important, it is necessary here to show a respect for the stratigraphic evidence, if phases are to have any stratigraphic relevance.

There are only 13 artifacts which are associated with 7 of the 14 burials, so the seriation of grave offerings ("grave lots") is not feasible here. Therefore, it is necessary to regard such features as body orientation, degree of flexure, and whether the body has been laid on the right or the left side. These are not the usual features used in burial seriation, but they are about the only kind available here. Furthermore, each feature involves some cultural choice on the part of those burying the deceased, so the features have as much cultural import as grave offerings.

Seriation of such traits can suggest only a very generalized sequence. It can only hint at phases. However, the following seriation of about 21 burial elements would be a reasonably good tentative beginning of this analysis of burials.

Willow Creek Burials*

Burial traits	Mnt-282			Mnt-281										
Burial number:	1	3	2	6	4	1	7	3	8-4	2	8-1	8-2	8-3	5
Red ocher	x													
Cremation	x													
Seated position	x													
Tight flexure	x	x	x	x	x	x								
Lying right side		x	x	x								x	x	x
Rocks over grave		x	x	x			x	x						
Olivella offering			x											
Bone-horn offering				x		x	x							
Haliotis offering					x									
Lying left side					x	x	x	x	x	x	x			
Lithic offering						x		x						
Loose flexure							x		x	x	x	x	x	x
Ventral semiflexure								x						
Missing skull									x	x				
No grave goods		x							x	x	x	x	x	x
Extended														x
Orientation														
Southeast	x	x							x	x				
Northeast			x											
Southerly					x	x								
Westerly				x			x							
Northern								x			x	x	x	x

* Such burial numbers as 8-1 to 8-4 are Beardsley's.

The preceding seriation suggests a sequence of individual burials. It coincides in a general manner with the known stratigraphy of the sites. However, a preliminary analysis of this kind does not consider the likelihood of intrusion by alien groups, although it might hint at when such an intrusion was a distinct possibility, if the phases could be distinguished clearly.

By counting the numbers of similarities and dissimilarities between the serially adjacent individual burials, it is possible to detect a clustering in some cases and a discontinuity in others. Such essentially statistical computations can suggest phases, even with this limited sample, if these proposed sub-phases were tied in with the information about the basic stratigraphic units.

In this way, then, a reasonably precise sequence of phases and sub-phases can be established. It will emphasize the chronological aspects of the available evidence, and will suggest an alternation of 2 basic cultural occupations in the later sub-phases.

Burial Sequence

The following sequence has been established using stratigraphic evidence and the seriation method of analyzing burial traits (rather than "grave lots" consisting of comparable types of grave offerings): 1) Phase 1 - Burial 1 (Mnt-282); 2) Phase 2a - Burial 3 (Mnt-282); 3) Phase 3 - Burial 2 (Mnt-282); 4) Phase 2b - Burial 4 (Mnt-281); 5) Phase 4a - Burial 6 (Mnt-281); 6) Phase 2c - Burial 1 (Mnt-281); 7) Phase 4b - Burials 3 and 7 (Mnt-281); 8) Phase 2d - Burials 2 and 8-4 (Mnt-281); 9) Phase 4c - Burial 8-1 (Mnt-281); 10) Phase 4d - Burials 8-2 and 8-3 (Mnt-281); 11) Phase 4e - Burial 5 (Mnt-281).

Alternative Burial Analysis

An alternative analytic procedure stresses cultural aspects. It is methodologically weak for chronological problems, but its use results in clear discernment of themes which are more intuitive than statistical. That is, such culture traits as grave offerings are weighted more than other traits, and maybe more heavily by the analyst than by the aboriginies. However, grave offerings are linked to their own trait clusters. Four phases emerge:

1) Red Ocher - cremation, seated position, oriented south
2) Shell offerings - tight flexure, lying on right side, rocks on grave, oriented southerly
3) Bone-horn-lithic offerings - variable flexure, most lying on left side, most with rocks on grave, variable orientations
4) No grave offerings - mostly loose flexure or extended, most on right side, oriented north

Such a sequence seems very suspect, but in spite of the analytic procedure involved, it coincides in a general fashion with the sequence which has emerged from the more statistical procedure.

Reconstruction of Burial Events

More than any other kind of archaeological evidence, a burial reveals a people's innermost feelings about the afterlife. There is a deep sentiment associated with the death of some loved one in a small group. It would be most callous for a scholar to neglect this human aspect of any burial. Ritual is associated with burials, and this usually has some symbolic trappings which are probably dearest to the people who are left with the task of burying a friend or relative and mourning...

The notion of home is perhaps the most emotionally potent among humans. This is not just a place on a map, but has a place in the heart of man. It is where one's loved ones live. A sense of home range and territory is developed even among infra-human primates so it need not be denied to aborigines.

Ethnographic accounts indicate that even transhuman populations in the South Coast Ranges retained some sense of home range and home base. No documented group is known to have occupied the sites at Willow Creek, so the home base of these "visitors" at Willow Creek must have been elsewhere. It is reasonable to argue that the people at Willow Creek may have wished to help their deceased "homeward" by orienting the bodies in a direction which might point towards some home base. It would be a symbolic gesture as well as a sentimental one.

It is also a useful clue for the archaeologist, if he is interested in following it up and checking it against the available data. It would be incorrect for him to assume that the associated ritual was somehow mechanical and devoid of symbolic import to the survivors. Here, then, is a reconstruction which is appreciative of a feature which could be quite significant.

It is based on a sequence which is already established. It relies on an interpretation of the artifactual evidence which is synthesized in the Chapter Summary. However, it is not the purpose here to impress or convince anybody about the nature of the events in this sequence, although the interpretations of the events are consistent with the facts and do anticipate fuller exposition in later chapters.

Phase 1 (Proto-Salinan)

The earliest occupation 2000 years ago is marked by artifactual evidence indicating a major reliance on hunting for subsistence. The dead were cremated in a pit where the body was seated in a tightly flexed position, interred with red ocher, and facing southeast -- probable point of origin.

Phase 2a (Proto-Salinan)

The subsequent occupation is characterized by the artifacts which are associated with hunting and fishing. Bodies were covered with rocks, maybe due to the extreme mobility which would not be consistent with deep trenching. No offerings are preserved. The body is tightly flexed, laid upon its right side, and still oriented southeast. Basketry tools and shell debitage are so abundant as to suggest the view that molluscs were gathered here for transport elsewhere. Artifactual affiliations are southerly and inland. It is noteworthy that the burial orientation is also southeast.

Phase 3 (Proto-Costanoan)

This occupation is very unlike that of the preceding two. The cultural content

has northerly affiliations. If body orientation is any clue regarding the home base of groups in this area, then it may be noted that the northeasterly orientation here is also consistent with areal correlates defined in Chapter IV, so far as this phase is concerned. The body is tightly flexed ans laid on its right side. A cairn-cover suggests a high degree of mobility. Olivella shells occur as grave offerings and were probably prized.

Phase 2b (Proto-Salinan)

There is a kind of cultural continuity apparent between a prior phase (2a) and this one. However, during this phase, a more sedentary ecological pattern which is associated with seed-grinding mortars and pestles is initiated. It is almost as if there was some attempt to transfer an inland home base to this coastal location at the mouth of Willow Creek. This shift is also indicated by a lack of cairn-cover on the burial which is oriented southerly.

Phase 4a (Proto-Costanoan)

Culture traits with northerly affiliations recur, but the burial is still cairn-covered during this phase, indicating a very transient occupation. Significantly, again, the orientation of the body is northwesterly. Thus, so far, there is remarkable agreement between the body orientation and artifact associations.

An adolescent female skeleton, tightly flexed, and lying on the right side, has an easily diagnosed traumatic injury -- a smashed face (maxillary being fractured). Violent death is indicated, and supports the view that would designate the Willow Creek region as a kind of No Man's Land or battle zone.

Phase 2c (Proto-Salinan)

Cultural affiliations are southerly, as is the orientation of the body. During this phase, a child is buried with a bone-gorge nose-plug around the region of the head.

Phase 4b (Proto-Costanoan)

Cultural elements are agian northerly. Cairn-covers persist during this occupation, indicating mobility. The bodies are oriented northerly, too, and this coincidence is remarkable, although one of these burials is pointing just a bit west of true north.

Phase 2d (Proto-Salinan)

Southerly cultural connections are again associated with a southerly body orientation. These bodies are decapitated. The missing skulls would support a view that this area was a battle zone during protohistoric times. Body flexure is looser and freer, consistent with a generally noted trend.

Phases 4c, 4d, 4e (Proto-Costanoan)

Northerly cultural affiliations are firmly established and all of these burials are oriented in a northern direction.

Summary of Burial Analysis

This analysis has relied on seriation and on stratigraphy in order to establish a sequence of burials. Eleven sub-phases have been distinguished. These can be grouped into 4 culture phases, so that some consistency might subsist between the stratigraphic units and the major cultural units.

The alternation of culture phases and culture sub-phases is enough to indicate that this site was probably visited by people who had their home bases elsewhere. This interpretation is supported by other kinds of evidence:

1. The traumatic injury of the body that has been assigned to Phase 4a shows violence in this region.
2. Two decapitated bodies in Phase 2d also indicate that violence occurred here.
3. This region was visited by people who oriented the bodies of the dead in a direction pointing towards a home base.

Lithic Artifacts

Chipped Lithic Points

Data on these points are in Figure 8 and Table 9. Only 4 occur in the upper midden (Mnt-281), while the lower one (Mnt-282) has 21. This remarkable 5 to 1 ratio is raised to 15 to 1, because the excavated volume of this upper midden is 3 times that of the lower one. If these ratios are weighted more than they may merit, then later people here seem to have hunted far less than the earlier people.

Chronology of Points

Chipped lithic points are usually the most truly distinctive imperishable artifacts in an archaeological site, so it may be useful to set up a chronology for the points at the outset, relying exclusively upon stratification, before attempts are made to propose any typology that suggests cultural types. The local collectors usually have an accumulation of such points, so areal correlations might help to suggest a general area of concentration (hence maybe origin). What is usually lacking, however, is a chronology, because the points which collectors possess have been picked up on the surface. Here, then, is the opportunity to establish a sequence for the various points.

Early: All eight Early points at Mnt-282 have thinner bases than later ones.

This suggests a marked difference in hafting. A flat pointed base would fit snugly into and parallel with a thin slot at the end of a wooden shaft. It could have been secured by relatively light lashing and cemented with asphaltum. In silhouette, an Early point has an asymmetrical diamond shape with a pronounced barb on one shoulder. Most of them have some part missing, so an accurate weight would be hard to determine. The average might be about 8 grams. The average dimensions would be almost 5 centimeters in length and about 3 centimeters in width. These might be darts.

Middle: At least 3 types occur in this middle level at Mnt-282. One (1-124862 - L) may be a large blade, so it is set aside. Another (1-124797 - I) is so unlike anything in both sites that it too may be set aside. It is of obsidian (black volcanic glass), and is also side-notched, eared and concave-based. The remaining 7 points exhibit variable dimensions. Yet they do have noticeably thicker bases which would have to be set at an angle to the axis of a wide slot in the end of a wooden shaft. They are almost the size of a spear point. One remarkable feature about the points is that their width across the shoulder is virtually invariable -- set at about 3.5 centimeters, regardless of other proportions. An accurate linear measurement of the length of the barb tends to curve back toward the base more sharply in these points than in Early and Late points. This feature probably relates to a distinctive manner of hafting the points.

Late: At least 3 types occur in the upper horizon of site Mnt-282 and in site Mnt-281. One (1-125261 - H) differs the most from every other point. It has a slim lanceolate shape with parallel sides and very fine diagonal trimming. Such a point may belong to the Middle Horizon of Central California farther north, but its base (the most vital portion) is missing. It is made of obsidian. There is another point here (1-133562-D) which may be a knife-blade or a spearpoint used for thrusting, because it lacks barbs and resembles in size and shape a type designated NAa by Heizer (1949: Fig. 11). This probably had a northerly origin, too. The remaining 6 points have a thick cross-section and relatively long barbs which jut out at right angles to the long axis. The average weight is about 16 grams. The range is from 8.74 to 22.42 grams. These points are about 2 times as heavy as the earlier ones, and the workmanship is considerably cruder. Only one of these points (1-125268 - A) in the upper midden seems to have any southerly connections.

Typology of Points

Type 1 Small arrow or dart point, glossy light beige chert; asymmetrical diamond shape; pronounced barb on one shoulder; asphaltum traces on thin base; length 5 centimeters; width 3 centimeters; weight 8 grams; probably very distant southerly origin; specimens include: Early - 1-124822, 1-124821, 1-124824, 1-125488, 1-124800, 1-124820; Middle - 1-124801, 1-124861, 1-124798. This is the earliest type here - 9 specimens; the 3 Middle points may be Early.

Type 2 Large dart or spear point, mottled dark calcedony; asymmetrical

stemmed shape with contracting base; long lanceolate body with barb on one shoulder; asphaltum traces on base; tendency to become thicker, cruder, heavier later; length 5 to 7 centimeters; width 3 1/2 centimeters; weight from 10 to 20 grams; probably southeastern inland origin; specimens include: Early - 1-124825, 1-124823; Middle 1-124802 (reworked tip), 1-125492, 1-124799, 1-124864 (blanks?); Late - 1-124860, 1-125493, 1-124772; Upper Midden - 1-125268. This is the type associated with Phase 2 here; there are 10 specimens representing this type; the 2 Early points may be Middle.

Type 3 Thin well-worked knife-blade, mottled chalcedony; laurel-leaf shape with notch on one shoulder; length over 9 centimeters; width almost 4 centimeters; weight over 35 grams; probably southeastern inland origin; one specimen 1-124862 occurs as a Middle point; this type is associated with Phase 2 here.

Type 4 Small arrow or dart point of black obsidian; asymmetrical triangular shape; side-notched, eared, concave-based; length 4 centimeters; width 2 centimeters; weight 6 grams; probably northern coastal origin; one specimen, 1-124797, occurs as Late point; it is intrusive in a deep channel here; this type is associated with Phase 3 here.

Type 5 Small arrow or dart point of black obsidian; symmetrical parallel-sided lanceolate shape; base is missing; length over 4 centimeters; width 2 centimeters; weight over 6 grams; probably northern origin; only one specimen, 1-125261, occurs as Late point; this type is associated with Phase 3 here.

Type 6 Thick crude spear point of grey chert; laurel-leaf shape like NAa type (Heizer, 1949); length 9 centimeters; width almost 4 centimeters; weight 46 grams; probably northern origin; one specimen, 1-133562, occurs in upper midden; this type is associated with Phase 4 here.

Two points in the upper midden (1-125208, 1-133563) lack bases and may be too fragmentary to include in this typology. These are associated with either Phase 4 or with Phase 2, during a restless period, when occupations belonging to both phases alternated in a sporadic manner in Mnt-281, before Phase 4 was established firmly as the only kind of cultural occupation at this site.

Chronological Sub-Types

If stratigraphic controls are firmer than they seem to be in basal levels of Mnt-282, then it is possible to distinguish 2 temporal sub-phases for Type 1 points:

Early - smaller, thinner points with finer trimming
Later - larger, thicker points with cruder trimming

By this token, Type 2 points would have 4 sub-phases: Early, Middle, Late, and Recent. These tend to become thicker, cruder and heavier with the passage of time. The sub-

phases of Type 2 points appear to be temporally rather than culturally distinguishable. The stratigraphic distribution of Type 2 points throughout Phase 2 middens would tend to validate at least 3 sub-types, because there are no manifestations of Type 2 points during Phase 1. In any case, such chronological sub-types would be very difficult to characterize. Generally, all points tend to become cruder, heavier and thicker.

Summary of Chipped Lithic Points

About half (10) of the points in the lower midden have asphaltum on the bases. Over half (6) are in the earliest levels at Mnt-282. About 75% of 8 Early points have a bit of asphaltum on their bases, while about 22% of Middle points and 50% of Late points have asphaltum on their bases. One point in Mnt-281 has asphaltum. This southern culture trait apparently persists (or recurs) throughout most of the site.

A chalky cortex recurs on the faces of the chert points here. Such local collectors as Dalidio, Evans and Ruth have noted natural occurrences of mottled dark chalcedony nodules cropping out of chalky matrix beds near the city of San Luis Obispo. It appears that the Middle and Late points may have been made from this kind of chert which occurs in some abundance within the geological discontinuity where the Santa Lucia Coastal Ranges merges at right angles into the San Rafael Mountains.

Glossy light beige chert nodules appear to have a somewhat more southerly and coastal distribution, along the western coast of Santa Barbara County, between the San Rafael and Santa Ynez Mountains, where they occur in white chalky and almost silty cutbanks. Most of the Early and several of the Middle points appear to have been made from this unique kind of chert.

Two points are made from obsidian. These are types which have been associated culturally with areas that lie north of Willow Creek. The sources of native obsidian also lie north and northeast of the Willow Creek sites, beyond the South Coast Ranges, although an opaque basalty form of obsidian does occur in small outcrops just outside of the city of San Luis Obispo. The points at Willow Creek have not been made from this local variety of obsidian, but resemble in structure, texture and color the varieties which occur farther north.

Incised Ground Slate Objects

It would be geologically correct to refer to the material of these objects as Monterey shale, which is partially metamorphized, and looks like slate when it is ground or polished. The material is quite common in the Carmel Valley, where natives ground and incised this material (Mnt-5 in Fackenthal collection, and Mnt-57 on Cahoon ranch). However, the slaty appearance of the objects recommends some reference to slate here.

Data on 21 incised and ground objects made from this local material are in Figure 9 where a scattergram floorplan shows how systematically these objects are

distributed near the surface at the southeastern end of the site and near the bottom of the northwestern corner. Objects only a foot deep in the southeastern section are coeval with those 5 feet deep at the northwestern edge of the site.

This inference assumes a brief duration for such incised objects, but it is clear already from the stratigraphic record alone that the articulating surfaces of the overlapping mounds are sloping, not level floors, so this artifactual evidence is consistent with the stratigraphic evidence for a high degree of horizontal stratification in Mnt-281.

All 21 incised objects occur only during Phase 4, according to the stratigraphic evidence. The vertical distributions of these objects are skewed, because the objects are scattered across the entire hypotenuse of this large excavated area.

The basic design elements of these objects can be recombined in order to define 12 varieties of incised stones whose vertical distributions (especially varieties A1b, A1d, C1d and C2) suggest a high degree of what has been called "horiztontal stratification."

Depth in inches	A1b	C1d	C2	A1d	A1c	B1c	B1d	C1b	C3	B1e	B-?	A1a	C1c
0-12	x												
12-24		x	x										
24-36	x	x	x	x	x	x	x	x	x				
36-48	x		x							x	x		
48-60				x									
None												x	x

Pestles

Data on 15 pestles are in Table 10 and Figure 10. All occur only in the upper midden (Mnt-281). This may suggest that as hunting became less important (as evidenced by the ratio of points at both sites), the gathering of seeds became more common. However, the point evidence is admittedly quite slim.

There are 3 types of pestles in Mnt-281. These do not exhibit any particular chronological or cultural significance, but appear to be related to demographic patterns ranging from transient to permanent residence, if very transient peoples used cruder pestles than more permanent ones.

Phase 2

The later sub-phases of Phase 2 produce 2 pestles. One (1-124999) may be

too fragmentary to classify. It is a stream-worn cobble with very slight wear on one end. A complete specimen (1-125295) is also a stream-worn cobble with very slight wear at both ends. These may be Types a and b, as defined for Phase 4, and would indicate rather high degrees of transience in the later sub-phases.

Phase 4

Type a Nephrite jade; unshaped, but naturally smooth and roundish; one end is worn; this may have been a hammerstone used in battering softer material, like abalone meat, but the nature of the wear suggests grinding, too.

Type b Stream-worn cobble; unshaped but elongate and mostly flattish; very slight wear at both ends.

Type c Granitic; overall working into a cylindrical shape; finely pecked and worked; proximal end may be flanged like a maul.

Types a and b seem to recur throughout Phase 4 from the earliest to the latest sub-phases Only the Type c may indicate any high degree of stable residence. It seems to be restricted to the intermediate sub-phases of this final "northerly" (Proto-Costanoan) Phase 4.

Hopper Mortars

Data on 4 hopper mortars are in Table 11 and Figure 10. Each has a thin ring of asphaltum around the edge of a pounding hole. This was probably the adhesive for basketry hoppers. They occur only in the upper midden (Mnt-281) along with pestles and incised stones. Two hopper mortar types occur:

Type a (Phase 2)

Diameter		250 mms.
Height		200 mms.
Pounding hole:	diameter	135 mms.
	depth	40 mms.

Type b (Phase 4)

		Range (in mms.)	Average (in mms.)
Diameter		180-300	240
Height		100-150	120
Pounding hold:	diameter	70-90	80
	depth	8-30	18

The size of the pounding hole in a mortar may have some importance so far as an aspect of demography may be concerned. A deep and large hole suggests heavier use over a longer period of time than might be indicated by smaller and shallower holes in

such mortars. The pounding hole in the hopper mortar of Phase 2 is twice as large in depth and diameter as those in Phase 4. This shows that the occupation during Phase 2 was probably longer in duration than during Phase 4. This, in turn, may suggest a more sedentary kind of settlement pattern, but this need not logically follow from the preceding inference. Therefore, it remains only a suggestion rather than any demonstration of more sedentary patterns, pending further evidence.

Pitted Stones

Data on 13 pitted stones are given in Table 12 and Figure 10. These could be grouped into 5 "functional" sets: cobble mortars, pigment mortars, unfinished spindle whorls, incipient cobble mortars, and drilling bases.

Cobble Mortars

Two fist-sized ovoid macro-crystalline cobble mortars have pounding holes almost a centimeter deep and 4 or 5 centimeters in diameter. Exteriors are stream-worn but otherwise unmodified. One (1-125272) occurs in Phase 4b and is associated with Proto-Costanoan Burial 3 in Mnt-281. It is stratigraphically coeval with the other specimen here (1-133540), and is associated with northerly traits. See Chapter Summary and areal correlations in Chapter IV.

Pigment Mortar

This specimen (1-125304) has neatly pecked sides. It is completely circular in diameter, and its height would be almost half of its diameter (10 centimeters). The pounding hole is relatively deep (over 2 centimeters) and wide (almost 6 centimeters). Its stratigraphic location suggests that it should be included in Phase 4c. It is associated with a tiny flat slab (1-125454) which looks like a miniature paint mortar, although the pit is less than half a centimeter deep, so its function is problematical. It may have been an incipient pigment mortar.

Six other small flat slabs are stratigraphically within Phase 4. Their grouping is artificial. They are not really a homogeneous grouping. However, their diameters are almost 7 centimeters, and their pounding holes are usually wide (about 4 centimeters) but shallow (under 1 centimeter). The thicknesses of the specimens are significantly variable.

Incipient Cobble Mortars

The 2 thickest specimens (1-133536, 1-125123) look like they may have been intended as cobble mortars, but were probably discarded before before being completed as such.

Unfinished Spindle Whorls

Three thinner specimens may have been intended to be spindle whorls. One (1-125308) is rectanguloid, and is made of the soft local serpentine. Another (1-133438) is also made of serpentine, but is fist-sized and has a hole bored almost all the way through it. The last one (1-133437) has pecking on both sides and is made from a yellow sandstone which is quite common in the northerly San Francisco Bay area. Specimen 1-125454 might belong within this grouping, but its function remains problematical.

Three somewhat larger slabs also occur stratigraphically within Phase 4. These are made from serpentine, a very soft and nonabrasive material. One (1-125157) is even perforated partially by pecking on both sides. The others are pecked on only one side (1-125352, 1-125564). All are drilling bases.

Drilling Bases

It is not likely that these large pecked objects were intended to be perforated. The holes resemble saucers and look as if they might have been moulded with a regard for the contour of abalone shells. A function which would be most consistent with entire archaeological contexts here would have to based on some regard for the local shell industry. Shell ornaments made from the larger (Haliotis rufescens) species would have to be perforated on some kind of solid backstop, so that the shell would not shatter or split even if an asphaltum adhesive was employed to hold the shell together under drilling pressure.

One of the small disc-shaped stones which has been made from a sedimentary rock (1-124830) occurs in the lower midden (Mnt0282). This is fixed within Phase 2a by the stratigraphic evidence. This disc has a diameter of almost 8 centimeters and is almost 3 centimeters thick. It has slight pecking on both sides. This suggests that it may have been intended to become a spindle whorl. It is carefully chipped. The dimensions resemble those of fly-wheels in the Lompoc locality of Santa Barbara County. However, they also look like some of the spindle whorls which have been described at Bowers Cave from Los Angeles County (Elsasser and Heizer, 1963: 24-28, Plate 5, c and d). The function of this object is uncertain.

Stone Sinkers

Data on 8 stone sinkers are in Table 13 and Figure 11. Their stratigraphic locations indicate that perhaps at least 2 cultural phases (2 and 4) may be represented by these objects. This tends to be confirmed by the stylistic differences between the stone sinkers in each of these phases. One type is grooved and the other is notched.

Grooved (Phase 2)

All 6 stone sinkers in the lower midden (Mnt-282) are fist-sized. They have complete equatorial grooves which have been pecked along either the longest or the shortest axis. The rocks are igneous or metamorphic. Four of these stones are paired, but 2 occur singly. Furthermore, the distributions appear to confirm some horizontal stratification here, since the objects seem to be generally coeval. They might have been used to weight part of the same netting. These distributions suggest a slope, downward, from east to west, probably from the center of the mound towards the beach.

Notched (Phase 4)

Both stone sinkers are fist-sized. One has had notches pecked on both lateral edges, and the other has a natural perforation which has been pecked and worn around the edges. The function may not be in any way related to fishing, but the shapes suggest it.

Rubbing Stones

Data on 7 rubbing stones are in Table 14 and Figure 11. Each stone is ovoid to circular in shape. Neither rock has any evident pecking, but all have one or both flat sides rubbed or smoothed. Minimal variations occur, although each has an average diameter of 10 centimeters and the thickness of about 3 centimeters. However, there are 2 features which can be used to segregate 2 chronological or cultural types in this upper midden (Mnt-281), so a distinction can be made:

Type 1 Asphaltum smeared; Phase 2c or 2d.
Type 2 Burned (or unburned); Phase 4d or 4e.

Abrading Stones

Data on 2 abrading stones are in Table 15 and Figure 11. One occurs in the lower midden (Mnt-282) and the other in the upper midden (Mnt-281). Both are very alike. Each consists mainly of a thin sandstone disc which has had one edge bevelled by rubbing, so it is quite sharp. However, one was worked better than the other, and this may be a valid distinction.

Type 1 Pecked edge and smoothed surface; Phase 3.
Type 2 Unworked slab with bevelled edge; Phase 4.

Discs

All 4 discs occur in the upper midden (Mnt-281). Their edges are battered. One is made from Monterey shale (a very slaty-looking material), and the others from the indigenous serpentine. These may be spindle whorl blanks. A careful study of

horizontal locations and the precise stratigraphic context completely reverses what the depth of the discs might suggest. Serpentine discs occur during Phase 2 and the "slate" (Monterey shale) disc occurs during Phase 4 along with the incised and ground objects which have been analyzed earlier. Data on these 4 discs have been tabulated in Table 15, Appendix 1.

Granitic Ground Stones

Data on the 3 seamples of these objects are in Table 15. They belong to Phase 4, and resemble slingstones. Only 2 of these may be paired in Mnt-281 (1-125088 and 1-125224).

Rubbed Schist Fragment

This looks like a broken flywheel disc, but the function may still be questioned, because it does look like some of the specimens which have been classed as spindle whorls.

Chert Slab

This looks like an awl sharpener, but it may have been used to smooth the edges of abalone shells. It consists of a very hard cherty material which is not abrasive, but some of the natural fracture plane grooves have been deepened by wear. This occurs in Phase 4. Data are given in Table 15.

Awl Sharpener

This fist-sized and flat pebble made of very slaty-looking Monterey shale has a groove cut into one surface across its shorter axis. It occurs during Phase 4, and relevant data occur in Table 15 and Figure 15.

Asbestos Poker

This white fibrous mineral does not conduct heat. It may have been used to nudge hot rocks. Both ends look and feel battered, but the material is too soft to have been a hammerstone. The ends were probably scraped by the stones that were being moved. It is over 10 centimeters long, so it is long enough to have been used for this purpose. The object is also sturdy, being 2 centimeters thick or 4 centimeters wide. Data are in Table 15. It occurs during Phase 2 in the upper midden (Mnt-281), and also has been found near Santa Barbara.

Steatite Objects

Data are given in Table 15. 2 types occur:

Short Paddle: This is a paddle-shaped or flat oblong object which has a handle

less than half a centimeter thick, and 4 centimeters wide. The wider end (but not by much) has a thickness of 1 centimeter. Steatite resists heat. It may have been used to transport or nudge hot objects. A utilitarian function is indicated by some wear, but this is a doubtful identification, because the form itself is apparently unique to Mnt-281 and Phase 2. Some association with handling hot objects is likely in an archaeological context which emerges here, but it is not very definite.

Pendant-like Ball: The object has several holes which are so worn by a natural agency that the holes look almost natural. Only one of these holes is relatively recent. It was pecked. It is as if the perforated steatite ball had been found, weather-worn, on this or some other beach, and reworked. The object occurs during Phase 4, and its function would probably have been utilitarian, because it lacks aesthetic properties. Its use is problematical, and it does resemble another rather problematical object which has been tentatively classed above as a stone sinker.

Steatite Ring

This object belongs to Phase 2 in Mnt-281. The data are given in Figure 13. It is a beautiful specimen which appears to have been intended as a finger ornament.

Sandstone Plummet

This charmstone-like object is very crudely worked. It has a rather sharp point which is ground down in a spiral way, indicating that it may have been a reamer or a drill which could have been used for perforating or smoothing already perforated mollusc shells. This occurs early in Phase 4. Data are given in Figure 13.

Red Ocher Lumps

Two red ocher lumps occur. One is associated directly with Burial 1 in Mnt-282. This is certainly a ceremonial use of red ocher during Phase 1. The other lump has some general stratigraphic association with pigment mortars which also occur during Phase 4 in Mnt-281. Association is inferred rather than actual in this instance, because the specimen (1-125209, NE3, 36"-48") was 10 feet away from the mortars. Neither piece of red ocher appears to be modified by usage.

Asphaltum-Covered Rocks

Eleven rocks are coated with asphaltum. Two are in Mnt-282 (Phase 2a), retaining impressions of basketry and fiber. The rest are in Mnt-281. Two in Phase 2bcd have no impressions of any sort. The remaining 7 are in Phase 4, and while 5 have no impressions, 2 do. An earlier one has fiber impressions, and the later one has textile impressions.

Data are given in Table 1. The single specimen with basketry impressions is

illustrated in Figure 13, along with a plasticine positive reconstruction.

The use is uncertain, but it is reasonable to suggest that some basketry containers may have been used to hold asphaltum lumps while the heated rocks were being inserted to melt the asphaltum. The melting point of crude native asphaltum is variable, since this depends on the degree of purity, but the range is well below the boiling point of water -- around 100° F or 50° C. Heated rocks are known to have been used for boiling water. Here, they may have been used for melting asphaltum.

Coating basketry on the outside is usual in waterproofing among many native tribes in California. Thus, water could be boiled inside without affecting the waterproofing mastic too much. If baskets were waterproofed inside at Willow Creek, then it seems that such baskets would not have been used for boiling water with hot rocks. However, such baskets with a coating of asphaltum on the interior walls were probably used mainly in coating fresh abalone shells with the molten mastic in order to reinforce such shells against splitting during the various shell manufacturing operations.

These asphaltum-coated rocks, then, were probably originally heated rocks which had been swished around the inside of the baskets in order to melt the asphaltum within the baskets. It is difficult to visualize an alternative function for these asphaltum-covered rocks.

Hammerstones

Data on 137 hammerstones are presented in Figure 12 and Tables 16, 17 and 18. Only 8 are in the lower midden (Mnt-282). The remaining 129 are scattered throughout the upper midden (Mnt-281). A fifth of all tools in Mnt-281 are hammerstones.

About half (over 80) of the hammerstones which are in Mnt-281 are made of the local nephrite jade (Plate 1). Only one in the lower midden (Mnt-282) is made of nephrite jade.

Phase 1

One small flat elongate hammerstone that has been battered on both ends occurs in this phase. There is no nephrite jade.

Phase 2a

Four hammerstones which have battered or worn surfaces on only one end occur here in Phase 2a. Each is fist-sized. There is a trace of asphaltum on one. Another has a bevelled edge. All may tend to be rather flattish in shape. A single jade hammerstone (no location) is found here.

Phase 3

Only 2 hammerstones occur here. These fist-sized hammerstones are battered on both ends. One is of soft, sedimentary stone, which is probably from the north.

Phase 2bcd

About half of the hammerstones in this upper midden (70 out of 129) are part of this cultural phase. Over 3/4 of these (about 55) are made from the nephrite jade which crops up locally.

Phase 4

The rest of the hammerstones (about 60) are in this phase. Less than half of them (about 25) were made from local nephrite jade.

The differences in frequencies of hammerstones between the lower and upper middens has ecological implications. The most obvious inference, namely that it implies a transition from an early phase of hunting or fishing to a more sedentary phase of gathering and grinding (already suggested by the study of some points, pestles and mortars), is probably incorrect.

Clearly, hammerstones can be used to crack nuts. However, it should be recalled that hammerstones occur during the early 3 phases where there are no pestles or mortars. It is likely that these hammerstones were probably abalone pounders, because abalone shells recur throughout each cultural phase. If this was their function, then the higher frequency of hammerstones in the upper midden may be correlateable with the higher frequency of abalone shells.

The hammerstones, then, suggest a continuity, regardless of their probable function. It is probably an ecological continuity, too, related to the gathering of mollusc shells, pounding the meat and/or battering their edges. At first, shells may have had their edges battered to lighten a load in transit to some inland home base, where they might be made into finished or polished shell ornaments. Then, when the home base was apparently shifted to this coastal site, the hammerstones were probably used for the shell ornament industry which is clearly evidenced at the site. However, this shift in home bases is not yet demonstrated, although an attempt to do this may be found in the analysis of shell debitage (near the end of this chapter).

Chert Objects

Data on 62 chert objects are in Figure 13, Tables 19 and 20. 22 occur in the lower midden (Mnt-282), and 40 occur in the upper one (Mnt-281). All appear to be too multifunctional to be arranged into any more specific tool types. Each is enough like a

knife, saw, scraper, or blade-blank to block any attempt at a consistent functional classification. Cores and flakes are all worked to some degree. These tend to form cutting edges of various sorts on even a single piece of chert. A few show some secondary trimming, but this trimming is usually very crude.

The average weight is similar in both middens -- about 20 grams. However, the ranges vary. In Mnt-282, this range is from 6 to 74 grams. In Mnt-281, the tools may be anywhere from 4 to 111 grams. This is probably due to the difference in size of sample. The excavated volume of Mnt-281 is 3 times that of Mnt-282. Accounting for this difference, then, it appears that Mnt-282 has proportionately greater numbers of chert objects.

Site Mnt-282 has a relatively greater number of these "butchering tools" per cubic unit of excavated midden. A kind of concentration index (Willey and McGimsey, 1954) is computed here in order to bring out this point more forcefully, because it is consistent with some inferences which have been drawn already about the ecological differences in emphasis between site Mnt-282 and site Mnt-281.

One purpose in applying the concentration index method here is to show exactly how many cubic feet of midden would have to be stripped in order to yield a single chert object in those stratigraphic layers or phases which have been defined here.

Stratigraphic layer	Approx. excavated volume in cubic feet	Number of chert objects	Computed volume of midden in cubic feet per chert object
Phase 1	300	14	20
Phase 2a	1800	3	600
Phase 3	500	5	100
Phase 2bcd	4000	0	-
Phase 4	4000	40	100

Rephrased, in order to yield an idea of how many of these chert objects may be expected per 1000 cubic feet, during each phase, these figures emerge: Phase 1 - 50.0; Phase 2a - 1.5; Phase 3 - 10.0; Phase 2bcd - 0; Phase 4 - 10.0.

Fire-Cracked Rocks

These are 87 nondescript rocks which seem to have been thermally fractured and then used as choppers or scrapers. Data on these cores and flakes are presented in Figure 13, Tables 21 and 22. 8 occur in Mnt-282, and 29 occur in Mnt-281. Most of these crude objects apparently have some signs of wear on the edges.

Several look deliberately flaked, and others resemble broken hammerstones which have been used secondarily as scraping or cutting implements. It is difficult to

assign a definite ecological function to such amorphous objects without some attempt at analyzing the other kinds of specimens within each stratigraphic and cultural layer or phase. Then, some functions might become rather obvious when the objects occur in an ecological context. Such a context is already outlined for each of the phases.

Phase 1 - Choppers

3 specimens (1-124859, 1-128786, 1-128788) show definite signs of wear on the cutting edges. These are large cores which seem to have been flaked deliberately on both faces. They are made of materials other than chert or nephrite jade. Their occurrence is linked to a hunting phase, so they might be choppers.

Phase 3 - Fire-Cracked Rocks

5 specimens appear to be simply fire-cracked rocks with no definite signs of any use having been made of some very sharp edges. There were perhaps heated to heat water or food.

Phase 2bcd - Broken Hammerstones

6 broken hammerstones have here been made from nephrite jade. The core-portions may have been used for hammering, and the relevant ecological context for this phase indicates that these cores might have been used in the shell industry. 6 flakes of materials other than nephrite jade also occur. These appear to be crude scrapers, but, considering the ecological context and the virtual absence of wear on the edges, they are most likely fire-cracked rocks.

Phase 4 - Fire-Cracked Rocks

2 fragments of flakes of nephrite jade occur here. The pieces do not seem to have any secondary trim or wear. They are most likely only the broken portions of hammerstones. The 22 core-fragments and 43 flake-fragments which are scattered throughout this quite recent stratigraphic layer or cultural phase are most likely fire-cracked rocks. The 65 fragments show minimal if any wear on the edges. Neither is chipped in any way, and not one is made from nephrite jade.

In summary, the hunters of Phase 1 apparently used fire-cracked rocks as choppers to butcher the bagged animals. Hunters during Phase 3 apparently did quite a bit of cooking. During Phase 2 in Mnt-281, hammerstones were apparently used in the shellworking industry. Cooking during Phase 4 is quite apparent from this debitage of cracked rocks.

Summary of Lithic Artifacts

There are 415 lithic artifacts at both sites. Mnt-281 had 345. This is about

5 times more than Mnt-282 which has only 70. These have been grouped into 24 technological categories which may be sub-divided into stylistic types of artifacts. Some general observations may be relevant here.

Evidence of Ecological Shifts

Mnt-282 has no category of lithic artifacts which does not also occur in Mnt-281. Yet Mnt-281 has 15 that do not occur in Mnt-282. Most of these indicate a shift from hunting or fishing to gathering or grinding. They include: pestles; hopper mortars; rubbing stones; cobble and pigment mortars; spindle shorls or flywheel discs; plummet-shaped reamer; incised ground slate; chert smoothers; asphaltum lumps; awl sharpener; drilling bases; asbestos poker; steatite objects; steatite ring, and slingstones.

Evidence for Ecological Continuity

These discontinuities are striking, but there is a kind of ecological continuity, too. 9 categories recur, and they cannot be dismissed by noting either some drastic change in frequency or some stylistic differences (although where no stylistic differences occur, none seem possible, due to some very generalized nature of the artifact category itself). The simple recurrence of any technological category is enough to suggest at least some kind of continuity, no matter how weak it may be. In this particular instance, it seem very weak.

"Technological" artifact category	Number in Mnt-282	Number in Mnt-281	Stylistic Differences
Chipped lithic points	21	4	Yes
Stone sinkers	6	2	Yes
Pitted stones	1	12	Yes
Hammerstones	8	129	(Materials)
Fire-cracked rocks	8	79	Yes
Abrading stones	1	1	Yes
Red ocher lumps	1	1	(Associations)
Chert objects	22	40	No

Vertical Distributions of Lithic Artifacts

It has been demonstrated already that a very high degree of "horizontal stratification" is evident in both sites so that any use of only vertical distributions would be very misleading in a meaningful analysis of the lithic artifacts. However, there have been plotted here in order to suggest at a glance some general overview of the vertical distribution of stone artifacts. The tabulations do only this, and are not intended to provide any short-cut to meaningful study or any substitute for more careful analysis.

Category of Lithic Artifact	Finer Types	Twelve-inch Stratigraphic Levels* Mnt-282							Mnt-281							
		A	B	C	D	E	F	G	A	B	C	D	E	F	G	NONE
25 chipped points		5	6	6	2	-	1	1	-	-	-	2	1	1		
8 Early		5	3													
1 intrusive			1													
7 Middle			2	5												
1 blade				1												
6 Late					2	-	1	-	-	-	-	2	-	1		
1 obsidian								-								
1 NAa type													1			
13 pitted stones		1	-	-	-	-	-	-	-	1	-	1	2	6	2	
1 disc		1														
2 globular										1	-	-	1			
3 large slabs												1	-	2		
6 small slabs													1	3	2	
1 pigment mortar														1		
62 chert objects		1	8	6	2	-	2	3	-	-	2	2	14	10	8	4
137 hammerstones			3	-	2	1	1	-	-	8	9	25	31	19	16	22
55 non-nephrite			3	-	2	1	1	-	-	3	5	7	13	9	5	6
82 nephrite jade										5	4	18	18	10	11	16
87 fire-cracked rocks			2	3	1	-	1	1	1	5	11	19	14	8	8	13
79 non-nephrite			2	3	1	-	1	1	-	4	10	18	13	7	7	12
8 nephrite jade									1	1	1	1	1	1	1	1
2 abrading stones				1	-	-	-	-	(?)							1
8 stone sinkers				4	1	1	-	-	-	-	-	-	1	-	1	
6 grooved				4	1	1										
1 natural hole													1			
1 notched															1	
2 red ocher lumps					1								1			
1 burial offering					1											
1 no associations													1			
11 asphaltum-covered stones					1	1	-	-	-	-	1	1	1	5	1	
1 basket-impressed					1											
2 fiber-impressed						1	-	-	-	-	-	-	1			
7 no impressions											1	1	-	5		
1 textile-impressed															1	

* The capitalized letters are symbols for these depths below the surface: A=72"-84"; B=60"-72"; C=48"-60"; D=36"-48"; E=24"-36"; F=12"-24"; and G=0"-12".

Artifacts in the remaining 15 categories occur only in Mnt-281, so these have been tabulated separately below.

Category of Lithic Artifact	Mnt-281 Finer Types	Twelve-inch Stratigraphic Levels Categories Only								The Finer Types							
		A	B	C	D	E	F	G	?	A	B	C	D	E	F	G	?
1 perforated slab			1														
4 hopper mortars			1	-	-	1	2										
	1 big round boulder										1						
	3 small flat cobbles													1	2		
4 stone discs			1	-	1	1	-	1									
	1 slate flake										1						
	3 serpentine cores												1	1	-	1	
15 pestles			2	1	3	3	3	3									
	1 end-use one end												1				
	6 end-use both ends										1	-	2	-	2	1	
	4 cylindrical-shaped											1	-	2	1		
	1 maul-like flanged													1			
	3 too fragmentary										1	-	-	-	-	2	
1 rubbed schist fragment				1													
1 asbestos poker				1													
1 plummet-shaped reamer				1													
1 steatite ring				1													
7 rubbing stones				2	-	1	2	1	(1)								
	2 asphaltum-daubed											2					
	3 rubbed only													1	-	1	(1)
	2 burned														2		
21 incised ground slate				2	4	10	2	1	(2)								
	A1d variety											x	-	x			
	A1b "												x	x	-	x	
	B1e "												x				
	B-? "												x				
	C2 "												x	x	x		
	C1d "													x	x		
	A1c "													x			
	B1c "													x			
	C1b "													x			
	C3 "													x			
	A1a "																(x)
	C1a "																(x)
2 worked steatite objects					1				(1)								
3 granitic slingstones					2	-	-	1									
5 asphaltum masses					1	3	-	1									
	4 unshaped												1	2	-	1	
	1 shaped													1			
1 slate awl sharpener						1											
1 chert smoother							1										

Chronology of Lithic Artifacts

The following inventory of artifacts, which occur within each of the main phases, provides a useful chronological catalog for the subsequent correlations even as it clearly specifies certain ecological and cultural aspects of every one of the sequential phases. These traits have been synthesized with coeval traits from other categories in the comprehensive Chapter Summary. These, then, are the basic units.

Phase 1 Type 1 chipped lithic points; red ocher with mortuary association; small flat elongate hammerstones battered on both ends; abundance of chert cutting objects, 50 per 1000 cubic feet; chipped core choppers.

Phase 2a Types 2 and 3 chipped lithic points; spindle whorls or flywheel discs; grooved stone sinkers; asphaltum-covered stones with basketry and fiber impressions; flattish fist-size hammerstones battered on one end, some asphaltum, nephrite; scarcity of chert cutting objects, only 1.5 per 1000 cubic feet.

Phase 3 Types 4 and 5 chipped obsidian points; Type 1 abrading stone; fist-size hammerstones battered on both ends, some of sedimentary rocks; relatively few chert cutting objects, 10 per 1000 cubic feet; fire-cracked rocks.

Phase 2bcd Types a and b pestles; Type a hopper mortar; Type 1 rubbing stone; Spindle whorl or flywheel disc; serpentine spindle whorl or flywheel disc blank; schist spindle whorl or flywheel disc; abundance of hammerstones, mostly of nephrite jade; some broken nephrite jade hammerstones; steatite paddle; asbestos poker; some fire-cracked rocks; asphaltum-covered rocks with no impressions; steatite finger ring; not a single chert cutting object.

Phase 4 Type 6 chipped lithic points; incised ground slate objects (12 varieties); Types a, b and c pestles; Type b hopper mortars; cobble mortars and cobble mortar blank; pigment mortars; spindle whorl or flywheel disc blank; base or backstop for drilling operation; stone sinkers, notched and perforated; granitic slingstones; perforated steatite object; Type 2 rubbing stone; Type 2 abrading stone; slate spindle whorl or flywheel disc; awl sharpener; grooved chert smoother; plummett-shaped reamer; red ocher for pigmentation; asphaltum lumps; asphaltum-covered rocks, some with fiber and textile impressions; abundance of fire-cracked rocks; abundance of hammerstones (half of nephrite jade); about 10 chert objects per 1000 cubic feet.

Bone Artifacts

Data on the 87 bone artifacts recovered from both sites are described in the text. Most have been illustrated in Figures 14 to 16. Mnt-281 has 52 bone objects, and Mnt-282 has 35.

Mnt-281 has 1.5 times as many bone objects. This imbalance is misleading,

because the excavated volume of Mnt-281 is 3.08 times that of Mnt-282 (8000 compared to 2600 cubic feet). A regard for the concentration index here indicates that twice as many bone artifacts occur in the lower midden (Mnt-282) than in the upper one (Mnt-281). This is consistent with the inferences which have been drawn already about ecology in the analysis of lithic materials.

Most of these bone artifacts appear to have been used in such industrial activities as the manufacture of fiber containers or shell ornaments. However, such functional interpretation may be suspect, unless it follows a thorough analysis. Here, then, the 87 bone objects are grouped into several categories which are designated by such functionally neutral and purely descriptive terms as "worked rib" except where a function is obvious. Then a more meaningful designation can be used, like "awl" (although the precise function of the awl might yet be uncertain). Finer sub-divisions than these categories are unsuitable, since the sample is too small for typological sorting.

The most meaningful organization of the descriptions of all 87 bone artifacts would seem to be one which is able to suggest chronological, cultural and ecological units all simultaneously. The phases defined so far by studies of stratigraphy, burials and lithics seem to provide the needed methodological model. The utility of a phase is also demonstrated here in the following treatment of an analytic problem, namely, the identification of any tool's main industrial function by reference to its ecological context. Such reference tends to add confidence to interpretations of any tool's likely function, even if a few alternatives add doubt. Usually, however, the formal aspects of each artifact suffice to suggest a function.

Phase 1

Splinter Awls

Two splinter awls (1-124784, A12, 72" and 1-124829, A10, 71") occur here. The complete one is 7.5 centimeters long. It is generally fresher looking and has a sharper tip than the broken one which is 4.8 centimeters long. This particular specimen is heavily worn and has a concave depression ground along one of the edges about a centimeter from the tip. It looks as if it had been used as a finger rest. The tip of each specimen has been bevelled, and is deeply scarred, but minimal if any wear is evident about a centimeter beyond the tip. These may be chert flakers, especially since this would be most consistent with the ecological characterization of Phase 1 as a hunting phase (on the basis of the analysis of lithic materials).

Phase 2a

Small Gouge

One small gouge (1-124814, A12, 73") occurs during Phase 2a and is part of a bone which has been split at the joint and honed to a sharp bevel edge. Its size and

shape suggests a fingernail (2.8 centimeters long and 1.2 centimeters wide). Its sharp cutting edge could serve well as a gouge, chisel, knife, etc., on soft surfaces. It was probably used mainly for very fine work in the preparation of fiber in basketry, especially since the only basketry-impressed asphaltum-coated rock in both sites occurs during this particular phase.

Matting Needle Fragment

One matting needle fragment (1-124842, A13, 72") is present here. It is made from part of a mammal rib. The handle has been broken off, leaving a specimen which is clearly plano-convex in cross-section. It is 5.4 centimeters long, and is about 1.1 centimeters wide at the break where it is broadest. It is not scored, but is very highly polished all around as if it had had heavy use upon a soft fibrous material. The end is blunt, and all the edges are rubbed very smooth, perhaps from continued use for the manufacture of matted containers or objects.

Deer Ulna Awl

One deer ulna awl (1-12438, B10, 68") occurs during this phase. This complete specimen is 11.1 centimeters long. The point is round in cross-section and very sharp at the tip. It is not very long though, because it tapers sharply to this handle which comprises virtually 3/4 of the specimen. The contours of the joint fit those of a human hand very snugly, so it was probably unhafted. The body of the bone is quite flat. It has a fragile appearance and was probably used for delicate work on fibers, suggested by a high polish due to faint longitudinal scorings. The tip, then, shows signs of continued use for some activity that involved the weaving or twining of thick fibers. This would be consistent with what is already known about Phase 2a.

Deer Proximal Cannonbone Awl

One deer proximal cannonbone awl (1-125817, A9, 60") occurs in Phase 2a, and is 12.8 centimeters long. The cannonbone-end is still intact, being naturally rounded, while the very contours of the long handle-end (over 1/2 the length) fit those of the human hand very conveniently, so it was probably unhafted. It looks quite sturdy. Yet the sharp point (round in cross-section) is so well polished by faint longitudinal scorings that it was probably used almost solely for the weaving or twining of thick fibers, consistent with the ecological context of Phase 2a (as indicated by the analysis of lithic materials).

Deer Split Cannonbone Object

One deer split distal cannonbone specimen (1-125816, A10, 56") occurs here, and is 13 centimeters long. It need not be a tool at all, but only a rejected half of a bone (split along the middle) which was to yield a suitable blank for an awl. A concave curvature of the outside surface and a very thin point would probably disquality this

fragment as a suitable material from which to make an awl. It may have been used for an abalone pry, since there is abundant shell evidence for Haliotis fulgens having been gathered during this phase. In any case, no other objects in this phase seem to have been used as abalone pries, with the possible exception of 2 worked rib fragments which are described in the following paragraph.

Worked Ribs

Two worked ribs (1-124787, A9, 43"; 1-124786, A12, 12") have been split and fragmented. The ribs are probably of deer. They were probably discarded, since their outer surfaces have a concave curvature. The other halves were probably blanks, which may have been made into matting needles whose lengths, suggested by these discards, were in the range of about 9 to 12 centimeters. However, they could have been used as abalone pries, since Haliotis fulgens shells do occur within the stratigraphic layer attributed to Phase 2a cultural occupation.

Deer Split Distal Cannonbone Awl

One deer split distal cannonbone awl (1-124785, A9, 44") has been found in this phase. It is 15.8 centimeters long. Its point is polished by faint longitudinal scoring. This scoring has been gouging a concavity into the round cross-section about 1 centimeter behind the tip, due to the activities involved in weaving fibers.

Deer Cannonbone Fragment

One deer cannonbone fragment (1-124815, A11, 55") is in this phase. This split or shattered bit is 6.6 centimeters long. It has had its edges worn down very smoothly, suggesting some use for scraping fiber and bark in basketry. This point is blunted.

Bipointed Gorge

One bipointed gorge (1-124818, A10, 62") occurs in Phase 2a. A complete solid bone pin, which is 3.9 centimeters long and 0.3 centimeters thick near the middle, this pin tapers to a sharp point at each end. One side is flat and the other sides are slightly humped. A most likely function would be that of a barb, probably on a compound fish-hook where both points could be useful if the gorge were set on a central fulcrum like a toggle hook.

Gorge Fragment

One pointed gorge fragment (1-124847, A14, 49") occurs here. This fragment is made from a split hollow bone of some small animal. The broken edges are worn smooth, and one end has a very sharp point. It resembles a toggle gorge (noted

above) in thickness (0.4 centimeters) and shape (humped near the middle except for 1 flat side). This fragment is 2.3 centimeters long, but the original length was probably closer to 4 centimeters.

Worked Bird-Bones

Two worked bird-bones (1-124773, A9, 14"; 1-124844, A14, 66") are the same length -- 5.9 centimeters long. Both unpolished pieces have one end broken and another end which is split or cut, but worn smoothly. They may be blanks for gorge hooks.

Torqued Bipointed Gorges

Two specimens (1-124783, A10, 44"; 1-125432, D2, 46") appear to be barbs which could be fixed firmly onto a compound fish-hook. Made of solid bone, each is propellor-shaped. Length ranges from 3.4 to 3.7 centimeters, the average being 3.5 centimeters.

Bird-Bone Beads

Two bird-bone beads (1-125494, D2, 49"; 1-125339, D1, 36") in Phase 2a are polished and cut short (2.2 and 3.3 centimeters). These are ornaments.

Cut Bird-Bone Tube

One end of this tube is blocked by a battered proximal joint of a bird ulna (1-125548, C1, 16"). This blocked tube is 12 centimeters long. It is not a finished object nor a discard. Context does not help much in assigning a likely function, but the occurrence of beads and toggle gorges made from bird-bones during this phase suggests that this might have been a blank for beads or gorges.

Flattened Fragment

One flattened fragment (1-124836, B11, 58") is in this Phase 2a. This polished solid bone object has a sub-rectanguloid and somewhat rounded cross-section (0.2 centimeters thick and 0.7 centimeters wide), but tapers to a point. The fragment is 4.4 centimeters long, and resembles a composite fish-hook shank. This attribution of a function involving fishing is consistent with the ecological characterization of Phase 2a so far in this analysis of the artifactual content of this phase.

Phase 3

Splinter Awls

Two splinter awls (1-124841, B12, 54"; 1-124839, B10, 3") are each 10.9

centimeters long. Both are complete. They have short tapering points 1 to 2 centimeters long. Slight longitudinal scoring is evident. These are sturdy tools. The points have a thick round cross-section. The heavier tool has a very sharp point whose tip is blunted. The slimmer tool has a sharp tip which has been worn about 2 centimeters beyond the tip, leaving a concavity along one side, indicating the depth of thrust, if the tool was used to make fiber containers which, in turn may be used to transport shellfish or acorn flour. The context here adds probability to the view that these awls were used as basketry tools, unlike those in Phase 1, which were most likely chert flakers. The actual physical difference between splinter awls in these 2 cultural phases is minimal, but ecological contexts differ enough to suggest alternate functions for such similiar implements.

Deer Split Distal Cannonbone Awl

One deer split distal cannonbone awl (1-124840, A13, 6") is shorter than the one in Phase 2a. This one is a complete specimen which is only 11.4 centimeters long. Its point is sharp and round in cross-section. Polished by longitudinal scoring, this awl has had a notch ground deliberately about half-way along its length, perhaps in order to give a grip on the back-thrust. This tool has a lengthy point, about 6 centimeters, which probably indicates the depth of thrust. Clearly, it was used in making fiber objects.

Long Pin Fragment

One long pin fragment (1-124781, A12, 12") occurs within Phase 3. It is part of a slender pin. Subrectanguloid in cross-section, it is only 0.2 centimeters thick and 0.5 centimeters wide. This fragment is flat and oblong, being 7.8 centimeters long at the break, and too delicate to have been used as an awl.

Bird-Bone Whistle

One bird-bone whistle (1-124846, B12, 56") still has the asphaltum plugs in it. A groove is ground 1/3 of the way on the flat side, and exactly in the middle of this cut bone which tends to contract near the center. This is a complete specimen, 6.6 centimeters long. It yields a high pitched tone which might be heard miles away. The emitted sound suggests that it might have been useful in situations which required long-distance signals or calls. However, the distal end retains impressions of fibers or strands in the adhering asphaltum. These appear to have secured decorative feather-shafts. Usage might have been ritual.

Burned Bird-Bone Fragments

Two burned bird-bone fragments (1-124843, A14, 29"; 1-124769, A12, 36") approximate 5 centimeters in length (really 4.5 and 4.9 centimeters). In each specimen, only one end has been cut. The other end has been broken and burned as if it had been

in contact with some pipe bowl. These would be about the right size and shape for identification as a pipe stem, but the lack of pipe bowls would make it an inconclusive identification. No alternative functions are suggested by either the form or the archaeological context.

Cut-Bird-Bones

Two cut bird-bones (1-124845, B12, 28"; 1-124774, A-?) occur in Phase 3. Both are cut near the humerus joint in the making of something else. They are most likely discards, 3.4 and 5 centimeters long, rather than blanks. It does indicate that bird-bones were worked into objects within the site rather than brought in from elsewhere.

Worked Antler Tine Tips

3 worked antler tine tips (1-124771, A11, 48"; 1-125338, D1, 12-24"; 1-124835, B10, 5") have been cut from a rack. Each tip is scarred in a spiral way. The heavy rubbing and grinding on one of the tips has blunted it almost square. Another tip has a 3/4 groove around its base, showing signs of binding to a notched handle. The other tine tip has had its base cut and then rubbed smooth in order to allow for hafting of some kind. These objects indicate a function relevant to the important shell industry at the site. They might have been used to perforate shell ornaments by manual pressure.

Fishbone Awl

One fishbone awl (1-124837, A23, 23") has been recorded in the field catalog, but it is missing.

Carbonized Fibers

Some unidentified or unidentifiable bits of burned fibers (1-124884, A12, 16") occur near the missing fishbone awl. They might be basketry, native tobacco, seaweed, or twine remains. The carbonization itself could have been rapid (due to exposure to fire) or slow (due to oxidization), so it is not definite whether these fibers were burned or just allowed to rot. The association with fire-pits is not definitely fixed in the field records, but it is probable.

Phase 2bcd

Deer Proximal Cannonbone Awls

3 deer proximal cannonbone awls (1-125114, NE5, 60-72"; 1-125629, NE2, 48-60"; 1-133579, B9, 0-12") look like the one in Phase 2a and were probably also used for the weaving and twining of thick fibers. However, there is a bit of difference in form. The head is not complete on any of these. About a quarter of each has been battered away.

Also, the points have been broken off these awls, suggesting that they might have been thrown away deliberately rather than lost. A twining or weaving function is consistent with what is known already about other objects within this stratigraphic layer.

Deer Ulna Awls

2 deer ulna awls (1-125648, NE7, 50"; 1-125639, SE4, 12") are slightly shorter, 9.5 centimeters, than the one in Phase 2a. Otherwise, the form is the same so there is more evidence here for cultural continuity between Phases 2a and 2bcd.

Deer Split Distal Cannonbone Awls

3 deer split distal cannonbone awls (1-125113, NE5, 60"-72"; 1-125004, NW2, 60"; 1-125077, SW5, 24") are about 3 centimeters shorter than the one in Phase 2a. An interesting feature is that the tips are broken off 2 of these awls (which are 10 and 12 centimeters long). It is interesting, since it is a feature which has already been noted for the earlier deer ulna awl. The single complete specimen here is 13 centimeters long. The function of these awls, as suggested by ecological context, is also probably relevant to the weaving of basketry.

Pointed Gorges

3 pointed gorges (1-124972, SW3, 66"; 1-124907, NW4, 48"-60"; 1-133582, D3, 17") may be classified as Type B. These gorges are very unlike those in Phase 2a and the difference is probably both temporal and functional, but not necessarily cultural. The 2 sub-types of gorges which occur during Phase 2a may be designated tentatively as Type a or simply as fish hook gorges. Type B gorges are not for fishing. Unlike the earlier gorges, Type B gorges have rounder cross-sections and tend to be about 1/2 centimeter longer. These are stylistic distinctions which could indicate that the objects might have been used for something other than fishing, especially since one is associated not with any fishing gear but with a child's face (Burial 1 in Mnt-281). They may have been nose-plugs. A diameter of between 2 and 3 millimeters at the center which is the thickest part) would be about the right size for a nose-plug, and the direct archaeological association also suggests this as the most likely function for these gorges.

Worked Bird-Bone Fragment

One worked bird-bone fragment (1-133575, C2, 12"-18") occurs during this phase. It is cut and polished to a point at one end but is broken at the other end. The piece is 6.8 centimeters long. This may represent less than half of the original length. A non-utilitarian function is indicated by its very flimsiness. It was probably a decorative hair-pin ornament or a "hat-pin" of some sort, since there is no alternative or more utilitarian function indicated by the context of other objects here.

Cut Bird-Bone

One cut bird-bone (1-125385, SE2, 36"-48") consists of a 7.5 centimeter long piece of the proximal end of a pelican humerus. It is probably a discard. The other part of this bone may have been utilized in the making of a decorative pin object. The context does not suggest any more utilitarian function to the object.

Worked Rib Fragment

One worked rib fragment (1-125634, NE3, 60"-72") may be part of a deer. Both ends have been broken off. The fragment is 11.1 centimeters long. It has been ground down into a pinlike shape with such heavy scoring that it looks incised. The probably function, consistent with the preceding evidence, appears to be relevant to some kind of ornamentation for the hair.

Worked pieces

4 worked pieces (1-125011, NW10, 60"-72"; 1-125086, SW3, 60"-72"; 1-125649, SE5, 24"-36"; 1-125480, SE2, 12"-24") in this phase look like discards. The manufacture of tibia or cannonbone awls might involve such discards. However, each of these might have been used as an abalone pry, since each shows definite signs of wear along the edges. The shortest (6.5 centimeters) has one end which is both broken and burned. The others would be about the right lengths for a medium sized abalone, about the size of a fully grown Haliotis fulgens species, whose shells dominate Phase 2bcd. However, lengths alone are very inconclusive. It is the association of these objects with Haliotis fulgens and the wear on the edges of these objects which might justify an interpretation of these objects as abalone pries.

Worked Deer Scapula

1 worked deer scapula (1-124932, SW1, 36"-48") occurs in this phase. It looks like a sawblade or a saw. The joint probably served as the handle but this might have extended further if it was hafted. The scapular spinal edge is not only cut away but also retains many traces of asphaltum. It is as if this asphaltum covered edge had been strengthened or reinforced by being hafted into a grooved wooden bar. The tip is missing, so the present length is only 13.5 centimeters. The other edge (the posterior border of the scapula) is also cut and worn, but is highly polished by wear. The worn edge might have been toothed before being submitted to heavy use. It may have been used to cut birdbones or abalone shells. A comparable specimen is recorded in the field catalog (78, C1, 41") for this phase, but it is apparently lost.

Deer Broken Base Cannonbone Awls

3 deer broken base cannonbone awls (1-125115, NE5, 60"-72"; 1-125219, NE3, 48"-60"; 1-133569, C8, 34") occur here. These are relatively short and complete

specimens (3, 4 and 7.6 centimeters) which tend to have bevelled points (round in cross-section) on the tips. There is longitudinal scoring evident around the middle of each awl, but the latitudinal or spiral scoring would seem to characterize the polished end of each. Joints were probably broken off in order to facilitate hafting. These awls were evidently intended for heavy drilling duty on abalone shell or wood. The high polish suggests drilling or punching in relatively soft matter.

Phase 4

Deer Vestigial Metatarsal Pins

Two deer vestigial metatarsal pins (1-133477, C2, 55"-65") are associated with the burial of an adolescent female, namely Burial 6 in Mnt-281.

Both pins are by the head of this individual whose fractured maxillary bones suggest a violent death. It is difficult to ascertain whether such skeletal evidence indicates a traumatic injury or whether the fracture occurred after death. There would be no evidence of healing in either case. Yet the one suggesting violent death need not assume some accident during the burial ritual, and seems to be at least as acceptable as the alternative interpretation of this evidence.

The associated pins were probably earrings. These specimens are virtually identical. Each has had the joints ground smooth, and the tips sharpened to a point which could pass through the lobe of a human ear. The definite archaeological association would seem to allow no other interpretation regarding the function.

Deer Split Distal Cannonbone Awl

This deer split distal cannonbone awl (1-125328, NE7, 18") is 7.5 centimeters long. This is about 4 centimeters shorter than the one in Phase 3 and is much shorter than the one in Phase 2a. Also, a relatively longer point seems to characterize this shorter awl which has no notch half-way as the others do. This may suggest a depth of thrust which is not so deep as before. The scoring is clearly longitudinal. Thus, aside from length, this awl is very like the type in Phase 3 which was used in basketry. This function would be consistent also with other objects in this phase.

Deer Broken Base Cannonbone Awls

During this Phase 4, 3 deer broken base cannonbone awls (1-125221, NE2, 27"; 1-133570, D6, 19"; 1-125238, NE6, 16") are 3 to 8 centimeters longer than those in Phase 2bcd. One complete awl specimen is 10.8 centimeters long, the other 2 with their tips broken off being only a shade shorter (10.5 and 9.8 centimeters). These were apparently hafted, so that more pressure might be exerted in perforating shell or wood. The breaking of such points is relevant for hafting.

There is 1 other specimen (1-125466, NE8-Extension) which has no listing or vertical location. Yet its length (9.9 centimeters) indicates that it might be grouped with similar objects during Phase 4 within this uppermost stratigraphic layer.

Deer Cannonbone Objects with Heads Worked Down

5 deer cannonbone objects with their heads worked down (1-125366, NE8, 24"-36"; 1-133572, D3, 18"; 1-133578, C3, 15"; 1-133583, C1, 12"; 1-133581, D4, 6"-12") are in this phase. These have variable lengths and perhaps a number of different functions, but the working down of each head was probably intended to provide a natural handle (no hafting) or a more aesthetic ornamental quality. One object has no point at all, since it has been broken near the base. One (10 centimeters long) has the tip and part of the base broken off. The remaining 3 are complete. All have very sharp and fine needle points which exhibit a high degree of delicate polish with no sign of any wear through use. The longest 2 specimens (14.4 and 10.1 centimeters) may have doubled as hair pins and sewing needles. The shorter one (5.1 centimeters) may be a needle which probably doubled as a kind of belt buckle.

Long Thin Curved Deer Cannonbone Objects with Broken Bases

Two long, thin, curved deer cannonbone objects with broken bases (1-124973, NW 7, 48"-60"; 1-133471, D5, 21") occur in Phase 4. Both specimens are complete (10 and 9.5 centimeters long) but their bases have been broken intentionally either for hafting or for the provision of a natural handle. The scoring is longitudinal and suggests a likely use as an awl for some basketry weaving or even for the manufacture of nets. The occurrence of fishing gear within this stratigraphic layer suggests as ecological context where fishing is evident.

Flat Eyed-Matting Needle

One flat eyed-matting needle (1-125017, NW5, 48"-60") is in Phase 4. Its tip has been broken off. An alternative function is difficult to envisage. It is polished by use and bears many light scoring scars which are all oriented longitudinally. The perforation could have doubled as an eye for a needle or as a hole for a pendant. This basal piece, over 3 centimeters long, was probably a centimeter longer. Fiber strands strung through the eye of this needle could slide easily between the cracks of the twined strips of thick fiber. The hole is biconically drilled from both sides of a rib.

Polished Rib Strigil

One polished rib strigil (1-125582, SE5, 12"-24") is found in Phase 4. It consists of almost the entire length of a split and polished rib (probably deer). One end is blunt and rounded, while the other end is broken. It is likely a strigil. This is suggested by its dimensions: 14.7 centimeters long, 1.4 centimeters wide, and about 0.2 centimeters thick.

Bone Tube

One bone tube (1-124909, NW10, 24"-36") looks like part of a hollow mammal (deer?) bone. It is about 2 centimeters in diameters and is 7.8 centimeters long. Also, it is noteworthy that both ends of this tube have been cut straight and ground very smooth. It is a very polished specimen marked by longitudinal scoring. It looks almost as if it had been repeatedly drawn through a rather porous weave in some container made from fiber, drawing a thick strand of fiber (inside the tube) along with the thrust of the tube through fairly well spaced cracks between rather thick fibers. The size of the fiber in between here suggests that it may have been used in somewhat larger structures and objects, like huts, floor mats, or large storage containers. This function is not conclusively established, because not a single organic structure has been preserved in this site. Yet the general ecological reconstruction of this Phase 4 supports a veiw which could argue cogently for such larger organic structures.

Bird-Bone Whistle

One bird-bone whistle (1-124906, NW7, 48"-60") is in Phase 4. This is quite a short specimen (3 centimeters) which has a shrill or piercing pitch, and its tone might carry even farther than that of the specimen which occurs in Phase 3. It is hardly a musical instrument. Its function may be more relevant to an activity associated with hunting where signals or calls over great distances can be important. However, as with the whistle in Phase 3, a ritual function is also quite likely. Each of the ends has been ground very smooth. The surfaces are well polished, and the stop-hole is in the center. The asphaltum plugs are missing, so plasticene was used to test the pitch.

Worked Deer Antlers, Horn Cores and Tine Tips

There is ample evidence of horn-working during Phase 4. This is provided by 4 antler cores and 6 worked tine tips. Worked objects of this kind are often described with no attempt being made at a functional analysis, but the context so far may assist in some attempt to attribute a function to each of these objects.

There are 4 deer horn shafts or bases here (1-133574, D3, 21"; 1-125614, SE4, 0"-12"; 1-124914, SW3, 0"-12"; 1-125172, NE4, 0"-12"). Two specimens are still attached to the skull piece, and another 2 have been broken above an equatorial bony ridge:

Horn Handles: One of the detached horns is also broken at the other end, and yields an L-shaped tool with a handle which is rather long (24.5 centimeters) and a small groove cut across a snub nosed tip, maybe to haft a small chert flake for a drill. The other detached horn has traces of asphaltum on one end which has been cut into a wedge shape, probably for hafting.

Grooved Horn Cores: Both antlers still attached to a deer skull have deep

grooves cut about 4 centimeters above the bony ridges. The obvious inference might be that these grooves indicate the interruption of a process which was intended to sever the skull fragment from the antler. Perhaps a less obvious (but likely) function is suggested by the regularity of the groove which may have been intended to secure a fiber strand. This long strand would allow a person to swing the skull fragment like a bola or bull-roarer, and, if released, could be a hard projectile.

There are 6 horn tine tips (1-133568, D4, 45"; 1-125640, SE4, 36"-48"; 1-125014, NW1, 36"; 1-125074, SE1, 30"; 1-125073, SE1, 30"; 1-133580, C2, 12"-18"). Generally, these tine tips have an average length of 8 centimeters. Their ranges are 2 centimeters either way (6 cm., 8 cm., 8 cm., 9.5 cm., 11.5 cm.) and their bases might be either roughly broken or neatly cut.

Cut Tines: The longest one (11.5 centimeters) has a wedge-shaped fracture running back from the tip suggesting use as a chert flaker. The tip is blunted and bevelled. Alternately, it may have been held, probably unhafted, in the fist, and pushed forward with some force at an angle to some plane, like a gouge over an organic material like wood or fiber, since there is some longitudinal scoring. The context suggests the latter rather than the former. The other tine is shorter (8 centimeters) and is cut at both ends. A circular hole has been drilled longitudinally from one cut end. It seems to be a handle of some kind with a socket at one end.

Broken Tines: Each of these 4 broken tines has its tip blunted by matter which had been set at right angles to the tine. One has the tip bevelled on several surfaces, suggesting use as a kind of chert flaker, but several of the spiral scorings angle rather abruptly, starting around a centimeter beyond the tip. These scorings and the blunted tips indicate that these were probably punches, and what looks like a broken end may have been battered. A broken tine, showing minimal use, is associated with the body of a mature female (Burial 7, Sub-phase b), and may be a pin.

Worked Whalebone Fragments

2 worked whalebone fragments (1-133573, C4, 45"; 1-125630, NW7, 12"-24") occur in Phase 4. Each is made from one split length of whalebone. Apparently opposite ends are broken off. One fragment (22.5 centimeters long, 5 centimeters wide, 0.7 centimeters thick) tapers at the end, and one (18.5 centimeters long, 6 centimeters wide, 1.8 centimeters thick) is rounded. These were probably opposite ends of abalone pries which could have been used to extract the fresh meat of abalone from the shell.

Archaeological Features

One whalebone object is associated archaeologically with a pit in the midden. See Feature 1 on Floorplan in Figure 6. There is a long oval fire-pit (or series of them) in the vicinity of this specimen which, according to the field catalog, was in a

"midden with large amount of burned shell." The dimensions of these fire-pits suggest that long logs were probably laid side by side, parallel to each other, within rather deep and long pits. Therefore, not only is depth in this case misleading, since this particular specimen is quite a few inches deeper than nearby objects also in Phase 4, but also, from the methodological view, the larger implication would be that a simple accounting for vertical distributions completely disregards such vital stratigraphic items as pits.

Summary of Bone Artifacts

The 87 bone artifacts have been grouped within 45 descriptive categories, and in a sequence of 5 consecutive cultural and/or ecological phases, which are tied in with the stratigraphic peculiarities evident at both sites and with 3 associated burials. A few of these categories recur in 2 separate phases. In most cases, this represents a continuity (between both parts of Phase 2, and between the Phases which have been numbered 3 and 4), except when a large difference in style suggests an alternative function (as with gorges and noseplugs). Stylistic features have been important in the attribution of functions, and in cases of doubt, an appeal has been made to ecological contexts.

Functional Correlates

The proposed functional equivalents for the bone objects in the various descriptive categories appear to be consistent with the general ecological context implicit in each phase as a result of the analysis of the lithic content of each phase.

Phase 1 (1 category, 2 specimens); 2 splinter awls - 2 chert flakers.

Phase 2a (15 categories, 19 specimens); 1 small gouge - 1 gouge for organic material; 1 matting needle fragment - 1 matting needle; 1 deer ulna awl - 1 basketry awl; 1 deer proximal cannonbone awl - 1 twining awl; 1 deer split distal cannonbone object - 1 abalone pry?; 1 deer split distal cannonbone awl - 1 basketry awl; 1 deer cannonbone fragment - 1 fiber scraper; 2 worked ribs - abalone pries?; 1 bipointed gorge - 1 toggle gorge for fish-hook; 1 pointed gorge fragment - 1 toggle gorge; 2 worked birdbones - 2 toggle gorge blanks; 2 torque bipointed gorges - 2 fixed barbs for fish-hook; 2 bird-bone beads - 2 bird-bone beads; 1 cut bird-bone tube - 1 blank for beads or gorges; 1 flattened fragment - 1 composite fish-hook shank.

Phase 3 (9 categories, 14 specimens); 2 splinter awls - 2 basketry awls; 1 deer split distal cannonbone awl - 1 basketry awl; 1 long pin fragment - 1 ornamental pin; 1 bird-bone whistle - 1 whistle for calls, signals or rituals; 2 burned bird-bone fragments - 2 pipe stems; 2 cut bird-bones - 2 abalone pries?; 2 worked antler tine tips - 3 hafted perforators; 1 fish-bone awl - 1 basketry awl; carbonized fibers - use of fiber.

Phase 2bcd (11 categories, 23 specimens); 3 deer proximal cannonbone awls - 3 twining awls; 2 deer ulna awls - 2 basketry awls; 3 split deer distal cannonbone

awls - 3 basketry awls; 3 pointed gorges - 3 nose-plugs; 1 worked bird-bone fragment - 1 ornamental hair pin; 1 bird radius pin - 1 ornamental hair pin; 1 cut bird-bone - 1 discard or ornamental hair pin; 1 worked rib fragment - 1 ornamental hair pin; 4 worked pieces - 4 abalone pries; 1 worked deer scapula - 1 saw; 3 deer broken base cannonbone awls - 3 hafted perforators.

Phase 4 (11 categories, 29 specimens); 2 deer vestigial metatarsal pins - 2 earrings; 1 deer split distal cannonbone awl - 1 basketry awl; 3 deer broken base cannonbone awls - 3 hafted perforators; 5 deer cannonbone objects with heads worked down - 5 needles, hairpins, belt buckles; 2 long thin curved deer cannonbone objects with broken bases - 2 hafted netting awls; 1 flat eyed-matting needle - 1 eyed-matting needle; 1 polished rib strigil - 1 strigil; 1 bone tube - 1 matting tool for larger structures; 1 bird-bone whistle - 1 whistle for calls, signals or rituals; 10 worked deer antlers, horn cores, tine tips - 1 handle for chert flakes, 1 wedged handle, 2 grooved throwing objects, 1 gouge or chert flaker, 1 socket handle, and 4 perforators; 2 worked whalebone fragments - 2 abalone pries; archaeological features - long oval fire pits.

Distribution of Functional Categories

30 functional categories of bone objects emerge from this analysis. Their temporal distributions may be tabulated most meaningfully in terms of The Phase - a chronological unit which has been anchored firmly to the stratigraphic records.

Functional Categories	1	2a	3	2bcd	4
Chert flakers	2				
Toggle gorges		2			
Toggle gorge blanks		2			
Fixed fish-hook barbs		2			
Fish-hook shank		1			
Bird-bone beads		2			
Bead blanks		1			
Matting needles		1			
Bark scrapers		1			
Twining awls		1		3	
Gouges		1			1
Basketry awls		1	5	5	1
Abalone pries		3	2	4	2
Whistles for calls			1		1
Pipe stems			1		
Carbonized fibers			1		
Ornamental hair pins			1	4	
Hafted perforators			3	3	7
Nose-plugs				3	

Functional Categories (continued)	1	2a	3	2bcd	4
Saw				1	
Earrings					2
Needles or pins					5
Netting awls					2
Eyed-matting needle					1
Tubular matting tool					1
Strigil					1
Horn socket handle					1
Horn wedge handle					1
Horn handle for chert flake					1
Grooved horn throwing objects					2

Alternative Mode of Analysis

Perhaps the most direct way of demonstrating the analytic utility of the Phase (as defined above) would be to present the results of a mode of analysis which relies on only the vertical distribution of artifacts either from the surface of the site or from arbitrary datum. This is an alternative mode of analysis which has had great utility in the study of samples derived from a single deep stratacut of limited areal dimension in a mound where natural stratification is virtually impossible to detect.

This alternative mode of analysis is likely to yield some very meaningful results in such sites, where a constant rate of deposition is often assumed, and where it is assumed that no great stratigraphic discontinuities obtrude. However, the extension of this mode of analysis to cope with such sites as Mnt-282 and Mnt-281 which have been excavated over a large area would seem to be an illegitimate extension of this method, especially since stratigraphic irregularities are known to exist within these sites at the mouth of Willow Creek.

The point here is methodological. Quite incidentally, it may recommend a re-examination of data from at least one major excavation where data show stratigraphic pecularities not taken into account by this mode of analysis which recognizes only vertical distributions of objects (e.g., Davis and Treganza, 1959). However, the concern here is with Mnt-282 and Mnt-281 and not with the re-examination of other sites.

At the Willow Creek sites, the use of only vertical distributions (and not the horizontal co-ordinates) can at best yield only artificial limits for each phase. These blurred boundaries in turn can provide only a very generalized characterization of such an arbitrary phase.

Consequently, it is likely that, lacking any clear ecological context for each phase, the objects themselves might have to have names which would be more descriptive than functional. The number of these generalized descriptive categories would be

be in the vicinity of 30. Such identification would be Step 1 in a 3 step program.

Step 2 would be to segregate those kinds of objects which occur only in the lower midden (Mnt-282) from those which occur only in the upper midden (Mnt-281). In effect, this would be a segregation of *"early" traits (in Mnt-282) from "late" ones* (in Mnt-281). Here, the procedure is facilitated by the intervention of about 10 feet of sterile gravel between the lower midden and the upper one.

Thus 10 "early types" (which occur only in Mnt-282) and 11 "late" ones (which occur only in Mnt-281) can be distinguished. This appears to be a useful distinction, but what of the 9 categories of objects which recur in Mnt-282 and Mnt-281?

Can vertical distributions alone suggest the nature of this apparent continuity? This would be Step 3, plotting vertical distributions, ignoring the stratigraphic peculiarities which may skew tabulations. Clearly, the tabulation on the following page suggests little (if anything) more than the one below.

Found only in Mnt-282	Found in both sites	Found only in Mnt-281
Large pin		Polished rib strigil
Small gouge		
Fishbone awl		Sharp deer vestigial outer metatarsal
Splinter awl	Deer ulna awl	Thin curved awl
Matting needle		
	Cannonbone awl: proximal end or distal end	Cannonbone awls: base broken or worked head
Fish-hook shank	Gorges	
	Bird-bone whistle	
Bird-bone bead	Worked bird-bone	Bird radius pin
Bird-bone fragment	Cut bird-bone	
	Worked antler	
	Worked rib	
		Worked pieces
		Mammal bone tube
Worked deer cannonbone		Worked whale bone
Carbonized fibers		Worked deer scapula

Category of Bone Artifact	Twelve-inch Stratigraphic Levels*													
	Mnt-282							Mnt-281						
	A	B	C	D	E	F	G	A	B	C	D	E	F	G
1 small gouge	1													
1 matting needle		1												
2 bird-bone fragments		1	-	-	1									
4 splinter awls		2	1	-	-	-	1							
4 proximal cannonbone awls		1	-	-	-	-	-	-	1	1	-	-	-	1
7 gorges		1	-	3	-	-	-	-	1	1	-	-	1	
3 deer ulna awls		1	-	-	-	-	-	-	-	1	-	-	-	1
1 fish-hook shank			1											
1 worked cannonbone			1											
2 bird-bone beads			1	-	1									
7 distal cannonbone awls			1	1	-	1	-	-	1	1	-	-	1	
3 worked ribs				1	-	1	-	-	1					
2 bird-bone whistles				1	-	-	-	-	-	1				
4 cut bird-bones					1	1	1	-	-	-	1			
3 worked bird-bones					1	1	-	-	-	-	-	-	1	
13 worked antlers					1	1	1	-	-	-	2	3	2	3
1 fishbone awl						1								
1 carbonized fiber						1								
1 large pin							1							
2 deer vestigial metatarsals									2					
6 broken base cannonbone awls									1	1	-	2	2	
4 worked pieces									2	-	-	1	1	
1 eyed-needle										1				
2 thin curved awls										1	-	-	-	1
1 bird radius pin											1			
1 worked deer scapula											1			
2 worked whalebones											1	-	1	
1 mammal tube												1		
5 worked head cannonbone awls												1	2	2
1 polished rib strigil													1	

* The capitalized letters are symbols for these depths below the surface: A=72" - 84"; B = 60" - 72"; C = 48" - 60"; D - 36" - 48"; E = 24" - 36"; F = 12" - 24"; and G = 0" - 12".

Shell Artifacts

Data on 277 shell artifacts are included in the text. Many of these are illustrated in Figures 17 and 18. 51 shell artifacts occur in Mnt-282, while Mnt-281 yields 226. This uneven ratio (1 to 4.5) seems suggestive, as is the difference in concentration index of shell artifacts at both sites (1 per 35 cubic feet in Mnt-281 and 1 per 51 cubic feet in Mnt-282). It suggests that people during the earliest occupations of the site might not have worked shells quite so intensively as more recent peoples.

Yet this difference may be due to demographic shifts in this region. It is the purpose of this section to suggest how such differences in frequency might reflect some relocation of home-bases closer to the Willow Creek locale. That is, when the home-base was in the vicinity of Willow Creek, then one might expect to work in shell should reach later stages in manufacture more than might be the case if the home -base were farther away elsewhere.

Classification of Shell Artifacts

Unlike the bone artifacts, very few if any of these shell objects are industrial tools. Rather, they probably represent the remains of the major industrial product which was made by people during most phases at both sites. This industry, of course, would be the manufacture of ornaments from local molluscs, especially from 3 abalone species which apparently abounded and still abound in the shallow tidal waters of this rocky coastal cove.

Consequently, a classification of the shell artifacts would be expected to differ from the schemes employed for the classification of burials, lithics and bones. Essentially 2 kinds of shell artifacts occur in both middens: 1) products, and 2) debitage. Most shell objects here belong to this second general category (debitage).

Our problem is to allocate such debitage within a few discrete temporal units, so that differences in frequencies might not be lost in some blur of quasi-seriation, which might be suggested by an accounting of only the vertical distributions of the shell objects. The differences in frequencies should be stratigraphically true. That is, they should be tied in with the natural stratigraphic layers rather than set apart according to arbitrary levels of depth from the surface or from some datum.

Problem-oriented in this way, then, this classification will refer to the phases which have been defined already in order to analyze first, the finished products, and then the debitage. Results should be far more meaningful than those yielded by the other analytic method which relies solely on vertical distributions. Before employing our selected method, it may be best to show the limited amount of significant inferences which may be made on the basis of the alternative method which uses only vertical distributions. It may bring out contrasts.

Comparision of Analytic Alternatives

It is possible to distinguish 25 categories of shell artifacts, regardless of which mode of analysis may be used. Again, the intervention of about 10 feet of gravel between the upper midden (Mnt-281) and the lower one (Mnt-282) tends to facilitate the segregation of objects which occur only in the upper midden ("late traits") from those which occur only in the lower midden("early traits").

Several significant inferences may be made on the basis of such segregation, regardless of which method of analysis is used. At this stage (Step 2), no apparent difference occurs between the 2 major modes of analysis.

Over 2/3 of all shell specimens fall within the intermediate 8 categories, where Mnt-281 has over 3 times as many specimens (150 to 46). This ratio is very consistent with that for excavated volumes of both middens.

Tabulations in the following pages suggest 3 other ratios:

1) 21 categories occur in Mnt-281, while Mnt-282 has only 12.
2) 4 "early" categories have only 5 specimens, while 13 "late" ones yield 77 shell objects.
3) Only 1/6 of all categories are "early", while 1/2 are "late".

Such ratios suggest that early peoples at Mnt-282 did not work quite so much on shell on this site as the more recent peoples did.

This, in turn, suggests another hypothesis. Lacking any actual physical evidence of worked shells within the Nacimiento, San Antonio and Salinas Valleys, it may be worthwhile to consider the possibility that these early peoples may have transported the shells from Willow Creek to some inland location where a few more sedentary specialists might finish working them. The test which is proposed later in this section is admittedly rather indirect in this regard, since the evidence is limited, but will involve a comparison of the frequencies of different kinds of debitage during various phases.

Incidental to this, but relevant here, it may be noted that the tabulated vertical distributions of the shell objects (following) display a number of stratigraphic discontinuities. It can be argued that the size of the sample is indaequate to mediate such gaps, but this is not a particularly reasonable argument if its purpose is to justify the use of only vertical distributions as a methodological tool. Most of these gaps are due to those stratigraphic peculiarities with which this particular method is unable to cope.

Found only in Mnt-282	Found in both sites	Found only in Mnt-281
Haliotis		
		Rim broken along valves
Perforated disc		Hole punched in back
Thin flat piece		Irregularly chipped
		Asphaltum-covered
	Ornament	Chipped disc
	Worked piece	Gaming piece
	Spoon or scraper	Ground rim
		Worked rim
Disc bead ("Early")		Disc beads ("Late")
	Fish-hook blank	
	Fish-hook	
Mussel		Chipped disc (Fish-hook blank?)
	Fish-hook	
Chiton		
	Plate	
Olivella		
Bead (3c type, disc)	Bead (1b type, ground spire)	Lopped spire bead Ground spire bead with hole in side
Limpet		
		Ground spire bead

Category of Shell artifact	Twelve-inch Stratigraphic Levels*														
	Mnt-282							Mnt-281							
	A	B	C	D	E	F	G	A	B	C	D	E	F	G	None
Haliotis															
14 ornaments	1	1	1	1	-	-	-	1	-	3	-	-	2	2	2
79 worked pieces	1	3	3	3	6	3	6	-	2	6	11	9	8	10	8
73 spoons or scrapers		1	-	-	1	1	1	-	7	15	7	11	14	3	12
9 fish-hook blanks		2	2	-	-	-	-	-	-	-	-	2	2		1
4 fish-hooks		1	-	1	-	-	-	-	1	-	-	-	-	1	
2 perforated discs	2														
1 disc bead			1												
1 thin flat piece				1											
15 irregularly chipped									1	3	6	1	2	1	1
3 rims broken along valves										2					
1 gaming piece										1					
3 ground rims										2	1				
8 worked rims										2	1	3	1	1	
3 pieces with holes punched in back											1	1	-	1	
15 asphaltum-covered											3	3	5	5	
8 chipped discs													3	3	2
2 disc beads														1	1
Olivella															
1 bead (3c type, disc)			1												
4 beads (1b type, ground spire)					1	-	1	-	-	-	1	-	1		
1 bead, spire lopped off											1				
4 beads, spire ground, hole in side												2	1	1	
Mussel															
3 fish-hooks							1	-	-	-	-	1			1
13 chipped discs (fish-hook blanks?)										6	4	2			1
Chiton															
9 plates							4	-	-	3	2				
Limpet															
1 ground spire bead											1				

* The capitalized letters are symbols for these depths below the surface: A = 72" - 84"; B - 60" - 72"; C = 48" - 60"; D = 36" - 48"; E = 24" - 36"; F = 12" - 24"; and G = 0" - 12".

Shell Artifact Products

2 main kinds of shell products are represented at both sites: a) fish-hooks, and b) ornamental objects like beads.

Fish-Hooks and Blanks

7 fish-hooks and 24 blanks (including those 2 perforated discs in Mnt-282) occur at both sites. Mussel and abalone shells were used, and 2 cultural types occur in both middens: 1) small and thin fish-hooks with round shapes due to a tight curvature of the hooks; and 2) large and thick fish-hooks with straight shanks and loosely curved hooks. It is noted that neither of these types shows barbs or auricles.

There can be no question about Type 2 being a fish-hook. It even looks like an unbarbed modern metal fish-hook. There have been some questions raised about Type 1 by Bowers (1883, 1887). He claims that they may be earrings.

This is contradicted along 2 lines of evidence. First, ecologically, fishing is established for the relevant phases (3 and 4) by other kinds of artifacts, such as stone sinkers and netting awls. Second, ornamentally, earrings are known to have been made from deer vestigial metatarsals, not shell, during the same phases. The reason for the small opening in these circular shell objects is cultural, and there is no reason why (except through his own cultural bias in the matter) Bowers should assume that a fish-hook could not have been swallowed.

Phase 1: No fish-hooks or blanks occur during this hunting phase.

Phase 2a: A Type 2, thick, large fish-hook (1-125489, C1, 63") with a loosely curved hook and straight shank occurs along with 6 perforated blanks made from the green-backed species of the middle tide zone abalone, Haliotis fulgens (1-124611, A10, 63"; 1-124834, A10, 68"; 1-124867, A13, 49"; 1-124869, A14, 52"; 1-124833, A11, 78"; 1-124808, A12, 72").

Phase 3: Two Type 2, large fish-hooks (1-125094, SW1, 60"; 1-125092, SW6, 24") with straight shank and loose curvature and made from abalone and mussel are indirectly associated (within this same stratigraphic layer) with 13 unperforated mussel discs.

These 13 objects have quite a uniform size. They range from 3.5 cm. to 5 cm. in diameter. This is about the right size for most fish-hook blanks. Yet neither is perforated. A possible alternative interpretation may indicate that these might have been gaming dies. This seems to be a weaker inference for two reasons. First, gaming dies made of slate occur during another cultural phase (Phase 4). Second, fishing is already indicated for this Phase 2bcd, so these mussel discs, with chipped edges, could have been fish-hook blanks. Perhaps a third reason might be that the shapes and dimensions of the objects approximate those that would be needed for the manufacture of shell fish-hooks. These appear to provide a reasonable basis for the characterization of these objects as fish-hook blanks (1-125192, NE6, 48"-60"; 1-125063, NE1, 36"-48"; 1-125193, NE6, 48"-60"; 1-125208, NE3, 36"-48"; 1-125275, NE4, 36"-48";

1-125191, NE6, 48"-60"; 1-125217, NE3, 48"-60"; 1-125216, NE3, 48"-60"; 1-125276, NE4, 36"-48"; 1-125232, No location, 1-125573, SE3, 24"-36"; 1-125460, SE1, 50"; and 1-133482, C-Trench, 24").

Phase 4: 2 Type 1 fish-hooks (1-125093, SW5, 1"; 1-125095, No location) are made from abalone and mussel. These occur in the same stratigraphic layer as do 5 fish-hook blanks made from Haliotis rufescens and at least partially perforated (1-133491, D5, 19"; 1-133486, A9, 12"; 1-125254, No location, 1-133490, C8, 35"; and 1-125547, SE1, 24").

Summary of Fish-Hooks and Blanks

Stylistic distinctions between Type 1 and Type 2 shell fish-hooks and fish-hook blanks are cultural. They are not chronological differences, because both types recur throughout both middens. Neither are these differences ecological in nature, because both types recur at the same fish-site, near essentially similiar fishes.

Later in the text, 3 Haliotis fulgens shells are described. These are whole shells which have been deliberately perforated through the center of the back. One has asphaltum around the edges of the hole, since asphaltum could have been used as a shock absorbing mastic in the drilling or punching of the shell. These might be Type 2 fish-hook blanks at a very early stage of manufacture. No alternative function is suggested by the formal qualities of the objects or by the ecological context.

Points of Difference Between Types of Fish-Hooks and Fish-Hook Blanks

Category of Shell Artifact	Point of Difference	Type 1	Type 2
Fish-hook blank (abalone)	1	Red-backed abalone (Haliotis rufescens)	Green-backed abalone (Haliotis fulgens)
	2	Large (average diameter is 50 millimeters)	Small (average diameter is 30 millimeters)
	3	Thin (average 3 mm.)	Thick (average 6 mm.)
Fish-hook blank (mussel)	4	Nil (maybe because blank is too small for identification)	Chipped discs (look like gaming dies and unperforated blanks with diameters of 35 to 50 mm.)
Fish-hook (abalone)	5	Circular shape, due to a very tight curvature	Straight shank and loosely curved hook

Fish-hook (mussel)	6	Circular shape, due to a very tight curvature	Straight shank and loosely curved hook
	7	Small, thin and delicate	Large, sturdy and thick

Beads and Ornaments

14 shell beads from both sites occur during only 3 phases (2a, 3 and 4). These have been organized here in accordance with the chronology implicit in the concept of the phase. At least 2 tribal groupings can be discerned on the basis of stylistic differences in the beads.

Phase 2a: 1 disc bead (diameter of 15 mm.) has been cut from an Olivella biplicata shell. Snail shells of this kind have an olive purple color when fresh. They were highly prized by several Costanoan groups even in historic times. It (1-124819, A12, 48") has been drilled to yield a small perforation.

1 spire-ground Olivella biplicata bead looks like Type 1b (Beardsley, 1954: Fig. 6). It is associated with Burial 2 of a female adult (1-124883, B11, 36"). This sub-type recurs during Phase 4.

Phase 4: 3 spire-ground Olivella biplicata beads look like Type 1b (Beardsley, 1954: Fig. 6). This sub-type also occurs during Phase 3 (1-125636, NW3, 36"-48"; 1-125650, C1, 0"-12"; 1-125651, NW1, 12"-24").

4 spire-ground Olivella biplicata beads also look like Type 1b (above), but might have had holes punched deliberately through their sides, so they are tentatively set into a separate sub-type here (1-125075, NE6, 6"; 1-125122, NE4, 24"; 1-125635, NW3, 12"-24"; 1-125151, NE7,, 30").

1 Olivella biplicata spire-lopped bead is also very much like Type 1b (above), except that the tip has been broken off. This has no chronological or cultural ramifications, but the distinction is made by others so it may have some significance elsewhere (1-125637, NW3, 36"-48").

1 large tall white dunce cap limpet Acmaea mitra has had its cone ground down, exposing a hole which is 3 millimeters in diameter. The ground base is 30 millimeters in diameter (1-125638, NW3, 36"-48").

2 Haliotis rufescens disc beads look like Type J2aI (Bennyhoff and Heizer, 1958: Fig. 1, No. 64) and Type 4 (Beardsley, 1954: Fig. 6). One has a location almost on top (1-133492, C8), and the other (1-125253, SW5) occurs in some back-dirt from a pit that is 90 percent upper shell layer.

The 14 shell ornaments at both sites occur throughout each phase. Typological

distinctions here clearly differentiate at least 3 cultural kinds of preference in regard to the general shape of the ornament and to the species of abalone which was used.

Phase 1: 1 large rectanguloid specimen is made of black-backed abalone (Haliotis cracherodii). The back has been abraded smooth and the edges are ground smooth. This smallest abalone species inhabits the warmer shallower tidal zone. It has a wide distribution along the coast of California (1-124631, A9, 73").

Phase 2a: 1 specimen (1-124806, A11, 60") is an ornament with an ovoid shape. It is made of green-backed abalone (Haliotis fulgens) whose spire is at the wide end of this long ovoid ornament. This is a species which lives in mid-tidal zones, and has somewhat more southerly distributions than the H. cracherodii species.

This same type of ovoid ornament, which uses the spire as part of the design at the wide end, has been found in Phase 2bcd. The implicit cultural relationship may be noteworthy, because another distinctive type here recurs there, too.

1 very long ovoid or almost trianguloid object (1-124812, A9, 60") has used the anal hole of the green-backed abalone shell (H. fulgens) as a design element at the broader end. This might have been a pendant.

Phase 3: 1 long tapering sub-rectanguloid ornament with a perforation at the wide end has had its edges serrated by grinding (1-124782, A11, 36"). It has been made of red-backed abalone (H. rufescens) which is the largest species that prefers the deeper tide zones. In shape and material used, this looks like 2 similar objects in Phase 4, 1 perforated and the other unperforated.

Phase 2bcd: An ovoid roundish ornament (1-124905, NW4, 82") has the spire featured at its wide end, and is only slightly larger than a similar one in Phase 2a. This type is quite distinctive and has been made from H. fulgens.

The other specimen (1-125281, NE2, 48"-60") is virtually a carbon-copy of the long trianguloid ornament which occurs in Phase 2a and employs the anal hole as a design element at the broader end. This was probably a pendant made from H. fulgens.

Phase 4: 2 long tapering sub-rectanguloid ornaments are made from H. rufescens, 1 (1-124974, NW7, 48"-60") being perforated at the wide end. This one looks like the single ornament from Phase 3. The unperforated 1 (1-125329, NE7, 12"-24") is a bit larger, but similar in material and shape.

2 similar unperforated fragments made of H. rufescens may fall within this type (1-125412, SE2, 0"-12"; 1-125646, SE6, 0"-12").

The other type of H. rufescens ornament is sub-circular in shape, and several are scratched like the slate objects which have been described before. It is possible

that these might have been employed in a similar game. 4 of these disc-like objects have been allocated to this phase (1-125644, NE8-Extension, 48"-60"; 1-125570, SE3, 24"-36"; 1-125315, NE4, no depth; 1-125468, NE8-Extension, no depth). It is most likely that this allocation is good, but the stratigraphic controls are the weakest here.

Chipped Discs and Odd Pieces

27 pieces in 7 categories have been set aside here as possible products. In any case, they appear to be objects which were near completion, if not actually completed.

Chipped Discs (Phase 4)

There are 8 chipped discs in Phase 4. One has an asphaltum smear on its back (1-33489, C8, 6"-15") while another (1-133487, D3, 10") has asphaltum along its edges.

This feature indicates that asphaltum was probably used as an adhesive in mounting these discs onto some surface. This suggests an ornamental function for all of the discs, even the 6 which no longer have any traces of asphaltum along their backs or edges (1-133484, A9, 21"; 1-125373, NE13, no depth; 1-133485, C1, 9"; 1-133482, C6, 24"). All have been made from the smallest and thinnest abalone species which sves in the warm tidal zone along the shore shallows (H. cracherodii). It was probably elected because of its lightness, brilliance and easy accessibility. Its interior has a lossy snowy hue.

Incised Ground Ovoid (Phase 4)

This was probably a gaming piece (1-125349, NE7, 50") showing wear, probably through handling as a gaming piece. A large heavy H. rufescans shell has been used, and a chevron design is evident at one end. See Figure 9 for data on incised slate objects.

Thin Flat Piece (Phase 3)

The function of this small object (43 mm. long, 8 mm. wide, 2 mm. thick) cannot be fixed with certainty. It is too small to have been an ornament, and too narrow for perforation. Yet it is about the right size for a shell fish-hook shank. It is rather ide and flat for a nose-plug or lip-plug, but it could have been suspended with a strand ed around its center and used as a compound shell fish-hook shank or as an ornament. (1-124770, A11, 41") has a slight curvature and has rounded ends. It is made of H. ufescens.

Pieces with Perforated Backs (Phase 2bcd)

These are whole H. fulgens shells which have had their centers deliberately

punched. Backs of these 3 pieces are abraded quite smooth. The edges of the holes have many traces of asphaltum. The adhesion of asphaltum to perforated shells, which have had their backs abraded (but otherwise not worked) indicates that asphaltum was used as a cushion for a perforating operation. See reference to 3 other objects which have been perforated and yield asphaltum traces on the interior surface or on both surfaces, following. Such evidence indicates that asphaltum was used, not only as a cushioning mastic for some of the sudden and sharp blows which had to be inflicted upon the shells, but also as a kind of cushioning backstop for the operations which would have involved cutting the whole shell into its specific shape. Asphaltum along an edge (as with the discs) along indicates that the specimens had been mounted. These 3 perforated shells occur during a very late sub-phase of phase 2bcd stratigraphically and typologically (1-124898, NW1, 24"; 1-125598, SE3?, 36"-48"; 1-125015, NE4, 0"-12"). These unfinished objects look like fish-hook blanks at a very early stage of manufacture.

Whole Shells with Ground Lips (Phase 2bcd)

All 3 are H. fulgens. 2 (1-125121, NE7, 48"; 1-125025, no location but near NW19 48"-60" objects) have outer lip ground away and have had a few spots of abrasion on their backs. The other specimen, whose stratigraphic location is uncertain (1-125058, SW3?, 41"?), has both its outer lip and it entire back completely ground off. The evidence here indicates 2 stages in the abrasion of shell: first grind outer lip, then its thick back.

Broken Outer Lip Sections (Phase 2bcd)

Both have been broken along the line of anal holes, and each is of H. fulgens (1-125215, NE3, 48"-60"; 1-125137, NE3, 48"-60"). One has traces of asphaltum retained on both inner and outer surfaces. This suggests that it may have been the practice to encase a shell within an asphaltum cover in order to cushion it against splitting during the manufacturing process.

Broken Outer Lip Sections (Phase 4)

This outer lip section is of H. cracherodii (1-125317, NE13, no depth, but 90% of this pit is composed of midden of Phase 4). It has asphaltum inside and outside. A stage in the manufacture of ornamental discs is indicated here.

Worked Outer Lip Sections (Phase 4)

8 worked out lip sections in Phase 4 are of H. cracherodii and H. rufescens shells. All are cut and polished. The only complete object is 10.8 cm. long and 1.7 cm. wide. All were probably long curved ornaments. They seem to have been bi-products in the manufacturing of discs in early sub-phases or of ornaments in late sub-phases (1-125135, NE7, 36"-60"; 1-124908, NW4, 48"-60"; 1-125119, NE3, 48"-60"; 1-125616, SE4, 24"-36"; 1-125229, NE6, 24"-36"; 1-125240, NE2, 24"-36"; 1-125070,

NE3, 12"-24"; 1-125476, NE4-Extension, 0"-12").

Shell Debitage

These objects are termed debitage, because they do not seem to have any finishing done on them. Included are 79 chipped-piece shells, 73 "spoons and scrapers," 15 irregularly chipped pieces, 15 objects covered with asphaltum, and 9 chiton plates.

Asphaltum-Covered Whole Shells

Perforated (Phase 2bcd): One (1-133467, NE2, 0"-12") has asphaltum on its inner surface, but no work except for the central perforation. Another (1-125081, NE3, 12") has asphaltum on the inside, too, but also has its back ground and its edges chipped. The third one (1-125592, SE4, 0"-12") is a particularly important piece, because the shell (which is coated on both sides by the asphaltum) is also burned on the back, as if the whole shell has been heated maybe to melt off some excess asphaltum inside a fire-pit, so that battering might continue on the back of this perforated shell. Clearly, here, asphaltum served as a kind of cushion for operations with an awl during the perforation of these whole H. fulgens shells. The perforations would argue against these objects being considered as containers for the melting of asphaltum.

Shells in Process of Manufacture (Phase 4): 6 such shells occur during Phase 4. One has a trace of asphaltum on both surfaces, prior to any actual working (1-125149, NE2, 0"-12"). This H. cracherodii shell was probably intended to have become an ornamental disc. No alternative use is indicated for this object.

The remaining 5 shells in this category and phase have been made from H. rufescens. This is consistent with findings which already indicate a preference for this species (Phase 4) in the manufacture of ornaments. These were probably ornament blanks. The 5 specimens suggest that this sequence of stages in the manufacturing process is probably correct:

1. 3 have not been worked at all yet, but they do have asphaltum inside the unworked shell (1-125305, SE2, 20"; 1-125057, SW3, 41"; 1-133466, C8, 15").
2. Another (1-125056, SW3, 36") has had asphaltum smeared on its interior surface, but also has had its back abraded.
3. The other (1-133468, C3, 30") has not only a ground back and asphaltum on the inside surface but also a mass of asphaltum on the outside surface. Furthermore, the edge is chipped or battered on this particular specimen.

Shells in Process of Manufacture (Phase 2bcd): 6 whole H. fulgens shells in various stages of manufacture occur during the late sub-phases here, as indicated by stratigraphy and typology. These would be coeval with Burials 1, 2 and 8-4. They suggest these staaes in the manufacturing operation:

1. 1 specimen (1-133470, C2,24") has had asphaltum both on its inside and outside surfaces. No working is apparent.

2. 2 whole shells (1-124980, NE2, 0"-12") are joined together by a single mass of asphaltum which fills the interior bowls of each. Both backs are ground. This indicates a way of cushioning shells against a pressure which may be exerted in order to abrade the backs.

3. 3 entire shells (1-125007, NW7, 48"; 1-125222, NW3, 36"-48"; 1-125559, SE3, 12"-24") have had their interior bowl filled with asphaltum. The backs and the edges have been worked by abrasion and by chipping.

4. 1 specimen (1-125080, NE3, 10") has had asphaltum smeared on both its inside and outside surfaces. Its edges are battered and its back is completely abraded.

Summary of Manufacturing Processes

Differences in the modes of manufacture during Phases 2 and 4 are here probably due to differences in cultural modes.

Phase 2bcd Method of Manufacture

1) Perforation was attempted before any other work, using a mass of asphaltum inside as a cushion. Asphaltum was also coated over the outside of the shell. This provided an additional cushion against likely splitting. Then, the asphaltum on the back was melted off in a low fire, and the back was abraded starting from the outer lip. Surviving this without splitting, the shell then again had its back coated with asphaltum. Finally, its edges were battered or chipped into some shape.

2) Unperforated shells are worked in the same sequence of steps as has been outlines above: a) coat interior with asphaltum, b) abrade back, c) coat the exterior surface with asphaltum, and d) batter the edges in order to mold shell into shape.

Phase 4 Method of Manufacture

1) Perforation was attempted before any other work. But first, both sides had to be coated with some asphaltum adhesive in order to keep the shell from splitting during the perforating operation. H. rufescens is a thick and heavy species of abalone. Therefore, the shell was placed on a backstop for additional support during the perforating operation. A description of just such a backstop which was probably used here in the section describing drilling bases. The shell, then, was perforated from the inside and not from the outside. This is a difference between Phase 2bcd and Phase 4 which is not only cultural but also the practical considering the difference in thickness between the species of H. rufescens and H. fulgens.

2) Unperforated shells are worked in the same sequence of steps as has been noted above for the previous Phase 2bcd.

Vertical Distributions of Asphaltum-Covered Whole Shells

The vertical distributions of the 15 asphaltum-covered whole shells do not provide any clues regarding the different modes of manufacture. On the contrary, the vertical distributions may shift the focus of attention to other questions regarding the odd vertical distributions of individual traits.

Therefore, the study of vertical distributions alone might tend to obscure what has been made the crucial point of this analysis regarding the manufacture of shell objects in the phases 2bcd and 4.

Only a cautious regard for the artifactual content of phases 2bcd and 4 could provide the necessary context for significant inferences regarding modes of manufacture from the following seemingly senseless distribution of individual traits and cultural elements.

Museum Number	Asphaltum inner/outer		Abraded	Edges chipped	Hole	Color of Back and Depth in Inches at Mnt-281			
						36-48	24-36	12-24	0-12
1-125007	x		x	x		Green			
1-125222	x		x	x		Green			
1-125057	x					Red			
1-125056	x		x				Red		
1-133468	x	x	x	x			Red		
1-133470	x	x					Green		
1-125305	x							Red	
1-133466	x							Red	
1-125081	x		x	x	x			Green	
1-125559	x		x	x				Green	
1-125080	x	x	x	x					Green
1-125080	x	x	Burnt		x				Green
1-133467	x				x				Green
1-124980	x		x						Green
1-125149	x	x							Black

Chipped Shell Pieces

By logical extension of what has been inferred already about Phases 2bcd and 4, it is possible to project a meaningful analysis of the following tabulation of depths of the 15 chipped pieces in Mnt-281. It is not likely that such an analysis could be made if only a study of the vertical distributions had preceded this specific analysis of the chipped shell pieces.

It will be noted on the tabulation on the following page that the 3 ovoid H.

fulgens ornament blanks belong to Phase 2bcd. The rectanguloid H. rufescens and the circular H. cracherodii belong to Phase 4. The vertical distributions alone tend to obscure such a division. However, our grouping is supported by a regard for both the stratigraphic peculiarities of this upper midden (Mnt-281) and for the implicit cultural preferences for certain shapes and species of abalone during the phases in question. This differs from the inferences that could be drawn by a reliance on only vertical distributions.

Haliotis species:
rufescens (red-backed)
fulgens (green-backed)
cracherodii (black-backed)

Museum Number	Pit	Rectangle / Ovoid / Circle	Depth in Inches in Mnt-281 60-72	48-60	36-48	24-36	12-24	0-12	Nil
1-125078	NE3	x	Red						
1-125005	NW1	x		Red					
1-125237	NE1	x		Red					
1-125280	NE2	x		Green					
1-125203	NE3	x			Green				
1-125204	NE3	x			Green				
1-124988	NW5	x			Black				
1-125386	SE2	x			Black				
1-125201	NE3	x			Black				
1-125600	Nil	x			Black				
1-125140	NE2	x				Black			
1-125557	NE5	x					Red		
1-125578	SE6	x					Red		
1-125110	NE4	x						Red	
1-125314	NE2X	x							Red

Worked Abalone in Mnt-282

Having hit upon a key to some reasonable explanation for the odd vertical distributions of the individual culture elements in these sites, it is relatively easy to make some sense of the vertical distributions of 25 worked abalone objects in Mnt-282. Their vertical distributions by themselves, however, make little if any sense without reference to the stratigraphic peculiarities.

Translating the distributions into natural stratigraphic layers, these significant features can be noted:

Phase 1: This is characterized by a preference for the shallow tide zone

abalone species (Haliotis cracherodii). Blanks for ornaments tend to be sub-rectanguloid. The phase yields 3 such objects (our numbers on the tabulation: 3,4,6) which are not abraded on the back but have the edges chipped and ground.

Phase 2: This phase is characterized by a preference for H. fulgens ovoids. 12 blanks for ornaments show a tendency to be more finished in the upper levels of Mnt-282. This may be due to somewhat more sedentary patterns emerging at the site, as it become better known to a population which might be visiting from some inland home-bases:

Step 1: One (14) has edges chipped. Two (15, 16) have edges ground. No other work occurs.

Step 2: Three (1, 3, 23) have chipped edges and ground backs. Edges are not ground.

Step 3: Six finished ornament blanks (6, 19, 20, 21, 22, 24) have backs abraded and edges chipped and ground. They are finished.

Phase 3: This is characterized by preferences for long tapering rectanguloid H. rufescens ornament or small disc of H. cracherodii. 10 ornament blanks occur. 4 (7, 8, 9, 18) are H. rufescens. All have chipped edges. 3 have abraded backs. 2 have ground edges. Only 1 is finished. 6 are H. cracherodii (10, 11, 12, 13, 17, 25) and 3 of these discs have only their edges chipped, while 2 also have abraded backs, and a third is finished (with chipped and ground edges and an abraded back). The most unfinished ones occur in the late level and the only finished one occurs in an early one. This fits the sequence which has been noted already for Phase 2.

Our No.	Depth in inches	Museum Number	Pit	Haliotis sp.: cracherodii	rufescens	fulgens	Shapes: Rectangle	Circle	Ovoid	Edges: Chipped	Ground	Backs Abraded
1	72-84	1-124832	All			x			x	x		x
2	60-72	1-124803	All			x			x	x		x
3	"	1-125490	C1	x			x			x	x	
4	"	1-125491	C1	x			x			x	x	
5	48-60	1-124881	A14	x			x			x	x	
6	"	1-124805	A9			x			x	x	x	x
7	"	1-124804	A9		x		x			x	x	x
8	36-48	1-124807	A10		x		x			x	x	
9	"	1-124870	A14		x		x			x		x
10	"	1-124776	A9	x				x		x		x
11	24-36	1-124777	A12	x				x		x		
12	"	1-125435	D2	x				x		x	x	x
13	"	1-124876	A14	x				x		x		x
14	"	1-124879	B10			x			x	x		
15	"	1-124877	A7			x			x		x	

Our No.	Depth in inches	Museum Number	Pit	Haliotis sp.: cracherodii	rufescens	fulgens	Shapes: Rectangle	Circle	Ovoid	Edges: Chipped	Ground	Backs Abraded
16	24-36	1-125436	D2			x			x		x	
17	12-24	1-124775	B10	x				x		x		
18	"	1-124880	B9		x		x			x		x
19	"	1-124882	A7			x			x	x	x	x
20	0-12	1-124784	A9			x			x	x	x	x
21	"	1-124872	B9			x			x	x	x	x
22	"	1-125255	D1			x			x	x	x	x
23	"	1-124871	B10			x			x	x		x
24	"	1-124875	B10			x			x	x	x	x
25	"	1-125252	D1	x				x		x		

The tabulated 40 specimens have been given adequate stratigraphic locations for translation into the 2 major phases (2bcd and 4). Thus, H. fulgens is restricted to Phase 2bcd, while H. rufescens and H. cracherodii occur only in Phase 4. They are empirical observations whose significance is apparent if one wishes to infer cultural preferences for certain species during different cultural phases at Mnt-281, but such inferences may be premature pending further substantiation.

8 worked abalone pieces have no locations in Mnt-281, and another 6 H. fulgens occur near the surface of this upper midden, probably belonging to the last sub-phases of Phase 2bcd. These 6 are tabulated below, while the other 40 specimens are tabulated on the following page.

Depth in Inches	Museum Number	Pit	Worked/ broken edges	Backs abraded	Cut along valve holes	Asphaltum on inside
0-12	1-125143	NE1	x			x
"	1-124983	SE1			x	x
"	1-125144	NE ?		x	x	
"	1-124886	NW7	x	?		
"	1-125323	NW12	x	?		
"	1-125593	SE4	x			

Worked Abalone in Mnt-281

Depth in Inches	Museum Number	Pit	Haliotis sp.: Green / Red / Black	Worked/ broken edges	Backs ground	Cut along valve holes	Asphalt inside
60-72	1-125001	SW4	Green	x		x	
"	1-125008	NW3	Green	x	x	x	
48-60	1-125266	NE2	Green	x			
"	1-125234	NE7	Green	x			
"	1-125136	NE3	Green	x			x
"	1-125128	NE5	Red	x		x	
"	1-125136	NE6	Red	x			
36-48	1-125199	NE3	Green	x			
"	1-125200	NE3	Green	x			
"	1-125198	NE3	Green	x		x	
"	1-125142	NE5	Green	x		x	
"	1-125477	NE6x	Green		x		
"	1-125147	NE5	Green		x		
"	1-125248	NE5	Red	x		?	
"	1-125202	NE3	Red	x			
"	1-125645	SE2	Red		?		
"	1-125668	SE2	Red		?		
"	1-125462	SE2	Red		?		
24-36	1-124891	NW3	Red		?		
"	1-125459	SE2	Red		?		
"	1-125588	SE4	Red		?		
"	1-125141	NE5	Red	x	x		
"	1-125348	NW13	Red	x			x
"	1-125294	NE7	Green	x		x	x
"	1-125228	NE6	Green			x	
"	1-125455	SE2	Black	x			
"	1-133469	C3	Black	x			x
12-24	1-125327	NE7	Black	?			
"	1-125175	NE2	Black	?			
"	1-125076	SW5	Green	x	x		
"	1-125480A	SE2	Green	x	x		
"	1-125480B	SE2	Red		x		
"	1-125647	SE5	Red	?			
"	1-133494	C2	Red	x			x
0-12	1-133493	D4	Red	x	?		x
"	1-133471	C5	Red		?		x
"	1-125322	NW12	Red	?	?		
"	1-125561	SE3	Black	x			

Spoon-Scrapers

There are 4 "spoon-scrapers" in Mnt-282 and 69 in Mnt-281. These are whole shells of abalone with: (a) the backs abraded, and (b) the thickened outer lip broken away. The term carries no certain functional meaning but follows a terminology which has been used for similar objects recovered in the area near Willow Creek. They are probably ornament blanks which have had the thick outer lip battered off. A study of distributions by phase demonstrates that the battering of the thick part of the lip was restricted to Phase 2 in both middens.

It may be recalled that some finished ornaments during Phase 2 had utilized the anal holes as perforations. This cultural peculiarity adds weight to the inference that the objects are pendant-like blanks for ornaments that were to be finished elsewhere. One of the "spoon-scrapers" is associated with Burial 4 in Mnt-281, where it was found near the waist, perhaps suspended from a belt.

The 4 objects in Mnt-282 are distributed as follows:

Museum number	Pit	Depth
1-124809	A11	66"
1-124873	A13	33"
1-124874	B10	6"
1-124878	B10	24"

All, except 2, of the 69 "spoon-scrapers" which occur in Mnt-281 are H. fulgens. These occur in every level, being most numerous in the later ones, indicating that people of Phase 2 might have battered the outer lips, perhaps for lightening the weight of the shells, but there is really not enough evidence here for very many inferences of this order. Approximately 45% of the "spoon-scrapers" in Mnt-281 are concentrated at 12 to 36 inches below surface.

Spoon-Scrapers in Mnt-281 (H. fulgens unless otherwise specified)

Depth in Inches	Number of specimens	Features
60-72	7	1 with Burial 4
48-60	15	1 H. rufescens
36-48	7	1 H. rufescens
24-36	11	
12-24	14	1 has asphaltum on back
		1 has asphaltum plugging anal holes
0-12	3	1 has asphaltum upon both sides

Chiton Plates

9 chiton plates (Cryptochiton stelleri) occur during Phase 2 both in Mnt-282 and in Mnt-281. They are not modified, except for some slight wear on the sharp edges and their use is indeterminable.

Summary of Shell Artifacts

The artifacts provide only the most general clues regarding likely diet, and the food refuse has not yet been identified and analyzed in any systematic way. My own observations of a few midden samples indicate that a number of mollusc forms occur in Mnt-281 (Cf. Fig. 17), but these are rather tiny, so I cannot make any statements regarding the efficiency in gathering such small animals for possible consumption as opposed to gathering the larger mollusc forms (abalone and mussels).

Determinations of this kind are specialized (Cf. Cook and Heizer, 1962), and the intent here has been to analyze the archaeological artifacts rather than the food refuse, so the question regarding diet is left unanswered. This question may yet be answered, however, since the necessary evidence is available. It was extracted from the W-Trench in Mnt-281 (Cf. Fig. 4) for analysis by qualified experts.

The stratigraphic record indicates that an analysis of the food refuse would yield a rather complete inventory of the dietary preferences during Phase 4. However, samples for Phase 2bcd may be too small to yield a comparable inventory for this earlier phase.

It has already been noted that Kroeber (1939: 206) was among the first anthropologists to have seen that a great abundance of natural resources in this region made the element of human choice most important in deciding which foods were to be eaten by members of a group. Invariably, perhaps, such choice was influenced if not determined by a respect for what a group considered tasty or tasteless, edible or inedible.

There is abundant evidence for likes and dislikes even among the very related Salinan groups for a single species (Cf. Footnotes, Tables 3 and 4). Therefore, the ethnography of this region confirms what can be inferred from the archaeological evidence regarding cultural preferences for certain abalone species during different phases.

This constitutes fairly strong archaeological evidence for the preference of certain kinds of abalone shells, but there is really no direct evidence for the meat having been eaten. On the contrary, the evidence suggests that the shells might have been prized more than the meat, since the shell-working industry is well documented.

Phase 1 - H. cracherodii
Phase 2 - H. fulgens
Phases 3 and 4 - H. cracherodii; H. rufescens

There is a great abundance of mussel shells during both Phase 3 and Phase 4. This is not so apparent for Phase 1 or Phase 2. There are no clam shells or oyster shells here, although various small forms occur throughout. Anticipating the results of more exact analyses, especially since mussel shells appear not to have been worked very much in this area, it is postulated here that mussels probably constituted a dietary supplement, especially during Phases 3 and 4.

Demographic Implications of Shell Objects

The concentration index is an extremely useful analytical tool in any attempt to reconstruct ecology or demography. The technique has been used here already, to draw out ecological implications. Here is another spot where the method might be used, this time to infer certain demographic aspects at the sites.

Just as it is necessary to know something about the function of a tool in order to infer something about ecology, it is necessary to specify what a bit of shell debris might mean in terms of certain demographic aspects before including it in computations involving the concentration index. It is necessary to offer some kind of demographic designata to the shells which are already analyzed, so this is attempted in the following analysis.

1) Finished Ornaments

a) Number - I cannot see any demographic import in the number of finished ornaments unless it can be demonstrated that these were either manufactured at the site or brought in from elsewhere. At Willow Creek, it is not clear where the objects were finished.

b) Species - There is clear evidence that certain species were preferred during different phases. Anticipating the Chapter Summary, these correlates are apparent (supported by areal correlations in Chapter IV): H. rufescens - northern group; H. fulgens - southeastern group; H. cracherodii - northern group (and earliest southern group).

c) Type - Tapering sub-rectanguloid ornaments with perforations at wide end of H. rufescens are identified with Phases 3 and 4. These will be shown in Chapter IV to be northerly (Proto-Costanoan) in origin. H. cracherodii discs are identified with Phase 4. This will be shown in Chapter IV to be of northerly origin (also Proto-Costanoan). H. cracherodii rectanguloid ornaments are identified in Phase 1. This will be shown in Chapter IV to be southerly (Proto-Salinan) in origin. H. fulgens ovoids using spire and anal holes at wide end as design elements are identified with Phases 2a and 2bcd. These will be shown in Chapter IV to be southerly (Proto-Salinan) in origin.

Summary - The species of abalone shell used and the type of the ornament might help in identifying the culture group during any phase. This, in Chapter IV (dealing with areal correlations), may suggest probably point of origin or home-base for the culture group, if substantiated by the correlation of indisputably diagnostic features.

2) Unfinished Ornaments

a) Number - The number of unfinished ornaments or ornament blanks at a site would indicate the extent of the shell-working at the site during a phase. However, there are degrees of completeness which could be taken into account in order to allow the computation of ratios.

b) Species - See 1a above.

c) Type - An abundance of abalone shells at a late stage of manufacture would indicate that the shells were probably made into finished ornaments at the site. An abundance of shell at some intermediate stage of manufacture would be difficult to assess in terms of any demographic aspect. An abundance of shell at a very early stage of manufacture would indicate that the shells were probably not finished at this site, but that they might have been prepared for transport elsewhere by knocking off the excess weight of the outer lip.

Summary - The most significant demographic ratios would seem to be those which compare the number of shells at late stages of manufacture with those in very early stages of manufacture.

Concentration index in units per 1000 cu. ft. for these abalone groupings		Volume in cu. ft.	Phases 1 300	2a 1800	3 500	2bcd 4000	4 4000
Unfinished ornaments:	Late stages		3.3	4.4	10.0	2.0	6.5
	Middle stages		3.3	2.2	10.0	5.5	4.8
	Early stages		3.3	2.2	-	18.0	0.4
	Total of unfinished ornaments		9.9	8.8	20.0	25.5	11.7
Finished ornaments:			3.3	1.1	2.0	0.5	4.3
	Total of finished and unfinished ornaments		13.2	9.9	22.0	26.0	16.0

Ratios of unfinished ornaments in Late stages to unfinished ornaments in Early stages: Phase 1 - 1.0; Phase 2a - 2.0; Phase 3 - (10 to 0!); Phase 2bcd - 0.1; Phase 4 - 16.0. Probably significance of such ratios to those aspects of demography which might concern the location of the home-base of a culture group: Phase 1 - home-base probably elsewhere; Phase 2a - home-base probably elsewhere; Phase 3 - home-bases probably shifted here from elsewhere (suggested by high ratio of shells at late stages of manufacture); Phase 2bcd - probably abortive attempt to shift home-base here (suggested by great abundance of shells at very early stage of manufacture); Phase 4 - home-base probably

established here.

Such computations and inferences by themselves do not constitute convincing proof for anything of this kind, but they can serve as a secondary kind of additional evidence for the support of the hypotheses which are suggested here and elsewhere on different kinds of evidence. At worst, it indicates an attempt to draw more inferences from the data than the data might warrant.

Ecological Implications of Shell Objects

The shell industry appears to have dominated the activities of the visitors at Mnt-282 and Mnt-281. Yet they had to eat. A likely correlation may be valid between the various species of shellfish associated with shell-working and the diets during most phases. Mollusc gathering could have supplied a large proportion of the diet of the occupants at Willow Creek.

However, fish-hooks also occur during the 4 phases, suggesting that a diet including local fish was prevalent. No other ecological correlates occur with the shell objects.

Phase 1: No ecological correlates for the shell artifacts are evident.
Phase 2a: 1 Type-2 (H. fulgens) fish-hook; 6 Type-2 (H. fulgens) fish-hook blanks.
Phase 3: 1 Type-1 (H. rufescens) fish-hook; 1 Type-1 (M. californicus) fish-hook; 1 probable (H. rufescens) fish-hook shank.
Phase 2bcd: 1 Type-2 (H. fulgens) fish-hook; 1 Type-2 (M. californicus) fish-hook; 13 (M. californicus) disc blanks; 3 perforated (H. fulgens) blanks, 3 perforated (H. fulgens) blanks with asphaltum.
Phase 4: 1 Type-1 (H. rufescens) fish-hook; 1 Type-1 (M. californicus) fish-hook; 5 (H. rufescens) fish-hook blanks.

Beads

13 of the 14 beads here occur during Phases 3 and 4 (Proto-Costanoan). The single disc bead which occurs during Phase 2a (Proto-Salinan) has had the anal hole of a H. fulgens shell employed as a perforation.

Phase 3: 1 perforated Olivella biplicata disc bead (Type 3c); 1 spire-ground Olivella biplicata bead (Type 1b).
Phase 4: 2 spire-ground Olivella biplicata beads (Type 1b); 1Type 1b O. biplicata bead that has had the spire lopped off; 4 Type 1b O. biplicata beads with holes in the side; 2 Haliotis rufescens disc beads (Type J2aI or Type 4); 1 spire-ground Acmaea mitra bead.

Conclusions

The general problems posed at the outset have not been solved by any means, but there is a suggestion implicit in this analysis which indicates that one might expect to find a rather complicated series of changes in certain demographic aspects of these sites. In outline, however, and anticipating the findings in Chapter IV, there appears to be a pattern of alternations in occupation by Proto-Salinan and Proto-Costanoan groups (as documented by almost all the other kinds of evidence presented so far, e.g., burials and lithics). Such alternations were of long enough duration to result in the accumulation of mounds of shell debris about 6 feet deep near the center and spreading out over radii approximating 50 feet or more.

Chapter Summary

Artifact Yield

Almost half of each site may have been excavated, but the artifact yield has been modest. Only 779 artifacts have been recovered from both sites (623 in Mnt-281 and 156 in Mnt-282), although 10,600 cubic feet of midden were excavated from the mounds. The artifact yield from both sites averages 1 artifact per 14.7 cubic feet.

Mnt-281 yields 1 artifact per 12.8 cubic feet. 1 artifact per 16.6 cubic feet is the yield from Mnt-282. A relatively lower yield may characterize this lower midden.

Sample Size

The artifactual sample is representative and adequate for a meaningful analysis, even though it may be reduced a bit below 779, since quite a few of them lack stratigraphic loci. The analyzable sample includes only 760 specimens. Such a selection has had to be stratigraphically spaced within 14 12-inch levels and then translated into natural stratigraphic layers (phases) in order to allow chronologically meaningful study.

87 categories of artifacts are identifiable in this sample which is not so large as to be unwieldy or demanding of much statistical treatment. Therefore, individual features of each object could be examined in greater detail.

Gravel Wedge

A sterile gravel wedge which is 10 feet thick at the west end splits the lower midden (Mnt-282) from the upper one (Mnt-281). This wedge is a convenient line of demarcation for analysis. It validates a grouping of some "early" traits apart from many "late" ones.

Burials

The remains of 14 individuals occur in both sites. However, again, the sample is large enough to allow a chronological grouping into 4 apparent phases, consistent with the number of phases indicated by stratigraphy. As a result of the wieldiness of the sample, it is feasible to focus very hard upon the peculiarities of every individual in the sample. This had led to assigning certain likely meanings to at least 2 burial elements at Willow Creek: orientation and cairns.

The direction in which a body is oriented may indicate a symbolic return to some home-base by the deceased person. This may be a useful clue for the archaeologist regarding home-bases, if it can be demonstrated more convincingly than the limited data at Willow Creek would allow. Therefore, here, this is intended as a suggestion or hypothesis for further testing rather than as a demonstrated fact.

The use of cairns of rocks to cover the deceased is an element which might be related to the degree of mobility of a group. If it is assumed that a group in transit does not have the time or the tools with which to dig a deep pit for the deceased, then it seems that using boulders as a grave cover would be more efficient for such a group than digging a deep pit might be. This, in any case, was the case among certain Plains tribes who did not employ the scaffold kind of burial.

However, there is a difficulty with the identification of cairns. Usually some standard grouping of 60 to 100 rocks arranged in a regular way, probably 2 or 3 layers thick, is assumed whenever a cairn is mentioned. This is not true at Willow Creek, where the records indicate that as few as 5 huge rocks and a number of smaller ones might be involved. Therefore, although the field records identify these as cairns, I would be inclined to be somewhat more cautious in such identifications.

Radiocarbon Dates

The dates for Phase 1 have been settled by 2 radiocarbon determinations on wood charcoal samples C-628 and C-695 from the base of the lower midden (Mnt-282). Both are concordant: 1) 1879 $\pm$ 250 years BP (1951); 178 B.C. to 322 A.D.; Circa 72A.D.; (Arnold and Libby, 1951: 111-120); and 2) 1840 $\pm$ 400 years BP (1951); 288 B.C. to 512 A.D.; Circa 112 A.D. (Libby, 1952: 673-681).

Content of Phases

It is possible to reconstruct ecological and cultural contexts for the defined phases by integrating functional, typological and chronological aspects of the categories of artifacts already summarized at end of each section so far.

Phase 1: Sample Size: 34 artifacts (300 cu. ft.); Concentration Index: 113 artifacts per 1000 cu. ft., 1 artifact per 8.9 cu. ft. Hunting: 14 chert cutting objects,

(50 per 1000 cu. ft.); 6 Type-1 chipped lithic points, (2 chronological sub-types); 3 chipped core-choppers; 2 chert flakers made from bone. Shell-working: 3 worked H. cracherodii shells; 1 rectanguloid H. cracherodii ornament; 1 small flat elongate hammerstone battered on both ends. Mortuary: red ocher offering; cremation in pit; body seated upright tightly flexed; orientation southeast.

Phase 2a: Sample Size: 72 artifacts (800 cu. ft.). Concentration Index: 90 artifacts per 1000 cu. ft., 1 artifact per 11.1 cu. ft. Hunting: 10 Type-2 chipped lithic points (3 chronological sub-types); 3 chert cutting objects (only 1.5 per 1000 cu. ft.); 1 Type-3 chipped lithic point. Fishing: 6 grooved stone sinkers; 6 Type-2 H. fulgens fish-hook blanks; 1 Type-2 H. fulgens fish-hook; 1 fish-hook shank made from bone; 2 toggle gorge blanks made from bone; 2 toggle gorges made from bone. Basketry: 1 asphaltum-covered rock with basket impress; 1 asphaltum-covered rock with fiber impress; 2 basketry awls, 1 matting needle; 1 bark (?) scraper; 1 twining awl; 1 gouge; 1 spindle whorl (or flywheel disc). Bead-Working: 2 bird-bone beads; 1 bird-bone bead blank; 1 H. fulgens disc bead. Shell-Working: 1 long ovoid H. fulgens ornament; 1 ovoid H. fulgens ornament (spire retained at broad end); 12 worked H. fulgens ornament blanks; 4 H. fulgens spoon-scrapers (?); 4 flattish fist-size hammerstones, (some nephrite jade, battered on one end with asphaltum on end); 3 abalone pries made from bone. Mortuary: no grave offerings preserved; cairn cover over shallow (?) grave; body tightly flexed; lying on right side; orientation southeast.

Phase 3: Sample size: 45 specimens (500 cu. ft.). Concentration Index: 90 artifacts per 1000 cu. ft., 1 artifact per 11.1 cu. ft. Hunting: 5 chert cutting objects (10 per 1000 cu. ft.); 1 bird-bone whistle for calls; 1 Type-4 chipped obsidian point; 1 Type-5 chipped obsidian point. Fishing: 1 Type-1 M. californicus fish-hook; 1 Type-1 H. rufescens fish-hook; 1 H. rufescens fish-hook shank. Basketry: 5 basketry awls; 1 carbonized fiber. Fire-Making: 5 fire-cracked rocks; 1 bird-bone pipe stem with burned end. Head Ornament: 1 hair-pin made from bone. Bead-Working: 1 O. biplicata disc bead, (Type-3c); 1 O. biplicata spire-ground bead, (Type 1b). Shell-Working: 1 tapering sub-rectanguloid H. rufescens ornament; 4 worked H. rufescens shells; 3 horn hafted perforators; 1 Type-1 abrading stone; 2 fist-size hammerstones; 2 abalone pries made from bone. Mortuary: O. biplicata spire-ground bead (Type-1b); cairn cover over shallow (?) grave; body tightly flexed; lying on right side; orientation northeast.

Phase 2bcd: Sample size: 247 artifacts (4000 cu. ft.). Concentration Index: 61.8 artifacts per 1000 cu. ft., 1 artifact per 16.2 cu. ft. Hunting: 2 crude chipped lithic points (excluded from section summary because bases are missing); not a single chert cutting object. Fishing: 1 Type-2 M. californicus fish-hook; 13 M. californicus disc blanks; 1 Type-2 H. fulgens fish-hook; 3 perforated H. fulgens blanks; 3 perforated H. fulgens blanks with asphaltum. Seed-Preparation: 1 Type-a pestle; 1 Type-b pestle; 1 Type-a hopper mortar. Basketry: 5 basketry awls; 3 twining awls; 2 spindle whorls (flywheel discs?); 2 rocks coated with asphaltum (for applying to baskets?). Fire-Making: 6 fire-cracked rocks; 1 asbestos poker for hot rocks; 1 steatite paddle

hot rocks; 2 serpentine flywheel disc blanks (may be spindle whorls?). Head Ornaments: 4 hair-pins; 3 nose-plugs. Body Ornaments: 1 steatite finger ring. Bead-Working: no beads. Shell-Working: 67 H. fulgens spoon-scrapers (?); 22 worked H. fulgens shells; 6 H. fulgens with asphaltum; 3 ovoid H. fulgens blanks; 3 H. fulgens with ground lips; 2 broken H. fulgens outer lip sections; 1 ovoid H. fulgens ornament, (spire retained at broad end); 1 long ovoid H. fulgens ornament, (anal holes being perforations). 70 hammerstones (75 nephrite jade); 6 broken nephrite jade hammerstones; 3 bone hafted perforators; 1 scapula saw; 4 abalone pries. Mortuary: Sub-phase b: flaked H. fulgens pendant offering; burial in deep (?) pit; no cairn cover; body tightly flexed; lying on left side; orientation southerly. Sub-phase c: bone gorge nose-plug; chert flakes, burial in deep (?) pit; no cairn cover; body tightly flexed; lying on left side; orientation southerly. Sub-phase d: no grave offerings preserved; burial in deep (?) pit; no cairn cover; body loosely flexed; lying on left side; skull missing (both burials); orientation southeast.

Phase 4: Sample size: 362 specimens (4000 cu. ft.). Concentration Index: 90.5 artifacts per 1000 cu. ft., 1 artifact per 11.1 cu. ft. Hunting: 1 Type-6 chipped lithic point; 40 chert cutting objects, (10 per 1000 cu. ft.); 1 bird-bone whistle for calls (or ritual?); 3 ground granite slingstones; 2 grooved broken antlers still attached to deer skulls (used as throwing objects?); 1 perforated throwing stone (?, natural hole with worn edges); 1 perforated steatite throwing object (?, waterworn hole with worn edges). Fishing: 1 notched stone sinker; 1 Type-1 M. californicus fish-hook; 1 Type-1 H. rufescens fish-hook; 1 Type-1 H. rufescens fish-hook blanks. Seed-Preparation: 13 Type a, b and c pestles; 3 Type-b hopper mortars; 2 cobble mortars. Basketry: 1 basketry awl; 2 netting awls; 1 eyed matting needle; 1 tubular matting needle; 1 strigil; 1 gouge; 1 awl sharpener; 1 horn socket handle; 1 horn wedge handle; 1 asphaltum-coated rock with basketry impression; 1 asphaltum-coated rock with textile impression; 5 rocks coated with asphaltum; 5 asphaltum lumps. Fire-Making: Long oval fire pits (logs laid parallel in deep pits that have concentrations of mussel shell); 67 fire-cracked rocks. Incised Ground Gaming Pieces: 21 slate objects (12 design varieties); 1 H. rufescens ovoid, (heavy wear on edges). Incision Instrument: 1 antler broken at both ends (handle for chert flake which was inserted in groove on tip of antler tine). Head Ornaments: 2 vestigial metatarsal pointed earrings. Body Ornamentation: 2 pigment mortars; 1 red ocher lump; 5 pins. Bead-Working: 3 spire-ground O. biplicata beads (Type-1b); 4 spire-ground O. biplicata beads (Type-1b) with perforations in the sides; 1 spire-ground O. biplicata bead (Type-1b); 1 apire-ground Acmaea mitra bead; 2 H. rufescens disc beads (Type-J2aI or 4). Shell-Working: 2 sub-rectanguloid H. rufescens ornaments (one perforated); 2 sub-rectanguloid H. rufescens ornament fragments; 4 scratched sub-circular H. rufescens gaming piece blanks; 8 chipped H. cracherodii discs; 4 worked H. cracherodii shells; 2 chipped H. cracherodii shells; 19 worked H. rufescens shells; 10 chipped H. rufescens shells; 8 worked H. rufescens outer lip sections; 1 broken H. rufescens outer lip section; 6 H. rufescens asphaltum; 2 H. rufescens spoon-scrapers (?). 60 hammerstones (50% nephrite jade); 5 Type-2 rubbing stones (2 burned); 7 horn hafted perforators; 2 slate flywheel discs (or spondle whorls?); 1 flywheel disc blank (or spindle whorl?) 1 base for drilling operation; 1 Type-2 abrading stone; 1 charmstone-like reamer; 2 whalebone abalone pries. Mortuary: Sub-phase a: vertigial metatarsal

pointed earrings; burial in shallow (?) pit; cairn cover over grave; body tightly flexed; lying on right side; orientation westerly. Sub-phase b: cobble mortar and horn flaker; burial in shallow (?) pit; cairn cover on grave; body loosely flexed; lying on left side; orientation northwesterly. Sub-phase c: no grave offerings preserved; burial in deep pit (?) no cairn cover; body loosely flexed; lying on left side; orientation north. Sub-phase d: no grave offerings preserved; burial in deep pit (?); no cairn cover; body loosely flexed; orientation north. Sub-phase e: no grave offerings preserved; burial in deep pit (?); no cairn cover; body extended; orientation north.

Ecological Evaluations

Phase 1: Artifact yield is relatively rich; 81.8% artifacts relate to hunting; shell workers prefer H. cracherodii; early hunters visit site for shells; probably origin is southerly (Chapter IV); C-14 date is about 100 A.D.

Phase 2a: Artifact yield is average; 50% artifacts relate to hunting-fishing; emphasis is on fishing (28% artifacts); 35% artifacts relate to shell industry; 11% artifacts relate to basketry; fishermen (who hunt) visit site for shells; shell-workers prefer H. fulgens; probably origin is southeasterly (Chapter IV); date is post-100 A.D.

Phase 3: Artifact yield is average; 24% artifacts relate to hunting-fishing; emphasis is on hunting (18% artifacts); 40% artifacts relate to shell industry; 13% relate to basketry; hunters (who fish) visit site for shells; shell-workers prefer H. rufescens; probably origin is northerly (Chapter IV); date is post-100 A.D.

Phase 2bcd: Artifact yield is very low; only 10% artifacts relate to hunting, fishing and seed-gathering; emphasis is on fishing (8% artifacts); 77% artifacts relate to shell industry; fishermen (who hunt and gather seeds) visit site for shells; only 3% artifacts relate to basketry (shells might have been carried inland from site on strings through H. fulgens anal holes); shell-workers prefer H. fulgens; probably origin is southeasterly (Chapter IV); strong cultural affiliations with Phase 2a are manifest (ornament types, species); date is post-100 A.D.

Phase 4: Artifact yield is average; over 20% artifacts relate to hunting, fishing and seed-gathering; emphasis is on hunting (13% artifacts); 43% artifacts relate to shell industry; hunters (who fish and gather seeds) live on this site, 5% artifacts relating to seed-gathering and grinding; 3% artifacts relate to basketry; 97% worked shells are at an advanced stage of manufacture; shell-workers prefer H. rufescens; probable origin is northerly (Chapter IV); cultural affiliation with Phase 3 is manifest in Type-1b O. biplicata beads; date is post-100 A.D. and probably proto-historic (post-1492 A.D.), since one asphaltum-covered rock has impression of cloth textile.

Haliotis Source

Perhaps the most accurate characterization of these two archaeological sites

would be one which stressed the Haliotis resources on the beach. It is certain that this area was visited for almost 2000 years by people from a number of places (as confirmed in Chapter IV areal correlations), and that these people manufactured objects from the 3 species of abalone. It is also certain which species of abalone was preferred during each of the culture phases which alternate here.

Anticipating the areal correlations in the following chapter, it may be noted here that in a very real sense this was a kind of quarry for the abalone shells which could have been marketed almost anywhere within inland California in prehistoric times. Therefore, it is suggested here that this particular coastal location might have been pivotal in the South Coast Ranges, since it does seem to mark a location visited by major tribal groupings from north and south.

CHAPTER IV

Areal Correlations

Three areas seem mainly relevant to the Willow Creek sites in this attempt to correlate cultural and temporal aspects of the evidence at Willow Creek with other areas. These are Santa Barbara area, San Joaquin Valley area, and San Francisco Bay area. Such broad definitions of area probably suggest a relationship between Willow Creek and each of the 3 broadly defined areas.

This may stretch the actual relationship a bit too far. A real long-distance affiliation would surely be indirect, perhaps due to trade, rather than direct, accompanied by infiltrations of adventuresome shell-workers. The evidence at Willow Creek for an alternation of occupations certainly suggests actual visitations by at least 2 groupings, but this need not support any argument for direct long-range affiliations.

Indeed, no such theory regarding direct long-range affiliations is being proposed here. More modestly, what is proposed is not a conflict between Chumash groups and Miwok groups at Willow Creek but a clash between proto-Salinan and proto-Costanoan neighbors. Whether these groups were in fact ancestral to the historic groups is not particularly relevant here, since the terms relate primarily to some definition of adjacent cultural areas within the South Coast Ranges, and the terms proto-Salinan and proto-Costanoan are most convenient in that they suggest the general areas occupied in historic times by Costanoan and Salinan groups.

Local Collections

The Fackenthal Collection is among the best for evidence from the Carmel Valley in Monterey County. It has been sold to Norman Miller who is a resident of San Francisco, but who has a cottage at Robles del Rio in the Carmel Valley. This collection has been very well documented in manuscript form by Beardsley and Pilling (filed in the Archaeological Research Facility at Berkeley).

The largest single collection in the vicinity of Salinas belonged to the late Mayor Madeira. It was stored in the City Jail until the local historical society opened its cottage museum in April, 1964.

Most of the inland portions of Santa Barbara and San Luis Obispo Counties are among the lesser known archaeologically, so it has been necessary to consult with the local collectors in order to fill this void. Two collections from this region approach museum proportions, and in fact have been set in glass cases for display. One belongs to Ernest Dalido of San Luis Obispo and the other to Clarence Ruth of Lompoc. There are more modest collections, too, in this area, and these are mentioned where relevant.

Monterey Peninsula is also best known through the many private collections

rather than from the few archaeological explorations (according to Pilling, 1955). The areal correlation of specimens in such collections with those found in a stratigraphic context at Willow Creek will be shown to be fruitful.

Santa Barbara

If any direct relationship can be postulated between the Willow Creek complex and any of the more remote areas, then a rather good case could be made for asserting some connections about 2000 years ago with a culture farther south in the Santa Barbara area. Because such early travellers could have reached Willow Creek best by an inland route, it may be assumed tentatively that the earliest southerners probably came about 100 A.D. from some inland areas between the present-day cities of Santa Barbara and San Luis Obispo. This would have been a time when much of this intervening territory could have been unclaimed by any tribes which would impede safe passage. However, this is only an assumption.

Such an assumption gains support in the occurrence of southern type projectile points (Type 1) in the earliest levels of Mnt-282 and in heavy concentrations around Lompoc in Santa Barbara County. There is no record of plank canoes north of Morro Bay, and this negative evidnece tends to support the view that an inland route might have been used in order to gain access to Willow Creek.

There is an isolated occurrence of a heavy Los Llagos type of ceremonial stone bowl just north of Willow Creek (at site Mnt-88 in the Big Sur area), but this is not in any good archaeological or stratigraphic situation, so this need not suggest a coastal route to Willow Creek around 100 A.D.

However, even such questionable evidence as the Los Llagos bowl at Mnt-88 need not be rejected offhand. It is possible that such a relic could have been transported northward even in historic times by white men, although the reason for this kind of activity is somewhat obscure to me. The bowls are neither indigenous to this are, nor in any sense usable as portable trade items (unless transported by boat to people who had similar ceremonies). Therefore, there is always the chance that this may be evidence for 2 inferences: 1) a coastal route from the Santa Barbara area to the Monterey area; and 2) the use of boats along this coastal route which could not have been traversed along the beaches. During Phase 2, the evidence tends to be weighted in favor of inland routes through Nacimiento and San Antonio Valleys.

San Francisco Bay

Extensive archaeological work has been done in the San Francisco Bay area by individuals from at least 3 universities: University of California, Stanford, and most recently, San Francisco State. It is feasible to refer to published works here as well as to a site near Pacifica which I examined during the summer of 1963, and which yields 2 obsidian points like Type-5 from Phase 3 at Willow Creek. These points probably belong

to the Emeryville facies which appears to be the one most relevant for these correlations with Phases 3 and 4 at the Willow Creek sites.

San Joaquin Valley

There is no apparent direct relationship between the sites at Willow Creek and the materials in the San Joaquin Valley. The historic Playanos are supposed to have used balsa boats like the Yokuts according to Ascension (1861), but the account is vague enough to suggest that these might have been raft-like floats employed by abalone gatherers at low-tide in the deeper tide zone.

Diagnostic Features

Areal correlations are limited here mainly by the nature of the artifacts which the local collectors have collected. They tend to be mainly chipped lithic points. Large mortars and bowls are quite common in local collections, but none occur at either Willow Creek site, so they must be set aside. By such a process the number of useful areal correlates is reduced, but still good.

This number might be reduced even more drastically, virtually beyond any practical utility here, if an individual collector were pressed to identify a specific site with the points which were collected in transit while the collector was strolling. However, wherever possible, site designations will be cited here.

Pilling (1955) has listed a number of such correlates in his analysis. These are tabulated in the appendix (Tables 6 and 7). However, of his list of 15, 13 must be rejected in this study. Seven are simply not diagnostic of any area, and the remaining 6 (basin metates, Mescalitan Island Las Llagas ceremonial bowls, painted petroglyphs, punctate bone decorations, incised clam shell beads, unglazed ceramics) simply do not occur at either of the Willow Creek sites. Turning, then, to the 7 traits which do not seem to be diagnostic of any area, the following points can be raised.

Cairn-Covered Burials

There is not only a range of cairn-covers over burials so far as the number of stones is concerned, but there may be even cultural types so far as shape is concerned. In any case, the category has not been studied in enough detail to permit areal correlations of this vague trait. At Willow Creek, for instance, only a few large boulders over a grave seem to justify a reference to cairn-cover. In the Canadian Plains, at least 60 stones set in a double tier within a rectangular area are needed in order to qualify for the classification of cairn-cover.

Furthermore, at Willow Creek, rocks cover burials at least once during each of the last 3 phases, regardless of cultural or temporal aspects. This feature might be more relevant to group mobility (a demographic factor), but this has not been

demonstrated either. Therefore, it may be best to set this feature aside from the proposed areal correlations, because it cannot be regarded as diagnostic of any area until its component elements have been properly studied.

Dish Made of Abalone

Essentially, this consists of a whole shell which has been minimally modified along one or both lips. It is a very non-distinctive kind of object, and its use as a trait which might be diagnostic of any area would be suspect. In the first place, the function is sometimes misrepresented (e.g., Pilling, 1955; Meighan, 1955) as a "container for asphaltum." At the Willow Creek sites, such abalone shells are simply shells which have been reinforced with an adhesive so that they might not split during a stage of ornament manufacure. In the second place, it seems that the identification of the species of the abalone shell might be more important for use as a diagnostic feature in proto-historic times than the identification of the genus (Haliotis) alone is.

Use of Asphaltum

The use of asphaltum is not restructed to any single portion of the South Coast Ranges, although the major sources are concentrated south of Willow Creek. There are other sources in San Joaquin Valley which were used by Yokuts, and lumps of asphaltum might be swept onto the beaches as far north as San Francisco from sub-terranean sources many miles to the south in spite of a current which sweeps the coast from north to south.

Furthermore, at Willow Creek, the use of asphaltum is shared by northern and southern groups through every single phase. Therefore, the use of this feature as a diagnostic trait would not be reliable in view of such areal distributions and such a stratigraphic situation at Willow Creek.

Hopper Mortars

Hopper mortars occur at Mnt-281 during Phases 2bcd and 4. These are stratigraphic layers which contain artifactual materials from 2 distinctive cultures. It will be shown in this chapter than Phase 2bcd has southerly affiliations, while Phase 4 has northerly affiliations. This suggests, then, that the distributions of hopper mortars might be expected to cover the entire South Coast Ranges. In fact, they do occur in northern Monterey at Mnt-91 as well as as far south as SBA-485.

Harrington (1942) lists the ethnological occurrence of hopper mortars mainly south of Willow Creek, but admits that the Costanoan area is inadequately documented. Furthermore, the improvisation of a hopper mortar is not real innovation, since it involves the simple combination of a basket attached to a mortar. Both of these elements occur throughout the South Coast Ranges.

Abalone Pries

Several kinds of abalone pries or bone objects which could have been used as abalone pries occur in various phases at Willow Creek. These are mainly very amorphous objects which lack any truly distinctive elements. It is not the sort of item which could be used as diagnostic feature, especially since it occurs as far north as Mendocino County among the Yuki (Gifford, 1939), and as far south as the Channel Islands (Heye, 1921: pls. XLVII, XLVIII, XLIX; Meighan and Eberhart, 1955: 122, fig. 40; Gifford, 1937 ms.; Gifford, 1939: 327; Gifford, 1940: 171).

Shell Fish-Hooks

The mere mention of shell fish-hooks need not lead to the assumption that a southerly origin around Santa Barbara is necessarily indicated. In Chapter III, 2 types of shell-fish-hooks have been described. These occur in various phases at Willow Creek. They differ both in type and in species of abalone used. Therefore, before any meaningful areal correlation can be attempted employing shell fish-hooks, it is necessary to provide a more precise definition of the kind of fish-hook being correlated besides indicating "shell."

Bed-Rock Mortars

Bed-rock mortars occur throughout the length and breadth of the entire South Coast Ranges (Cf. maps 5 and 6). There is a concentration in the Monterey Peninsula where over 25% of all the sites are bed-rock mortars, but the feature is common elsewhere.

No earth-bound or bed-rock mortars occur at the mouth of Willow Creek, but there is a great number at the entrance to the mountain passages around Jolon which lead to Willow Creek. These cluster in 2 main concentrations set 5 miles apart at both ends of the entry route to the Willow Creek sites. The spacing is curious and may suggest a northern group belonging to people enroute to Willow Creek from the north and a southern group belonging to the people farther south. These are 5 miles apart. From them, trails converge into the Willow Creek coastal vicinity (Cf. map 7).

The demographic import of bed-rock mortars in the South Coast Ranges need not be lost here. Apparently people in this entire area were quite transhumant in pre-historic times, and it was convenient for them to visit sites where mortars were available in the form of holes in huge boulders. Such bed-rock mortars usually occur along well worn trails. This made the manufacture of portable mortars or the transport of portable mortars unnecessary, and this would be convenient, because mortars are heavy enough not to be very portable.

The feature of bed-rock mortars may also be better defined than it is currently, if use for comparative studies is to be facilitated. Therefore, the feature is not regarded

as an areally diagnostic one.

Areal Correlates

Taking into account these reasonable restrictions, which limit the number of features that can be suitable for comparative studies or areal correlations, it has been possible to isolate a few diagnostic features which can suggest the areal affiliation of each of the phases at Willow Creek.

Phase 1 - Type-1 Chipped Lithic Points (Diamond-shaped): Santa Barbara County, Lompoc vicinity, 3000 specimens (Ruth Collection at Lompoc); San Luis Obispo County, Arroyo Grande vicinity, 8 specimens (Evans Collection at San Luis Obispo), 2 specimens (Dalidio Collection at San Luis Obispo); Monterey County, Jolon vicinity, 2 specimens (Plaskett Collection at Salinas); Salinas vicinity, 4 specimens (Purdin Collection at Salinas), 2 specimens (F. Johnson Collection at Salinas).

None of these Type-1 chipped lithic points have been found north of Salinas, and they seem to be most common near the boundary of Santa Barbara and San Luis Obispo Counties, near the source of this light beige chert.

Phase 2a - Type-2 Chipped Lithic Points (Stemmed): Santa Barbara County, Lompoc vicinity, (Rare in Ruth's collection); San Luis Obispo County, Arroyo Grande vicinity, 1 specimen (Paulding Collection at Arroyo Grande), 8 specimens (Dalidio Collection at San Luis Obispo); Monterey County, Jolon vicinity, 1 saw-edged (Plaskett Collection at Salinas); Salinas vicinity, 5 specimens (Madeira Collection at Salinas); Carmel Valley vicinity, 3 specimens (Fackenthal Collection at Robles del Rio, Mnt-12, Mnt-173, Point Pinos Reserve), 1 specimen (Cahoon Collection at Carmel Valley), 2 specimens (W. Martin Collection at Carmel Valley, Mnt-18, Mnt-101); Mouth of Carmel Valley, 1 specimen (Robson Collection at Carmel Valley, Mnt-90), 1 specimen (Downie Collection at Carmel, Mnt-18).

The distribution of this type of point is quite wide in the South Coast Ranges. It is difficult to attribute a focus for such points on the basis of such a broad dispersal of a very limited sample of Type-2 points. The rarity of the points in Ruth's collection presents a problem, especially since Heye (1921: pl. XXXVIII) illustrates such points on a Santa Barbara Channel Island, and Rogers (1929: 59) has his Hunting People using them. Such points also occur in strate II-III at SBa-105 near Point Sal in the northwestern corner of Santa Barbara County (Carter, 1941: 215-224).

Dalidio is the single collector contacted who seems to have the greatest number of these points. This, combined with the literature already cited, might suggest a southerly focus for such points. The wide distribution may represent a time depth especially since Heizer (1949: Figs. 11 and 13, SAa) illustrates a few in Sacramento Valley, and Beardsley (1954: 9, S3) shows the type in Marin and San Francisco Counties. This is a greater extension than might be anticipated by allusion to the materials

published about Santa Barbara County. Therefore, it is suggested here that: (1) the wide dispersal of Type-2 points may be due in part to a common hafting style which favored stemming the points; (2) the broad distribution may indicate a very early occurrence of such points; (3) the focus probably shifted over this long period, but for the period involved at Willow Creek it is likely that these foci were located in the general inland area of central and southern Monterey County and the locality at the boundary of San Luis Obispo and Santa Barbara Counties.

The feature is almost non-diagnostic, but the line between what is useful and what is not useful for areal correlations is harder to draw when the material available for such study is so limited. Much of the artifactual content at the Willow Creek sites is non-distinctive. By contrast, the Type-2 points are distinctive enough to be useful. The time depth involved is enough to result in cruder versions of this point type in Phase 2bcd in the upper midden (Mnt-281), so the broad distribution of this point type may seem to be at least partly a function of time.

In effect, Type-2 points would characterize all of Phase 2 in both middens, just as the Type-2 shell fish-hooks recur in Phase 2a and Phase 2bcd in both lower and upper middens.

Phase 2bcd

Type-2 Shell Fish-Hooks: None of the collectors visited had any of this kind of shell fish-hook, except Stuart Fackenthal who had one from Mnt-12 in Carmel Bay, a mile south of a delta where the Carmel River flows into the Pacific Ocean.

Drucker (1937: 7, 47) and Sparkman (1908: 200) report similar hooks among the Luiseno in Los Angeles County in historic times. Heizer (1949: 89) reports such a type along the Santa Barbara Channel, and a Santa Barbara site (SBa-205 or Jalama) has yielded this type. The literature identifies this as a southerly type. Its occurrence as far north as Carmel Valley is rather unusual, but would indicate to me that this may be a function of great time depth, as in the case of Type-2 points. These Type-2 shell fish-hooks also occur in both Phase 2a and Phase 2bcd (Mnt-282 and Mnt-281). Thus, like the Type-2 points, this type of shell fish-hook may characterize all of Phase 2. Also, like the points, these fish-hooks probably had a southerly focus.

Steatite Finger Ring: Santa Barbara County, 5 specimens (Ruth Collection at Lompoc); San Luis Obispo County, 1 specimen (Madonna Collection at San Luis Obispo, from Old Creek near Cayucos), 1 specimen (Dalidio Collection at San Luis Obispo, from site near Toro Creek); Monterey County, 1 specimen (Plaskett Collection at Salinas, from near Jolon).

These distributions suggest a focus somewhere south of Willow Creek, and is consistent with the anticipated distributions (that is, with the southerly foci of Type-2 points and Type-2 shell fish-hooks of Phase 2 at Willow Creek).

Phase 3

Types 4 (eared) and 5 (lanceolate) Points: These are late types at Willow Creek, and occur mainly north of Willow Creek. Dalidio has not found any in the Arroyo Grande of San Luis Obispo County, and Ruth has found only a few examples of this type in the Lompoc vicinity of Santa Barbara County. Plaskett found a few at Jolon near the inland entry to the Willow Creek sites, suggesting that these obsidian points were brought into Willow Creek over inland routes, just as the steatite rings from the south had been brought in through this natural pass into Willow Creek.

Fackenthal has found quite a few such points in the Carmel Valley (Mnt-18; Mnt-157; Mnt-233), and 2 were recovered during August 1963 at a site near Pacifica in San Francisco County. This would suggest a northerly locus.

Wedel (1941: Pl. 39), Schenck and Dawson (1929: Pl. 91, 380), Gifford and Schenck (1926: 84), Pilling (1950: 438), and Treganza (1952: 22) note such points in the San Joaquin Valley. This suggests a northeasterly origin for such points, in the area of the sources of obsidian. In either case, the foci for these points lie northerly from Willow Creek.

Phase 4

Type-1 Shell Fish-Hooks (curved) and Emeryville Facies Traits: This type of shell fish-hook occurs at Willow Creek, but is not reported anywhere else in Monterey or San Luis Obispo Counties. In fact, this type occurs during both Phases 3 and 4 at Willow Creek, suggesting a kind of cultural continuity here.

The focus of Phase 3 has been placed north of Willow Creek, and possibly inland, too, in a northeasterly direction, on the basis of the distribution of two point types. It is not so easy to allocate Phase 4 to such a northeasterly focus on the basis of Type-1 shell fish-hooks (which also occur during Phase 3), because the literature is quite specific in terming this a kind of Santa Barbara feature.

For instance, Schumacher (1875, 1877), Rau (1884), Yates (1900), Rust (1907), Heye (1921), Gruvel (1928), Woodward (1929), Colton (1941), Robinson (1942), Irwin (1946), and Heizer (1949) seem to identify this general type of shell fish-hook in the Santa Barbara region. This would seem to constitute fairly conclusive evidence that this trait has a focus south of Willow Creek.

The only distinctive feature about the hooks at Willow Creek which might set them apart from the southern variety might be the selection of red-backed abalone (Haliotis rufescens) as a material, but the substitution of species here hardly constitutes any great innovation. This, then, presents a problem, since the other materials within Phase 4 are more closely affiliated with the Emeryville Facies in the San Francisco Bay area than with any comparable site in Santa Barbara.

About a dozen traits (or almost all of the traits) defining the Emeryville Facies occur during Phases 3 and 4. This is an interesting fact, and it immediately suggests a likely locus half-way between San Francisco and Willow Creek for Phases 3 and 4. The traits involved include: O. biplicata spire-ground beads (Type 1b); abalone discs with split-V edge-engraved decoration; lumps of red ocher; piled plummet (Type b) charmstones; generalized pestles; obsidian points (not typed, but like types 4 and 5 here); bone gorges; whistles with oval holes (bird-bone); incised antelope metacarpals; bone awls; bone pins, various worked antler tines. This list is in Beardsley's (1954) account of the Emeryville Facies, and the number of coincident traits here (which also occur at Willow Creek) is somewhat greater than might be accounted by the general cultural homogeneity which has been noted within the South Coast Ranges by Harrington (1942).

Therefore, in regard to the Type-1 shell fish-hooks at Willow Creek, it is difficult to decide whether they really represent a southerly feature, as the literature indicates, or whether it might not have had more northerly distributions. Such shell fish-hooks are fragile and not too easy to identify for amateur collectors who have trained their eyes to search for points and bowls.

The focus of the Emeryville Facies lies somewhere south of San Mateo and Santa Clara Counties (Beardsley, 1954: 93-94). This suggests that curved shell fish-hooks might also be found yet in the coastal regions of Santa Cruz County. However, this is a hypothesis which cannot be proved or disproved on the basis of the available evidence.

In the allocation of a locus for Phases 3 and 4, I am inclined to lean towards the area north of Willow Creek on the basis of 2 point types and the dozen traits which occur during Phases 3 and 4 and at Ala-309 (Emeryville A) in the San Francisco Bay area. Tentatively, I would question the limited distribution of curved shell fish-hooks which is indicated by the literature, and would suggest that wider distributions might be found yet, especially since these objects are known now to have such a wide distribution on many islands in the Pacific (personal communication with Emory, University of Hawaii).

Trait Lists

The areal correlates have been selected here from a series of rather extensive trait lists for each phase at Willow Creek. The trait list for each Willow Creek phase is adequate enough to outline certain aspects of entire cultures during different periods.

Until the materials collected in this area by the local collectors are diversified enough to add a few more likely areal correlates, the trait lists which have been compiled for the Willow Creek phases will have to stand as the only meaningful cultural and chronological contexts in terms of which local items might be identified as to function, as well as in regard to the time and culture involved.

In short, further correlates may have to await further collecting by collectors in the adjacent areas.

Summary of Areal Correlations

7 diagnostic features have been isolated as among the most useful for areal correlations between the sites at the mouth of Willow Creek and the adjoining areas. These are not all of equal value, some being almost non-diagnostic (if not actually non-diagnostic). 13 traits which have been used in the past as diagnostic elements have had to be discarded on the basis of what has been learned from the data supplied by the Willow Creek sites, and for other more general reasons. Thus, the quest for areal correlates has been difficult, compounded by the lack of diversification in the collecting habits of the local collectors.

However, the 7 selected areal correlates have been supplemented by about a dozen other traits from the Emeryville Facies, and this seems to be adequate for the purposes of this thesis, because it is possible to identify the most likely point of origin of the populations who occupied Willow Creek during various phases.

Phase 1: southerly origin likely; Type-1 lithic points (diamond-shaped); locus probably near Lompoc, Santa Barbara County.

Phase 2 (2a and 2bcd): southeasterly inland origin likely; Type-2 lithic points (stemmed); Type-2 shell fish-hooks (loosely curved); steatite finger rings; locus probably in inland, central and southern Monterey County or San Luis Obispo County.

Phases 3 and 4: northerly origin likely; Type 4 (eared) points; Type 5 (lanceolate) points; Type-1 shell fish-hooks (tightly curved); 12 Emeryville Facies traits; locus probably north of Carmel Valley.

CHAPTER V

CHRONOLOGICAL CORRELATIONS

The mode of chronological correlation which has been selected here may be termed "selective" (not "holistic"). It involves the selection of some segment or phase of a temporal sequence which has been already established for some distant area. This selected portion is then correlated with the appropriate phase at Willow Creek.

The areal correlations in the preceding Chapter IV have already hinted at the temporal correlates which might be most relevant for selection from the various areas. This, in effect, adds the temporal dimension to the materials which have been presented in the preceding chapter.

Santa Rosa Island

Only 1 radiocarbon date for a Late Canalino Phase at Santa Rosa Island (Orr, 1956: 3) is relevant here. This is a date of 96 A.D. (± 340 years) obtained from a sample (CT-36) of surfgrass, which had provided house thatching, in Trench 4, Locality 131.2, Skull Gulch, at a depth of 30 inches below the surface.

This particular phase could be coeval with Phase 1 at Willow Creek, However, the diagnostic Type-1 lithic points (diamond-shaped) are not evident at all on Santa Rosa Island, probably due to an ecological pattern which obviously stressed fishing over hunting, as evidenced by unleached black and unconsolidated soils containing a high percentage of shell and fish-bones.

These Late Canalino people utilized circular fish-hooks, like Type-1 at Willow Creek, but made of H. cracherodii. H. rufescens is rare or absent.

Rogers (1929) has suggested a rather sharp difference between populations in the Channel Islands and those in the mainland portions of Santa Barbara County. This may be an ecological difference rather than a cultural one, as is suggested by Orr (1956: 1): "There can be no doubt of a Canalino correlation between the Mainland and Island." Therefore, chronological correlations with the southern coast of Santa Barbara County might be more fruitful.

Southern Santa Barbara

In summary, Orr proposes 3 Late Canalino subphases on the southern Santa Barbara coast based on a bowl typology:

Early: 1000 B.C. - Mescalitan Type.
Middle: 300 A.D. - Las Llagas Type; 500 A.D. - Sunset Valley Type.
Late: 700 A.D. - Olla-shaped Type; 1400 A.D. - Later Mescalitan Island Type;

Santa Ynez Type.

The only relevant subphase here is the Middle one of 300 to 500 A.D. (Las Llagas). A Las Llagas ceremonial bowl has been identified at site Mnt-88 and is in the Post collection. This is about 30 miles north from Willow Creek. However, the bowl was a surface find, and no associated artifacts have been identified with this distinctive bowl. This need not lead to a rejection of this evidence for a southern type bowl so far north from its probably origin, but should be accepted with caution. It suggests the possibility of very long coastal journeys by boat from Santa Barbara to the Monterey Coast, but does not establish this as a firm archaeological fact.

If the occurrence of the Llas Lagas bowl in Monterey County is substantiated by more data, then it may be reasonable to suggest a wide range for the Santa Barbara populations around 300 A.D., or about the time of Phase I at Willow Creek.

Northwestern Santa Barbara

Clarence Ruth wrote his Master's thesis in 1937 at the University of Southern California. It concerns the archaeology of the Lompoc vicinity where he has done extensive archaeological surveys in the past 30 years. His collection is housed in large museum quarters adjoining his residence and is called The Indian Museum.

Now retired, Ruth devotes a good portion of his spare time to the chipping of projectile points from obsidian. It is not likely that the Phase 1 at Willow Creek would have had such a firm areal correlate in Lompoc without the availability of Ruth's collection which has about 3,000 Type-1 (diamond-shaped) chipped points made of glossy light beige chalcedony.

These points from the Lompoc region, which are in Ruth's collection, have often been associated directly with Las Llagas bowls. Ruth has collected hundreds of these bowls associated with Type-1 points at coastal sites within an area now closed by United States Air Force Vandenberg Base.

Point Sal

Carter (1941) has excavated the stratified site at Point Sal. This is located near the northwestern corner of Santa Barbara County. In summary, the relevant strata are:

Stratum I: Phase I - (Possible Type-1 points)
Stratum II: Phase 2 - Type-2 points
Stratum III: Phase 2 - Type-2 points

The identification of Stratum II with Phase I is rather vague, because the distinctive element in this stratum is a metate of the basin type. Stratum I actually yields no

projectile points at all.

Arroyo Grande

Type-2 projectile points appear to have a locus around Point Sal, but farther north and inland, in San Luis Obispo County. Clarence Ruth has found a few, but inland and maybe somewhat north of Lompoc. His avid protege is an individual who lives just outside the County Seat of San Luis Obispo, and who has done most of his collecting in the Arroyo Grande, just north of Point Sal. This collector is Ernest Dalidio. He has found Type-2 points in the Arroyo Grande area and regards them as most typical here.

Monterey Peninsula

Pilling's sequence (1955) for Monterey Peninsula is summarized here:

1. Early vegetable-gatherers and coastal dune-dwellers use basin metates (Cf. Point Sal, Strata I-II). Hunting is indicated by points at Mnt-30 and Mnt-197. These are unlike the points at Willow Creek. The early phase here is not yet represented at Willow Creek, probably because these people stayed at home-bases near the mouth of the Carmel Valley.

2. Middle phase mollusc-gatherers and dwellers along the creek banks south of the Monterey Peninsula have Las Llagas bowls and Type-2 (loosely curved) shell fish-hooks. This indicates contacts with peoples who represent Phase I in the Willow Creek region, especially since Type-1 (diamond-shaped) points are associated with Las Llagas bowls in the Lompoc region. However, this is a very tenuous kind of relationship at best. Pilling also claims that bed-rock mortars, cairn-covered burials and abalone pries are "southern" traits in this area during this phase, but I have questioned this.

3. The so-called "Late-Middle" or "Late" phase apparently bewilders Pilling, because he is confronted with some very distinctive kinds of points (Types 2, 3, 4 and 5) and northern and southern traits mixed in a way that makes no sense to him. He calls this a phase of "infiltration" of northerly elements. It seems to me that this phase, which Pilling also regards as one when collectors of salt and abalone camped on sand-dunes in a fashion set by peoples of his Phase-1, is very inadequately separated out into subphases.

Perhaps the evidence from Willow Creek can suggest some reasonable solution to Pilling's problem regarding this late phase. By now, what with the phases at Willow Creek being a context for wider correlations, it should be apparent that a confounding of 2 chronological and cultural units must lie at the root of Pilling's problem. It is true, as Pilling is anxious to point out, that southern elements do occur in the vicinity of Monterey Peninsula. It is also true that traits like basin metates and Las Llagas type bowls indicate early dates for such southern contacts. However, it is also true that a number of very interesting events must have cut his Phase 3 in the Monterey Peninsula

vicinity.

In essence, the solution is simple. Pilling's Phase 3 must be sub-divided into 2 sub-phases, or, even better in this case, expanded into 2 distinctive chronological and cultural phases:

Phase 3: This is related to Phase 2 at Willow Creek, which is correlated areally and chronologically with inland San Luis Obispo and Monterey Counties. The following traits (listed by Pilling) are probably relevant to this revised Phase 3 in the Monterey Peninsula vicinity: painted petroglyphs - 25 sites near Mnt-250; punctate bone decoration - Mnt-131; use of asphaltum - Robson collection (12 hopper mortars and asphaltum-tipped bases on Type -2 points from mouth of Carmel Valley); hopper mortars - Colby collection (from Big Sur area); Type-2 points - Mnt-5, Mnt-108, Mnt-12, Mnt-173, Point Pinos Reserve, Mnt-18, Mnt-101, Mnt -57, Mnt-90, in the collections of Downie, Martin, Fackenthal, Cahoon and Robson.

Phase 4: This is related to Phases 3 and 4 at Willow Creek. These phases probably constitute a single cultural unit. The locus may be somewhere between San Mateo and Monterey Counties. This is the area which probably held those people that introduced Late Horizon elements into Beardsley's Central California sequence. Pilling lists these items which probably belong to this phase in the Monterey Peninsula sequence: Types 4 and 5 points - Mnt-233 (historic sites Mnt-18, Mnt-157); incised clamshell beads (Fackenthal collection); unglazed ceramics (Mnt-18, Mnt-159); "container for asphaltum" (Mnt-250); hopper mortars (Colby collection from Big Sur area); use of asphaltum (Robson collection from Carmel Valley mouth).

With these revisions, then, Pilling's sequence may be accepted.

San Francisco Bay

It is clear from the sequence at Willow Creek that only the Late Horizon material from San Francsico Bay may be most relevant. The Emeryville Facies, in fact, is about the only one which bears much connection to Phases 3 and 4 at Willow Creek. This Emeryville Facies is defined on the basis of materials secured from 6 Littoral Zone sites in the Alameda (not Marin) Province in the San Francisco Bay area: Emeryville A (Ala-309) (B is Middle Horizon); Greenbrae A (Mrn-76) (B is Middle Horizon); Bayshore A (SFr-7) (B is Middle Horizon); Ponce A (SCl-1) (B is Middle Horizon); Glen Cove (Sol-236); Maltby (CCo-250).

The coeval Marin Province Facies (disregarding Mrn-76 which Beardsley (1954) places in Alameda Province) is known as the Mendoza Facies, which is defined on the basis of data from 2 sites: Cauley A (Mrn-242) (B is Middle Horizon); Mendoza (Mrn-275).

About 12 traits (or almost all the traits) defining the Emeryville Facies occur

during Phases 3 and 4 at Willow Creek.

Beardsley hints at a probably southern origin for the Late Horizon in the Alameda Province, especially when he indicates that the material in the Middle Horizon of the site which may be too far south to be included in his Central California sequence of facies, namely, the Ponce site (SCl-1), is remarkably like Late Horizon farther north. The hypothesis here is that this entire Late Horizon was probably a veneer laid by a very wide territorial expansion of peoples who probably originated near some place just north of Monterey Peninsula. This is a hypothesis.

The facts appear to be in concordance with such a theory. Caldwell's study (unpublished M.A. thesis, Stanford University) is more descriptive than theoretical, and rather limited in scope, but it highlights the anomalous character of the Ponce site (SCl-1) in Beardsley's Middle Horizon. Because it is so crucial here, a more detailed treatment is advisable.

The Ponce site (SCl-1), alias Mayfield, alias Castro, can be described as a large site. It measures 300 by 125 feet and rises about 10 feet above the old marshland at a southern tip of San Francisco Bay. Now it is about 3 miles from a rather muddy area which is regarded as the present shoreline.

In 1911, L. L. Loud singlehandedly excavated 50 burials from a 100-foot trench, inspecting over 12,000 cubic feet of midden from the west end of a mound which was to be revisited in 1946 by R. F. Heizer and his colleague, F. Fenenga. They recovered 3 additional graves from this butchered site. Loud recorded only those burials (24 in all) which had grave offerings associated with them, and disregarded describing 26 without grave lots, aside from mentioning their location in the mound.

Beardsley (1954: 93-94) had difficulty with analyzing this evidence. It may suffice here simply to cite his suggestive conclusions:

> "This assemblage of artifacts and burials gives none too strong assurance of the existence of the 2 facies postulated... Ponce Site is near the edge of the culture area to which sites previously considered belong. Investigation has been very slight in the region to the south. If more were known, Ponce Site manifestations now labeled Ellis Landing Facies and Emeryville Facies might rather be grouped with a different set of facies."

Aside from the artifacts and burials at the Ponce site, a feature regarding the debris content of the midden is noted by Gifford (1916: Table 5, p. 19). This differs from other sites in the San Francisco Bay area in 2 respects. First, it is marked by an extremely low percentage of mollusc shells. Second, it is marked most by remains of various deer or antelope species. This suggests that the people at SCl-1 may have stressed hunting, just as some people during Phases 3 and 4 at Willow Creek seem to have stressed hunting.

This kind of evidence, then, is enough here to suggest quite a strong archaeological relationship between Phases 3 and 4 at Willow Creek and the Emeryville Facies, or, perhaps more significantly, with the Middle Horizon portion of the Ponce Site at the southernmost periphery of the San Francisco Bay region.

This also suggests the hypothesis that during Late Horizon times there were some people around Santa Cruz who began to expand territorially, expanding outward, north, south, and east. It is apparent that they probably moved into both San Francisco Bay and Willow Creek. The problem is: How far did they go? North and east are 2 cardinal directions which point to areas beyond the scope of this thesis. How far south, then, did these people go?

Moving Southward

The time period involved for the Late Horizon may be anywhere between 300 A.D. and 700 A.D. near San Francsico Bay, according to radiocarbon sample C-689 for the Hotchkiss Site (CCo-138). The date is 725 A.D. (± 200 years). Libby (Science, Vol. 120, pp. 733-742) records this determination. Heizer concludes (1956: 7):

> "Phase I of the Late Horizon culture of Central California, as judged by sample C-689, was in operation by 700 A.D. The actual beginning date of this culture phase can be projected back to about 300 A.D."

The phase might be a bit later in making its appearance as one moves away from some locus near Santa Cruz. It may be quite late at the peripheries of this apparently expanding sphere of cultural influence. The question here is how far south this influence might have reached, perhaps in the guise of small groups intruding upon coastal areas as far south as the boundary between the counties of Santa Barbara and San Luis Obispo.

Perhaps the best kind of evidence for such inferences might be burials, especially if these are accompanied by grave lots. Fortunately (in one sense), Dalidio has excavated and catalogued a number of burials in this region, and these can be studied in his private collection.

Upon my request, Dalidio has filed his findings with the Archaeological Research Facility in Berkeley, but I shall refer to his code numbers in identifying the artifacts associated with the burials. First, 10 examples of the typical kinds of burial in this region will be described. Then, 6 rather atypical burials will be described, and an attempt will be made to explain the anomalous features so far as grave lots and other features (such as body orientation) are concerned.

Ten Typical Burials

1. Flexed adult female lying on left side; oriented east; Biddle Ranch, Arroyo

Grande (excavated August, 1962); light grey sandstone mortar (F-M26) located above shoulder area (9 in. tall, 14 1/2 in. diam. at top, 6 1/2 in. diam. at base, 1 1/2 in. rim).

2. Flexed adult female lying on right side; orientation east; Arroyo Grande, (excavated August, 1963); light brown sandstone bowl (F-M28), located above body, broken into 6 pieces (7 in. tall, 14 in. diam. at top, 5 1/2 in. diam. at base, 1 1/2 in. rim).

3. Flexed adult female lying on right side; oriented east; Biddle Ranch (Arroyo Grande), (excavated August, 1962); light grey sandstone mortar (F-M29), killed in 2 pieces, and halves inverted over face and back of cranium (6 in. tall, 14 in. diam. at top, 3 1/2 in. diam. at base, 1 1/2 in. rim).

4. Disturbed by bulldozer; oriented east; Hollister Ranch, Gaviota; small blue-black steatite bowl (W-S79), shaped like an orange (1 1/2 in. tall, 4 in. diam., 1.4 in. thick); string of steatite beads (in the Silveira collection).

5. Flexed adult; oriented east; Los Olivos site; killed sandstone mortar (8 1/2 in. tall, 13 in. diam. at top, 7 in. diam. at base, 1/2 in. rim); H. fulgens whole shell with anal holes filled with asphaltum (D-F37) and laying inverted over skull.

6. Flexed adult lying on right side; oriented east; Biddle Site (Arroyo Grande); grey granite polished phallic-shaped pestle (F-Z97) with lower half encased in asphaltum, lying under body in area of rib cage.

7. Flexed adult; oriented east; Casmalia Site; fish vertebrae (B-B32) decorated with inlaid small shell beads located near chest cavity.

8. Flexed adult lying on right side; oriented east; Cave Landing Site near Avila Beach; 14 small bone tube beads (A-B67) placed in criss-cross fashion in a pile in the fold of forearms.

9. Flexed adult male lying on right side; oriented east; Biddle Ranch (Arroyo Grande); many clam-shell beads and abalone pendants; killed mortar scattered over burial; 4 obsidian points in rib cage; 1 shark's tooth with trace of asphaltum on the base (F-F9 to F-F26).

10. Flexed adult male lying on right side; oriented east; Toro Creek Site (Cayucos); 2 perforated H. fulgens discs (1 1/2 in. diam. with double holes in center and slight traces of asphaltum around the holes or along the back, lying back to back near the jaw area (I-F 2 and I-F 3).

Six Atypical Burials

1. Flexed adult male; oriented north; Cave Landing Site near Avila Beach; human vertebra with arrow tip lodged in it (Base of this mottled brown chalcedony point is missing (A-B-38); 1 Type-2 hafted banded steely grey chalcedony point (A-C16) is lodged behind left shoulder, with fiber and wood adhering to asphaltum; 1 Type-2 mottled dark greyish brown point (A-C15) also behind left shoulder; 2 spear points with rounded bases and with wood-grain of shaft impressed on asphaltum (A-C13, A-C14) like a large Type-2, lodged in chest cavity 12 inches below clavicles; 11 Type-4 and Type-5 points, no asphaltum, lying parallel, oriented northerly like body (A-C17 to A-C27); 3 yards of O. biplicata disc beads, like Type 3c, strung into the chest cavity (F-252) (One third in Louis Silveira collection).

2. Flexed adult male lying on right side; oriented north; Cave Landing Site near Avila Beach; 5 whistles (A-B70 to A-B74) in fold of arms near waistline; 2 similar small bone whistles (A-B69 to A-B69a) lying on nearby surface but not directly associated with this burial.

3. Flexed adult male tying on right side; oriented north; Cave Landing Site near Avila Beach; 2 Type-1 H. rufescens (!) fish-hooks in fold of flexed arms (A-F79, A-F80); 1 H. cracherodii blank standing on edge in folds of flexed arms (A-F160); 1 ground slingstone object (Z48) about 2 inches from shell artifacts.

4. Flexed adult face-down; oriented north; Los Olivos site; "bound in isolated burial outside burial boundaries"; H. rufescens inverted over back of body (D-F36).

5. Badly decomposed adult in compacted soil; oriented north; Gaviota Site; "3 ornaments were stacked one on top of another 6 inches from shoulder on west side of burial"; these ornaments include: F-F33, "whole limpet shell ornament with outer edges partly ground"; D-F34, D-F35 - "shell ornaments" (like H. cracherodii discs).

6. Flexed adult; oriented north; Casmalia Site; "sweat scraper" (B-B8) made from bone lying at waist parallel to body.

Among the most striking similarities between the various "typical" burials and between the several "atypical" burials is body orientation. The burials which contain grave lots that are quite diagnostic of southerly portions of the South Coast Ranges are invariably oriented inland (east), while the burials whose grave lots are very like objects most common in the northern portion of the South Coast Ranges are invariably oriented north. Here is perhaps additional evidence for the probably significance of body orientations in the designation of home-bases, but these few examples do not yet demonstrate this hypothesis.

Leaving body orientations and their probable significance aside for the moment, it is possible to suggest that the "typical" group was probably indigenous to this

region and that the "atypical group" was probably intrusive in this area, solely on the basis of grave lot associations. The objects in the intrusive group of burials suggest some relationship to Phases 3 and 4 at Willow Creek. Extending this even farther, on the basis of areal correlations in the preceding chapter, it is likely that the ultimate origin of these 6 "intruders" (almost invariably males) was north of Willow Creek.

The occurrence of these intrusive (and northerly oriented) burials in San Luis Obispo suggests nothing so dramatic or far-fetched as a territorial expansion, but it does indicate that perhaps these northern groups did wander into alien territories, possibly violating tribal claims to coastal resources in the southernmost extremities of the South Coast Ranges. This would be not so much an invasion by hordes as possibly an infiltration of small groups. In any case, some northerly influence is evident in the occurrence of Type-4 obsidian points (I-C31, I-C32, I-C33, I-C39) and Type-3c O. biplicata disc beads (F-252) with these burials.

Chapter Summary

Selective correlations of the phases at Willow Creek with portions of the chronological sequences in adjacent areas yield some general sequence of relationships within the South Coast Ranges between 200 A.D. and 1800 A.D.

Phase 1 (1879 ± 250 yrs. B.P.; 1840 ± 400 yrs. B.P.); Santa Rosa Island - Late Canalino Phase (1860 ± 340 yrs. B.P.); Southern Santa Barbara - Las Llagas Sub-Phase (300 A.D.); Western Santa Barbara - Lompoc Focus (Ruth ms.); Point Sal - Stratum I? (Carter suggests Oak Grove); Monterey Peninsula - Phases 1 and 2 (Pilling suggests southern origin).

Phase 2 Point Sal - Strata II and III (direct relationship); San Luis Obispo - sites in Arroyo Grande area (Dalidio catalogue); Salinas Valley - no definite evidence; Carmel Valley - Mnt-12, Mnt-18, Mnt-90, Mnt-101, Mnt-173, Point Pinos Reserve; Monterey Peninsula - Phase 3 (Mnt-5, Mnt-157, Mnt-131); (10 burials from Arroyo Grande in Dalidio catalogue).

Phases 3 and 4 San Francisco Bay Area (300 A.D. on); Ponce Site (SCl-1), Middle and Late Horizons in Central California sequence (Beardsley, 1954); Emeryville Facies - Late Horizon in Central California sequence (Beardsley, 1954); Hotchkiss Site (CCo-138) - 725 ± 200 yrs. B.P.; Monterey Peninsula - Phase 4 (Mnt-157, Mnt-233); San Luis Obispo - 6 "intrusive" burials in Arroyo Grande vicinity (Dalido catalogue).

The foregoing correlations indicate a general sequence of relationships within the South Coast Ranges. These are internal relationships and may have some demographic implications.

1. Ca. 200 A.D.

Fishermen and hunters from the western coast of Santa Barbara probably took the land route to the Willow Creek sites. There is no physical evidence of the plank canoe north of Point Concepcion, except in Morro Bay (probably on account of rough water), but I would guess that the occurrence of Las Llagas type bowls north of Willow Creek need not rule out the possibility of marine travel along this coastline. Allowing this, it may suggest a very early relationship with Hokan-speaking Pomo groups north of San Francisco Bay, but this strikes me as very unlikely, since the archaeological evidence farther north indicates that the prehistoric peoples in current Hokan areas tend to have greater time depth than those in current Penutian areas, according to Prof. M. Baumhoff, who mentioned this during a conversation with me.

Going even farther afield for a moment, it may be noted that the Polynesian Islands were not inhabited until about 200 A.D., according to Emory's work in the Oceanic area over the past 30 or more years (Emory, Bonk, Sinoto, 1959; Emory, Sinoto, 1961). Shell fishhooks occur in Polynesia.

Might it not be a distinct possibility that a few of the seamen who were enroute to a region north of San Francisco Bay from Santa Barbara (400 miles) or possibly returning from there to their southern home-base were taken off course? Ferdon (1963: 499-505) suggests multiple sources for Polynesian elements by taking into account current and wind patterns in the Pacific Ocean. The trip to Hawaii would be 5 times as far, but not quite so long in terms of actual time, because swift currents could carry a boat from California to Hawaii more quickly than people could hope to paddle a canoe northward along the California coast against the current.

Emory (personal communication, Feb. 6, 1964) writes: "California fishhooks, in regard to head forms, resemble more closely the Caroline Islands' hooks than the Hawaiian ones, which makes the puzzle even more puzzling."

Sinoto (personal communication, Feb. 17, 1964) writes: "Circular hooks of the west coast have been often mentioned as though they are related with some of the Polynesian circular hooks; however, so far we have not found any similar hook in our archaeological excavations in Hawaii or the Society Islands. Suggs did not report any similar hooks from Nukuhiva excavations either. Some of the ethnological collections of similar hooks (Beasley, 1928) are listed as from Tahiti, but we are sure they are from Micronesia. We do not have any evidence that the west coast type of hooks or similar type of hooks existed in the Pacific in 200 A.D."

Sinoto continues: "We do not know much about the prehistoric fishhooks in Micronesia, but the ethnological collection represents only the last phase of the native culture, and we think those hooks are quite late."

Sinoto concludes: "The method of making circular hooks on the coast is

drilling a large hole in the center, then opening the gap between the tip of the point and the shank. This method was rarely practiced in Polynesia; however, all the stone hooks in Easter, Pitcairn and New Zealand were made by this method. It is difficult at this stage to see the relationship between the west coast and the Pacific circular hooks, especially around 200 A. D."

2. Post-200 A. D. (Phase 2)

Most of the South Coast Ranges from the Santa Barbara Channel Islands to the Monterey Peninsula constitute a territorial unit which has strong southerly affiliations in the archaeological record. The northernmost boundary is rather vague and might actually involve a wide strip of land that was peripheral to the home bases of groups on either side of such a strip. In any case, Willow Creek seems to have been located within such a wide boundary zone.

During this time, there might have been inland trade relations between the occupants of Willow Creek and peoples in the San Joaquin and Sacramento Valleys, but there is no actual archaeological evidence for such relationships. Ethnological accounts suggest that Haliotis might have been traded from the coast to the inland areas at times preceding the historic period, but such projections of historical relationships into the perhistoric past may be invalid. However, they do suggest possible internal relationships which are consistent with the archaeological evidence and the nature of the habitat around Willow Creek.

3. Post-200 A. D. (Phases 3 and 4)

People from the Santa Cruz area are apparently established in the San Francisco Bay area by 700 A. D. and might be setting their sights farther south, challenging some of the territorial rights around Willow Creek, at least in so far as they gained access to resources in the Willow Creek vicinity. The burial evidence at Willow Creek suggests (but does not demonstrate) the hypothesis that this might have been a battle zone during the time that northern and southern groups alternated in occupying the Willow Creek sites.

CHAPTER VI

SUMMATION

The alternation of proto-Costanoan and proto-Salinan occupations at the Willow Creek sites over at least the past millenium is now well documented. This documentation contributes to the information which we have about aboriginal populations in this coastal portion of the South Coast Ranges, and may contribute to the eventual solution of the problems concerning the so-called Playanos and Esselens. My own view at this time favors a re-examination of the reality of these ethnological entities in the light of this new archaeological evidence.

Having extended the extent of the available knowledge about this particular part of the South Coast Ranges, it may be appropriate to re-evaluate what is already known archaeologically about this general area and adjoining areas. In essence, it would involve a summary of the background work that has been done by other archaeological investigators. However, hopefully, a certain degree of cohesiveness may be attained by reference to the preceding analyses in Chapters III, IV and V.

Proto-Salinan Area

The proto-Salinan area is defined broadly here to subsume all of the South Coast Ranges south of Willow Creek. Santa Barbara County might be regarded for the purposes of this summary as a southerly extension of the proposed proto-Salinan area, especially since the relationship between Salinans and Chumash groups even in historic times has been rather close. Both major tribal groupings speak variants of a language which has been classified as Hokan (Powell, 1891) and both share more culture elements with each other than with other adjoining groups (Harrington, 1942).

Most sites in San Luis Obispo County are not only coastal but also concentrated along a 25 mile sandy strip between Morro Bay and Pismo Beach. Relic collecting in this locale has gone on for many years (Pilling, 1951) and continues, led by diverse persons who seem to reiterate continually that a major source of Pismo Clam shells (Tivella stultorum) was located in this coastal territory known as the Pecho Coast and owned historically by the Obispeno-Chumash tribe.

Bennyhoff and Heizer (1958) report that Tivella beads are distributed as far as the Western Great Basin where they have been in excavated sites in Inyo County (Iny-2, Iny-372) and are known from a surface collection from Nevada (Ch-9). Such a wide distribution of this clam that breeds in warm sandy coastal beaches must be important, but no clam-shell disc-beads occur at Willow Creek. There is apparently no connection between Morro Bay and Willow Creek during the time when Pismo Clams were being accumulated for inland trade.

The most important single site in the mainland part of Santa Barbara County

may be SBa-7 known as Carpenteria or Mishopshnow site ("Fig Tree Mount"). Here are those Oak Grove People of Rogers (1929). They used metates before the Hunting People with hopper mortars arrived. The Canalino People would be the most recent in this nebulous sequence whose utility in this comparative study of Willow Creek items has been limited. Ford (1887), Olson (1930) and Bryan (1931) have also written on the Carpenteria site, but their reports have been even less useful here.

What makes this proposed sequence impossible to use comparatively is that the Canalino phase is claimed to have lasted for the last 4,000 years, while the entire sequence of 11 sub-phases at Willow Creek is bracketed (by radiocarbon dates) within the past 2,000 years.

Orr (1943) suggests 3 major sub-divisions of the Canalino phase, based on the typology of stone bowl forms. The Mescalitan type of sandstone bowl from Mescalitan Island on the southern coast of Santa Barbara County (SBa-46) is dated around 1000 B. C. by Orr. A middle and a later sub-phase have other types, and these subdivisions of the Canalino phase might have had some utility in correlations with items from Willow Creek, but not a single sandstone bowl occurs at or near Willow Creek.

A single Las Llagas type sandstone bowl, assigned by Orr to c. 300 A. D., occurs just north of Willow Creek (at Mnt-88 near the mouth of the Carmel River). However, this is a surface find. A local collector named Post found it in a cutbank on the beach. It has no stratigraphic context or archaeological associations, and might have been brought this far north even in historic times.

There are 2 other important coastal sites in Santa Barbara County. One occurs exactly between the 2 sites which have been mentioned. This is known as the Burton Mound or SBa-28. It has been described by Harrington (1929) as well as by Rogers (1929) in defining his 3 phases.

The other coastal site is in the northwestern corner of Santa Barbara County. This is known as the Point Sal Site or SBa-105. Carter (1941) summarizes it in 10 pages. A more complete account of this region is contained in UCAS (unpublished) manuscript No. 1, written by Clarence Ruth.

Materials from the Cachuma Reservior area were mostly surface-collected, although Baumhoff (1951) did undertake some exploratory excavations. A definite inland sequence is lacking for these materials.

The archaeology of Santa Barbara County lacks an unambiguous and definite chronology. Lacking local sequences, correlations which could be made with the Willow Creek sites have had to be more distributional in nature, rather than temporal.

It is apparent that the sequence from Willow Creek may tend to crossdate some of the materials in Santa Barbara County, but this would be quite incidental. A

more vital consequence has been the establishment of a firm early affiliation between Willow Creek and Santa Barbara.

It will be recalled that 3 steatite objects and several curved shell fish-hooks occur at Willow Creek. Their origin has been traced to the Channel Islands where they have been recorded for 80 years in the literature. Bowers (1883, 1887) is skeptical about the identification of the circular unbarbed shell hooks with no auricles as fish-hooks. He prefers to classify them as earrings or pendants. Arguing that the gap looks too tiny for a fish's lip to penetrate, Bowers fails to consider the possibility that the hook might have been intended for the fish to suck or swallow, and not to nibble.

Others call them fish-hooks. Schumacher (1875, 1877), Rau (1884); Yates (1900), Rust (1907), Heye (1921); Gruvel (1928); Woodward (1929); Colton (1941), Robinson (1942); Irwin (1948) and Heizer (1949) appear to concur in identifying them as fish-hooks, so the majority rules here, if truth may be legislated.

Shell fish-hooks recur on the mainland, too. Ruth has an impressive number from the northwestern portion of Santa Barbara County. Farther north, Fackenthal has one from the mouth of the Carmel River (Mnt-12), but it has a straighter shank and is made from mussel shell rather than abalone. Both types occur in Mnt-281 and Mnt-282, so fish-hook distributions are very crucial here.

Steatite (soapstone or talc) is a soft mineral which can be cut with a knife, since its hardness is only 1 to 2.5 Moh. A great abundance of this material occurs on Santa Catalina Island. Schumacher (1878a) counted 300 steatite quarries associated with tools and boulders carved into blanks for pots ("pot boulders"), within 2 square miles on the southeastern end of Santa Catalina Island.

Schumacher (1878b) has suggested that prehistoric people may have brought steatite to the mainland by paddling large plank canoes. The trade routes may have included stopovers at Anacapa, Santa Cruz, Santa Rose and San Miguel Islands, since big ollas seem to have been made on Santa Catalina Island and perhaps other islands (Schumacher, 1878b) and traded to people on the mainland for such foods as acorns as well as for sandstone bowls and skins. Even tiny fragments of these steatite bowls were reworked by mainland people.

Schumacher (1876) could find no other source of steatite, but Ford (1887) has recorded a deposit in the San Rafael Mountain Valley, which runs parallel to the Santa Ynez Range in Santa Barbara County. Heizer and Treganza (1944) suggest several more. In any case, the presently known sources are south of Willow Creek, so at least a general southerly direction is indicated here.

Steatite heats without cracking and thus makes good cooking pots. The use of steatite is widespread in North American among the aboriginal populations, and until a few years ago, soapstone was used in our own kitchens for fireless cookers.

Other uses and values appear when long distances separate a people from the source of steatite, and a more aesthetic value seems to be given to the mineral. An ornamental quality characterizes the steatite ring at the Willow Creek site. However, the paddle-like object and the perforated one at Willow Creek might provide an exception to this general observation, because they are very crudely worked and were probably used for more utilitarian purposes.

Since 1946, the Santa Barbara Museum of Natural History has concentrated its archaeological work on the prehistory of Santa Rosa Island. Orr has already published many radiocarbon dates for specimens on this grassy treeless and waterless channel island (1956, 1959, 1960a, 1960b). The most relevant single date here is for Late Canalino.

The dating sample is derived from surfgrass (Phyllospadix) in the collapsed roof of a hut in Locality 131.2, Trench 4, at a place called Skull Gulch. The date is 1860 $\pm$ 340 years B. P. (CT-38). It is congruent with both Willow Creek dates, and it contradicts Wallace's view (1955, Table 3) which allows the entire Canalino phase less than a thousand years.

Boundary Zone

The boundary zone between the proto-Salinan area and the proto-Costanoan area is defined here as a strip of land about 50 miles wide and stretching from Willow Creek along the Pacific Coast into the Salinas Valley around the current location of King City. In the general area here considered as the interior valleys (Nacimiento, San Antonio, and Salinas), exploration has been rather uneven.

Although Davis (1961) traces a major aboriginal trade route through the Salinas Valley, major portions of it are unexplored even today. The inland void is partly a function of the extent of exploration, so it need not be assumed that it reflects the distribution of aborigines during the prehistoric periods, although the field evidence that I collected during 1963 (and which is summarized in Chapter IV) does not do much towards filling this lacuna in terms of sites.

This rather uneven nature of archaeological survey within the South Coast Ranges is not restricted to this proposed boundary zone. Background information about the archaeological work in the South Coast Ranges has been summarized in Tables 5 to 7, Maps 4 to 6, and Site Lists 1 and 2, in the appendices. Even a cursory scanning of such data shows that the archaeological work has been distribured quite unevenly over the South Coast Ranges.

The central area just east of Willow Creek remains one of the more empty areas upon the archaeological map (See Map 6). This may be attributed to more attention having been directed to more northerly or southerly extremities where most of California's scholarly facilities are situated.

However, at this time, in view of evidence from the Willow Creek sites, it may be predicted that further exploration within this boundary zone (as defined here) is unlikely to yield any evidence for sedentary prehistoric populations, although traces of transhumant aboriginal movements might be expected. This hypothesis is supported by the documented tribal relations in this area and by the proximity of the historic boundary between the Salinans and the Costanoans, as well as by the alternation of occupations at the Willow Creek sites which suggest cultural affiliations with home bases that might be situated farther north or south of this boundary zone.

Shortly after the Willow Creek excavations were ended, an archaeological survey party was sent into the Nacimiento Valley, since funds were available for the search and salvage of antiquities in areas which would be flooded by proposed reservoirs. The salvage archaeology of the Nacimiento Reservior was unrelated to the project at Willow Creek, but has been more relevant here in tracing inland bonds.

During 1963, a Graduate Student Grant from the Patent Funds of the University of California made it possible for me to revisit this general area and Willow Creek in particular. At that time, certain field observations were made which allowed a fuller exposition of the stratigraphic situation at the Willow Creek sites as well as a broader assessment of the archaeological potential of this boundary zone between proto-Salinans and proto-Costanoans.

Proto-Costanoan Area

The proto-Costanoan area is defined broadly to subsume all of the South Coast Ranges north of Willow Creek. Sites traditionally regarded within the Central California sequence (Beardsley, 1954: 1) are regarded for the purposes of this summary as the northerly extensions of the proposed proto-Costanoan area, especially since such problematical sites as SCl-1 and Ala-309, even according to Beardsley (1954: 92-94), appear to be associated with more southerly facies.

A third of the 370 sites which have been recorded in Monterey County occur on the Monterey Peninsula where a local resident and graduate student of the Department of Anthropology at the University of California in Berkeley, Arnold Pilling, gathered a mass of data from local collectors among whom may be cited: Bruce Church and Francis Johnson of Salinas, Walter Fisher of Pacific Grove, Edward Doud and James Martin of Monterey, E. B. Robson and Harry Downie of Carmel, L. S. Cahoon and William Martin on Carmel Valley, Stuart Fackenthal of Robles del Rio, Joseph Post of Big Sur, and the curators of the Museum of Natural History at Pacific Grove.

Most of these are now deceased, so Pilling's work was a timely one. This is largely in manuscript form at Berkeley at the Archaeological Research Facility. His summary (1955) is tabulated in Appendix 1 (Tables 6 and 7). However, the Monterey Peninsula has been investigated by other scholars. These include: R. K. Beardsley

(1946), S. Broadbent (ms. 1955), E. Fisher (ms. 1935), E. W. Gifford (ms. 1913), E. Golomshtok (ms. 1921-1911), R. E. Greengo (1951), W. W. Hill (ms. 1929), A. L. Kroeber (ms. 1915), and A. E. Wood (ms. 1930).

Almost 30 archaeological sites occur within an area of 2 square miles around Isabella Meadows cave (Mnt-250) which was excavated by Clement Meighan (1955). Fackenthal's work in Carmel Valley, just a few miles north of the Ventana Cones, supplements the information about this inland region. Even Meighan (1955: 26) regards the material more Costanoan than Salinan in nature, so the ascription of this Esselen territory to the proto-Costanoan area here is congruent with the archaeological evidence. There is another significant feature about the material from the Carmel Valley, namely, the use of Monterey shale at Mnt-5 in the Fackenthal collection and at Mnt-57 on the Cahoon ranch. This material occurs during a late sub-phase at Willow Creek, and helps to identify the people who ground and incised this material perhaps for gambling.

No sites have been excavated in Santa Cruz or San Benito Counties, but Caldwell (ms.) notes some sites in the counties of San Mateo and Santa Clara. The most important single site in northern Santa Clara County is the Castro or Ponce (SCl-1) site described by Barnes (1897). The site has 2 facies and each resembles certain phases at Willow Creek more than do most other excavated sites in Central California.

Beardsley (1954: 92-94) has difficulty in distinguishing these 2 facies at SCl-1 as Ellis Landing Facies (Middle Horizon) Coastal Province or as Emeryville Facies (Late Horizon Phase 1) Alameda Province. He suggests placing this site in some more southerly facies, as is done in this study. However, a more precise kind of reclassification is not really feasible until such facies can be worked out in Santa Cruz or Santa Clara. There is still not enough physical evidence in these counties to isolate the likely center or centers of the proto-Costanoans.

In any case, it seems unlikely that Beardsley's culture sequence for Central California can be extended farther south than Alameda and San Mateo Counties. Therefore, the evidence from Willow Creek is particularly significant here in suggesting that the home bases of the proto-Costanoans were located northward from Willow Creek and probably even north of Monterey Peninsula. Thus, there is some indication here that further work in the area between Monterey and San Mateo counties may yet yield important sites, since the hypothetical center of the proto-Costanoan area may lie here.

Willow Creek is probably independent of the early San Francisco Bay facies which are related to an inland area perhaps in Sacramento Valley. It is possible that the San Francisco Bay area was not Costanoan territory during early prehistoric times, but that the Coast Miwok might have claimed it. Beardsley (1954) has indicated a close archaeological fit between his sequences for the Littoral and Interior Valley Zones, so it is likely that our theme of coastal-inland relationships is relevant even at this most northerly extremity of the South Coast Ranges.

There is also an aspect about Ellis Landing Site (CCo-295) of the Middle Horizon in the Coastal Province which suggests that the most relevant facies to Willow Creek (in terms of temporal relationships) was actually insulated from any external influences for over 3500 years. This is confirmed by Nelson (1909: 346), Gifford (1916: 12-14) and even Kroeber (1925: 930), who remarks on the immutability of culture in this Richmond mound which is about 28 feet deep.

Great stability over so many years at this site is also recognized by Beardsley (1954: 87-88). He recognizes a "zone of confusion" only in the upper 6 feet of the shell midden. It seems to me that this so-called "confusion" might have been due to the intrusion of more southerly coastal people (probably proto-Costanoans) into the Bay area.

Such territorial expansion of the proto-Costanoan groups is evident in the later sub-phases at Willow Creek. The burial evidence alone apparently justifies speaking of actual groups of people here, rather than of influences or of diffusion, because the actual remains of persons occur, at CCo-295. This is also true of the Willow Creek sites.

However, only the later facies of the Emeryville Mound (Ala-309) is most directly relevant to Willow Creek. This is perhaps the most famous site in the entire Bay Area. It was excavated in 1902 by Max Uhle, and yielded over 700 burials. The mound is at least 32 feet deep, but the precise depth of this enormous aboriginal cemetery cannot be known, since the top was scraped level for a dance pavilion. Uhle (1907: 22) finds some "unquestionable evidence of cremation" in the upper levels, but Schenck (1926: 183) can find charred skeletions only in a bottom level. Beardsley (1954: 89) cannot find any cremations at all. This dispute is not very relevant to Willow Creek, since only a single burial there is cremated and is clearly not proto-Costanoan.

The artifactual content of the later facies at Emeryville is very like that at Willow Creek. This has been called Phase 1 Late Horizon (in the Alameda Province). The definitive objects in the top 10 feet, without burial association, include type G (fish-shaped) Haliotis ornaments, steatite pendants, bird-bone whistles (with stop off center), and piled-plummet kinds of charmstones. These are artifacts which also occur in later sub-phases at Willow Creek.

It may be significant that the later phase of SCl-1 (Ponce or Castro Site), which has already been noted, also occurs within that cultural-temporal-areal niche which is shared by this later phase in the Emeryville Mound. SCl-1, or course, exhibits even stronger and more pervasive affiliations with a southern group (like the proto-Costanoans), since it will be recalled that "late" (proto-Costanoan?) elements occur even in this site's co-called Middle Horizon. This is a noteworthy feature.

This feature indicates that about the time that the proto-Costanoans were expanding territorially southward into the Willow Creek region, they were also extending

their sphere of influence northward into the San Francisco Bay area.

Central Valley Area

The relevance of Sacramento Valley to Willow Creek may be only peripheral, but there is a kind of parallel here, because both areas exhibit many archaeological relationships with the coastal regions that are located at opposite ends of the South Coast Ranges, namely San Francisco Bay and Santa Barbara.

Beardsley (1954), of course, has drawn many convincing archaeological relationships between Sacramento Valley and the San Francisco Bay region. No single study of such scope has been attempted to relate Santa Barbara sites to those in Sacramento Valley, perhaps because Santa Barbara has no adequate chronological sequences for such long-range correlation. Such an attempt cannot be made in this thesis either, but an early attempt may be cited.

The work of Heizer and Fenenga (1939: esp. 394-396) seems to be correct in its analysis of the Sacramento Valley data so far as it suggests that the people in Sacramento Valley might have traded with people in the San Joaquin Valley who, in turn, are known to have traded with people in the Santa Barbara locale.

Therefore, in the Central Valley area, it may be more correct to suggest a diffusion of Santa Barbara traits through intermediaries to some relatively sedentary populations. However, a more direct bodily relationship appears to be involved at both of the Willow Creek sites, where the evidence indicates that individuals from northern and southern groups actually made physical contact. Neither of these groups seems to have established any sedentary occupation site at Willow Creek, so it might even be misleading to refer to long-range cultural influences through trade or diffusion, since these influences presuppose a more sedentary population at Willow Creek than seems to have been the case.

Treganza (1952) describes the Farmington Complex which may be very ancient in northern Stanislaus County near the boundary between the historic Yokuts, Northern Miwok and Central Miwok. Due to its possible early date, it has not been relevant here, but a number of undated features may be relevant for Willow Creek.

For instance, Treganza (1952: 16) notes cairn-covered burials in Sta-10, the Topanga culture near Santa Barbara (Treganza, 1950: Pl. 15,a), and some Middle Horizon settlements in Sacramento Valley. Several Willow Creek burials are also cairn-covered. This is a feature which has already been analyzed in the Willow Creek sites, and the hypothesis that this feature is associated with very mobile groups regardless of cultural affiliation gains additional support from these studies by Treganza.

Furthermore, Treganza (1952: 22) notes an ethnographic account by George

Drais. It states that, from 1850 to 1880, the Central Miwok "would visit out in the valley and once I remember they went clear to Monterey to get sea shells. When they got back they were almost starved so my mother gave them some food and then they went up in the hills to trade their shells."

This would be consistent with our theme about coastal and inland relationships, but the account refers to a late historic period, so it might not reflect precontact conditions. In any case, it is a very relevant observation here, since it suggests some connection, at least in historic times.

Ethnologically, the San Joaquin Valley is Yokuts. This grouping of Penutian-speaking tribes dominated the easterly side of the entire South Coast Ranges. Yokuts relationships with the coastal peoples within these South Coast Ranges are an ethnographic fact, as indicated already in Chapter II. They may also have had prehistoric coastal relationships at least as intensive as they are known to have had during early historic periods in California. Most of the archaeological work has tended to focus on the northern and southern extremities of the San Joaquin Valley and is consistent with the pattern already noted in coastal California, especially along the South Coast Ranges.

Buena Vista Yokuts territory is among the best known archaeologically, since 10 sites have been excavated and described in Kern County. Four of these sites around Buena Vista Lake have been described by W.R. Wedel (1941). They include a cluster of sites Ker-39, Ker-40, Ker-41 and Ker-42. Another 3 are in the Pelican Lake area (Ker-59, Ker-66 and Ker-67). They have been described by Estep in UCAS manuscript No. 38. In UCAS manuscript No. 10 (1951), Heizer describes a burial in a cave at Ker-185. Riddell (n.d.) describes a more northerly site on Shrier Ranch (Ker-74). However, the archaeological relevance of these sites to any of the sites at Willow Creek appears to be minimal if it exists.

Kings County lacks any major excavations. This also is true for Merced County. The archaeology of Merced and Kings Counties is known mainly through 2 general works, one by Hewes (1941), and the other by Gifford and Schenck (1926). These works are too general to be as useful as a more detailed account of primary data might be, but it is doubtful whether even site reports would be too relevant, because the cultural items here are unlike those on the coast, especially at Willow Creek.

Tulare County archaeology consists of a single excavated site (Tul-10) known as Slick Rock Village and described by Fenenga (1952). This site yields most of the data on the prehistory of the Tulare Yokuts. They are known to have made trading trips into Salinan territory in historic times (Gayton, 1946: 7,9), perhaps through lands now allocated to Fresno County. However, there appears to be minimal historic and prehistoric influences upon the coastal Willow Creek sites from this inland source. It may be due to the rather insular nature and peculiar location of the Willow Creek sites. The Yokuts are known to have penetrated to the Pacific coast in recent times, but farther south and north (Pilling, 1960). It is but another peculiarity which suggests that Willow

Creek might have been in a No Man's Land.

The Tranquillity Site (Fre-48) described by Hewes (1943 and 1946) is probably a more important excavation than that described by Wallace (ms.), Lathrap and Shutler (1955), who report upon the Vermillion Valley site (Fre-115), because of the materials analyzed. However, the efforts of Hindes (1959, 1962) in the Huntington Lake region of Fresno County add lustre to the work of her predecessors, because she relates 112 sites to the local trails and trade routes. The most noteworthy feature is perhaps the abundance of bed-rock mortars located near the major trails converging from 3 directions -- Paiute Pass, Mono Pass, and Mammoth Pass. These features are noted here, because they are most relevant in supporting our interpretation of many of the bed-rock mortars which occur in the Nacimiento Valley near Willow Creek.

Nacimiento Valley seems to have been a stopover area for people moving between Willow Creek and the Salinas Valley. The clustering of bed-rock mortars in the Nacimiento Valley also suggests that the northern cluster might have been claimed by the proto-Costanoans, while the southern cluster might have been claimed by the proto-Salinan. There are no other cultural associations with these bed-rock mortars in the Nacimiento Valley, however, so this suggestion may be formulated here in the form of a hypothesis for testing rather than as a demonstrated historical reality.

Hypotheses

1a. Evidence at Willow Creek (especially Mnt-281) suggests a territorial expansion of the groups that came from the north, that is, the proto-Costanoans. An expansion of this kind need not be oriented only in a southerly direction, but may have rippled outward from some center. This center may have been located somewhere just north of Monterey Peninsula.

1b. Intrusions might have been made into the San Francisco Bay area, but probably in a more friendly manner, because trade relationships between the Costanoans and the Miwok groups have been recorded as amicable. This has been documented in Chapter II. A similarity in linguistic patterns may have helped. Both groups spoke Penutian languages. However, the proto-Costanoan encroachments upon the territories occupied by the proto-Salinan groups (who probably spoke some Hokan variant) in the south would probably be more hostile. This is part of a theory here which tends to be supported by the available ethnographic and archaeological evidence.

2. The other part of this theory is that inland people of Central California had the strongest possible relationships with coastal people, mainly due to the desire for marine shells from the beaches of the Pacific Ocean. Several corollaries emerge:

2a. The demand for abalone shells and snail shells probably led to an economic rivalry between coastal groups near Willow Creek.

2b. Inland groups with no coastal claims, such as the Yokuts, were ideal intermediaries for trade between coastal groups that were rivals.

2c. San Francisco Bay people probably had their closest bonds for millenia with the inland people who occupied the Sacramento Valley rather than with the proto-Costanoans.

2d. People within the Sacramento Valley traded with people in the San Joaquin Valley, who, in turn, traded with people in Santa Barbara, so Heizer and Fenenga (1939: 394-396) would certainly appear to be correct in their analysis of Sacramento Valley data.

Chapter Summary

The Willow Creek sites are set in a background of many major ethnological and archaeological problems. Hypotheses have been formulated as a guide to the kinds of proposition that have been addressed and tested in the preceding correlations, and they may also serve as a kind of very theoretical framework for the entire thesis, since their plausibilities are supported if not demonstrated by the evidence from Willow Creek and the South Coast Ranges.

To recapitulate, briefly, here are a few of the major points which have been raised here:

1. The archaeological work in the South Coast Ranges has been uneven so that the distribution of sites might just as easily be a function of exploration as of the actual demographic patterns in the area.

2. The Salinas Valley is archaeologically virtually void, but this may reflect a demographic reality, since it has been included here in the proposed boundary between proto-Costanoan and proto-Salinan areas.

3. Monterey Peninsula is archaeologically very well known, but at least 1/3 of the sites in this locale are bed-rock mortars, so it is suggested that the proto-Costanoan center or home base might have been farther north.

4. Archaeological remains from Ventana Cones and the Carmel Valley look more Costanoan than Salinan, so these regions have been subsumed in the proposed proto-Costanoan area.

5. The absence of Tivella objects at Willow Creek indicates that there was probably no historical connection between the Pecho Coast, where these Pismo Clams are known to have been accumulated for inland trade, and Willow Creek.

6. In spite of the richness of the archaeological materials in Santa Barbara County,

there is no adequate chronology yet established for this region, so it is not possible to draw any meaningful chronological correlations with the sequence in Santa Barbara County.

7. The steatite sources and the existence of circular shell fish-hooks in the Channel Islands are important items in the areal distributions which are correlated in order to establish a firm early relationship between Willow Creek and the Santa Barbara coast.

8. Kern County Yokuts are known to have occupied the area which is among the best known in the archaeology of California, but the prehistoric remains of this San Joaquin Valley region are not so intimately related to Willow Creek as a reading of early ethnographic accounts may indicate.

9. The Santa Clara sites may belong to a more southerly facies, probably proto-Costanoan, with a center somewhere just north of Monterey Peninsula, and very directly related to the archaeological material at Willow Creek.

10. The Emeryville facies of the San Francisco Bay area is the one in this area which bears any direct archaeological relevance to the materials at Willow Creek.

11. The relationship between Santa Barbara assemblages and those in the Sacramento Valley is rather indirect, and involves the intermediacy of trade through San Joaquin Valley, but the relationship between Santa Barbara and Willow Creek is direct, and involves the bodily contact of northern and southern peoples, alternating in their occupation of Willow Creek, with no buffer zones supplied by such friendly intermediaries in trade as the Yokuts were farther east.

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