LATE PREHISTORIC EXCHANGE NETWORK ANALYSIS IN CARRIZO GORGE AND THE FAR SOUTHWEST

A Thesis

Presented to the

Faculty of

San Diego State University

In Partial Fulfillment

of the Requirements for the Degree

Master of Arts

in

Anthropology

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by

Michael Steven Shackley

Fall 1981

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Approved by:

Joseph W. Ball — Thesis Chair — 11-20-81 Date

Larry L. Leach

Fred H. Greenwood

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Although the above-mentioned individuals contributed in various ways, the author accepts full responsibility for the structure, content, and conclusions of this thesis.

TABLE OF CONTENTS

LIST OF TABLES

LIST OF FIGURES

CHAPTER I

INTRODUCTION

In October 1542, Juan Rodriguez Cabrillo sailed into San Diego Bay. The Native American Kumeyaay who witnessed the event fled in terror; however, three of the Kumeyaay remained and communicated to Cabrillo that they knew of other men, like him, who had traveled in the interior a few years earlier. This was Alarcón of the Coronado Expedition who traveled up the Colorado River in 1540 (Bolton 1916). The Kumeyaay on the coast were aware of this expedition over 200 kilometers to the east. The communication of these ideas through the region, as well as the exchange of material goods, is the focus of this thesis.

The investigation of prehistoric exchange has received considerable attention recently in archaeological literature (Earle and Ericson 1977; Fry 1980). Many of these studies have worked to generate a body of mid-range theory amenable to local and regional hypothesis testing and research modeling. Most have been based on the anthropological economic theories of Sahlins (1965, 1972), Fried (1967), and others. Many have attempted to test analogic models based on the ethnographic record, with some success (see Earle and Ericson 1977). Other researchers, particularly those working in Europe, have chosen to work strictly with statistical models (Hodder and Orton 1976; Ottawa 1981).

Much of the exchange theory generated has been applied to levels of social organization above the band level, such as existed in the Far Southwest in the ethnographic present and the immediate late prehistoric. Most of these studies involve sociopolitical systems of Mesoamerica and the Southwest (Fry 1980; Pires-Ferreira and Flannery 1976).

The ethnohistorical treatment of exchange in California by J. Davis (1961) and the archaeological treatment by Ericson (1977a, 1977b) represent virtually the only comprehensive materials on exchange for California. Both are adequate within the frameworks of their foci, but are woefully inadequate for comparative work on exchange in the specific region under discussion.

This thesis attempts to synthesize the dispersed ethnographic/ethnohistoric and archaeological data pertaining to exchange in the Far Southwest. Based on data from the desert foothills region, inferences will be derived concerning exchange route-site associations in Carrizo Gorge in Anza-Borrego Desert State Park. These data as well as regional level site data will be used to test models of egalitarian exchange and their applicability to the region under discussion.

As discussed throughout the thesis, there has been very little investigation of regional exchange systems in the Far

Southwest. This thesis is an attempt to (1) promote research in this direction, (2) test applicable egalitarian economic theory on a local and regional level, and (3) offer a viable research program to develop the investigation of egalitarian exchange in the Far Southwest. As such, the research presented is meant to be preliminary to further testing of regional band level economic theory in the Far Southwest.

CHAPTER II

ETHNOGRAPHIC/ETHNOHISTORIC BACKGROUND

Introduction

Recently the use of ethnographic and ethnohistoric data as a basis for formulating models of prehistoric exchange has become increasingly important (Dalton 1977; Earle 1977; Hughes and Bettinger 1981; Pires-Ferreira and Flannery 1976). Archaeologists in Southern California are particularly fortunate in having a large body of ethnographical and ethnohistorical data to utilize in assessing the functional and evolutionary significance of prehistoric exchange. Through the efforts of determined historicists such as Kroeber, Gifford, Spier and others, as well as early Spanish chroniclers and historians, valuable synchronic and diachronic material is available to the archaeologist. These data are necessary in the location of late prehistoric trail systems and exotic resources, as well as the assessment of the dessication of the prehistoric exchange systems in the Far Southwest.

Fortunately, these data are rarely contradictory; a phenomenon that may be a result of the linguistic homogeneity and transhumant fluidity that existed in the late prehistoric period in what is now San Diego County, Imperial County, and

Northern Baja California (Hedges 1975; Hicks 1963; Luomala 1976; Williams 1973). This important concept will be discussed later in this chapter.

The eighteenth century Spanish expeditions of Anza, Arrillaga, and others illuminated the location and direction of aboriginal trail networks, major villages, social organization, and material culture of the Yuman-speaking Kumeyaay that lived in the study area in the ethnographic present (Arrillaga 1796; Bolton 1930; Hicks 1963).

The following ethnographic and ethnohistoric material, as well as appropriate anthropological economic theory, will be utilized as an aid in the understanding of late prehistoric exchange in the Carrizo Gorge area and greater relationships in the Far Southwest.

Egalitarian Economic Theory

The use of the term "exchange" in this thesis is in preference to the term "trade." "Exchange" is preferable to eliminate confusion between the formal trade engaged in by Western state societies and "primitive exchange" as described by Sahlins (1965, 1972). On the basis of available archaeological and ethnological evidence, "exchange" is more appropriate for the level of sociopolitical organization present in the late prehistoric time frame in Southern California. This roughly corresponds to Fried's (1967) "egalitarian" societies.

Models for economic exchange can be found in Rappaport's (1968) work on the Maring of New Guinea, Leach's (1954) work on the Kachin of Burma, and more importantly for this region, Bean's (1972) work on the Cahuilla of Southern California. Additionally, the superb treatment of egalitarian economics by Sahlins (1972) is one of the most valuable ethnographic publications on hunter-gatherer exchange mechanisms.

In egalitarian societies, there exist two general types of economic transations: reciprocity and centralized movements (redistribution and pooling) (Sahlins 1972:188).

<u>Reciprocity</u>. Sahlins defines reciprocity as "a whole class of exchanges, a continuum of forms" (1972:189).

The types of reciprocity in egalitarian groups are many and tend to covary with the kinship system (Bean 1972; Sahlins 1972). Reciprocal exchange can include sharing and counter-sharing of unprocessed food, informal hospitality, ceremonious affinal exchanges, loaning and repaying, compensation for specialized medical or ritual services, transfers that seek peace agreements, and even impersonal haggles (Sahlins 1972:192). According to Sahlins, there are three varieties of reciprocity possible: generalized, balanced, and negative (1972:193-95).

Generalized reciprocity is a transaction that demonstrates putatively altruistic assistance, and <u>if possible</u> assistance returned. This type of reciprocity will occur predominantly on the household level, or perhaps on the intra-lineage level and includes sharing, hospitality, free gifts, and generosity. According to Sahlins, "a good pragmatic indication of generalized reciprocity is one-way flow" (1972:194).

The next level of reciprocity is balanced reciprocity. This is direct exchange where the reciprocity is the culturally defined equivalent of the thing received, and is usually immediate (Sahlins 1972:194). With generalized reciprocity, the material flow is sustained by prevailing social relations, whereas for most balanced transations, social relations hinge on the material flow. This is an important point in the region focused on in this thesis. The greater the social distance, the more "balanced" and less generalized the transaction becomes. Within most groups, it is an accepted practice to allow "credit" to be extended to close family members. On the other hand, an immediate reciprocation is demanded of someone who may not be close consanguineally or affinally. If familial relationships exist over large areas, then exchanges of material may tend to move in a more generalized pattern within the given region.

Lineages in the Peninsular Ranges would have been more likely to share food during droughts with related agricultural groups from Imperial Valley, than with groups that were not kinship-related. This idea will be discussed in detail later, but the important point here is that the general ethnographic record suggests a high association between generalized reciprocity and close kinship ties, and a high association between balanced reciprocity and non-kinship exchange relationships (Bean 1972; Rappaport 1968; Sahlins 1972).

> The span of social distance between those who exchange, conditions the mode of exchange. . . . close kin tend to share, to enter into generalized exchanges, and distant and nonkin to deal in equivalents and guile. (Sahlins 1972:196)

Speaking of the Cahuilla, Bean states:

> At any one time a group had a surplus of one or more items which could be exchanged for others. The kinship system was a major mechanism for accomplishing this exchange. . . . Nevertheless, exchange or trade between individuals and groups occurred frequently without the support of kinship or ritual institutions. This is most clearly seen in the trade relationships the Cahuilla maintained with their distant neighbors such as the Gabrielino and the Yuma. (1972:122-23)

Negative reciprocity, as Sahlins most aptly put it, is "the attempt to get something for nothing" (1972:195). This can include haggling, barter, gambling, theft, and warfare.

Warfare has received considerable treatment in the ethnographic literature (Meggit 1977; Spier 1923; White 1974). Valuable exotic material was certainly procured as a consequence of warfare and raiding.

In the region under discussion and along the Lower Colorado River, warfare was common, possibly as an adaptive response to environmental and subsistence stress (White 1974).

An amity-enmity alliance network may have represented long-range coping mechanisms, while localized conflicts served to relieve specific subsistence stress (White 1974). The alliance network proposed by White (1974) as existing from the 1600s to the late 1800s, may have been related to late prehistoric alliances and exchange patterns, but there is no direct empirical evidence, nor a measure of post-contact influence.

Centralized movements. This type of exchange, including pooling and redistribution, is most common among ranked and chiefdom level societies. In these groups mechanisms exist within the society to pool various resources from diverse areas and redistribute the material to areas of need (Sahlins 1972). According to Sahlins, pooling can exist without a central figure or class deciding where and what quantity of material will be redistributed (1972:189). Pooling does stipulate a social center where goods meet and then flow outwards. Pooling, unlike redistribution, can exist below the chiefdom level, in tribal or presumably some band level groups where a central place is chosen for exchange on a periodic basis (Sahlins 1972:189). In the case of pooling, there exists a social boundary within which persons or groups are cooperatively related. An exchange mechanism similar to this may have existed in the Far Southwest prehistorically, and will be discussed below.

Ethnographic/Ethnohistoric Data

Upon Spanish contact in the sixteenth and again in the eighteenth centuries, the group inhabiting the study area was the Kumeyaay (Hedges 1975; Luomala 1976, 1978). The Kumeyaay belong to the Yuman division of the Hokan-Siouan linguistic superfamily (Luomala 1976). This group has been variously called Kumeyaay, Southern Diegueno, Eastern Diegueno, Mountain Diegueno, Desert Diegueno, Tipay, and Kamia (Hedges 1975). For the purpose of this thesis, Kumayaay will be used to designate the group that occupied the territory from the Pacific Coast south of the Iipay and Cahuilla east to eastern Imperial Valley. The southern border existed 65 to 80 kilometers south of the international border on the coast, to a point near the Sand Hills in eastern Imperial Valley approximately 25 kilometers south of the border (Figure 2-1). The Iipay or Northern Diegueno are dialectically related and culturally very close to the Kumeyaay (Figure 2-1).

As can be seen in Figure 2-1, the Kumeyaay occupied an area nearly 200 by 80 kilometers or about 16,000 square kilometers. This large area inhabited by one linguistic group contained tremendous ecological and topographical diversity, perhaps the most diverse area exploited by any single hunter-gatherer group in Northern America. Three major life zones are present in the region: Lower Sonoran, Upper Sonoran, and Transition. Due to the uplifting Peninsular Range Batholith,

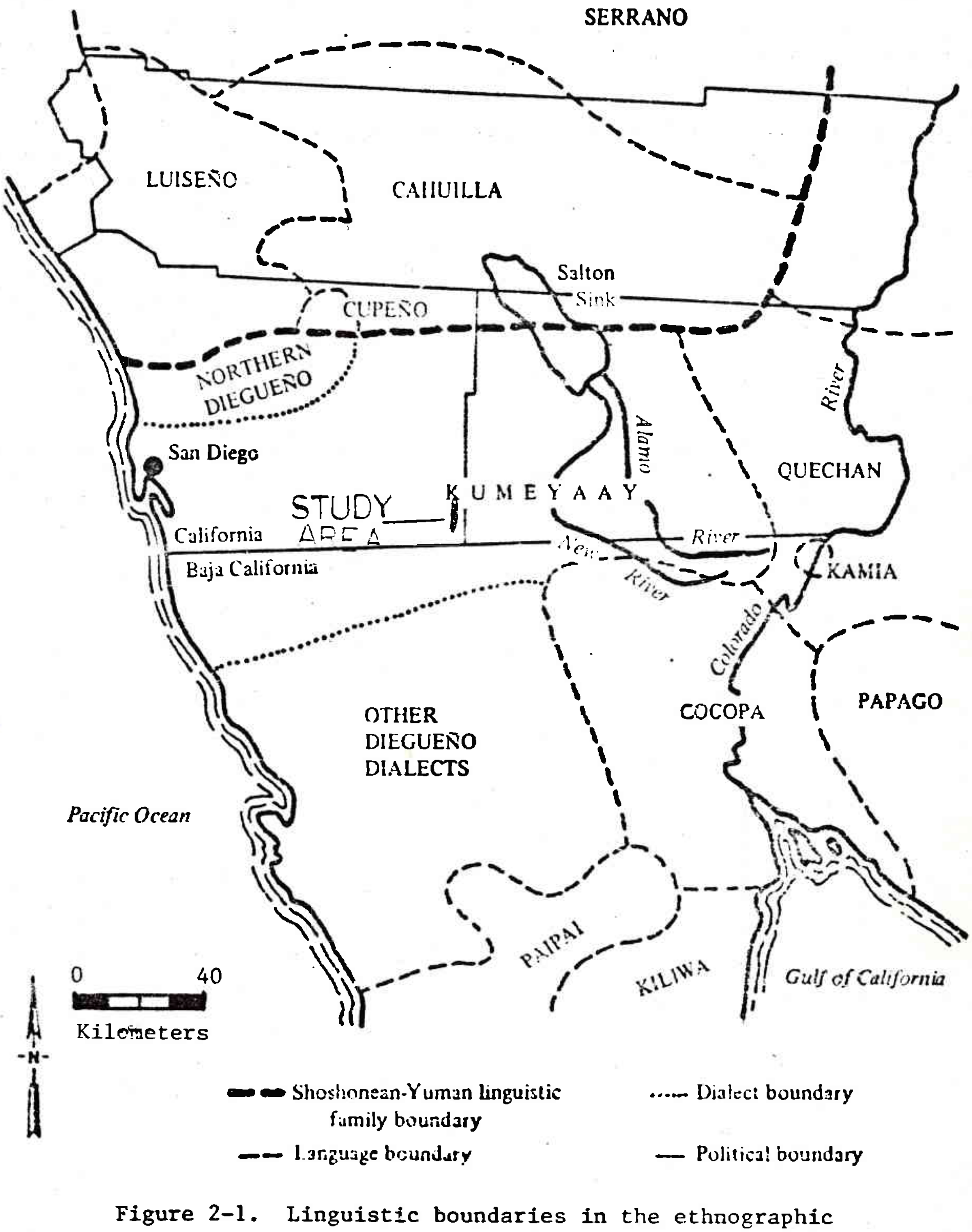

Figure 2-1. Linguistic boundaries in the ethnographic present (Hedges 1975).

tremendous topographical variability exists--mountains, canyons, passes, foothills, valleys, desert floor, as well as uplifted marine terraces and ocean shoreline. Ecosystems exploited included coastal and lagoon, foothill, mountain, desert foothill and desert floor. As a result of this tremendous environmental diversity, sufficient subsistence, lithic, ceramic, malacological, and ceremonial resources were available eliminating the necessity for interlinguistic exchange.

According to Luomala, the Kumeyaay

> traded more frequently with each other than with unrelated tribes; however, major intertribal trails, such as the Yuma, crossed their territory between the lower Colorado and the Pacific. (1978:601)

Diachronic relationships. Although difficult to completely substantiate, archaeological evidence suggests that the Kumeyaay lived within a similar territorial area possibly as early as 700-800 A.D. and most probably were settled in the territory recognized ethnographically by 1500 A.D. (Berryman 1981; True 1970).

At least six times during the late Pleistocene and early Holocene, Imperial Valley was flooded with fresh water from diversions of the Colorado River (Waters 1980; D. Weide 1976). The last stand of prehistoric "Lake Cahuilla" was from about 950 A.D. to about 1500 A.D. (Waters 1980). Wilke (1978) has suggested that a large portion of the population in

Southern California lived on the lakeshore until dessication around 1500 A.D. when the lacustrine adapted groups moved into and populated the Peninsular Ranges. Margaret Weide suggests that the lacustrine habitat may have been only part of a transhumant pattern that was carried on after the dessication of the lake with agriculture added to the subsistence pattern of lakeshore groups (M. Weide 1976).

Evidence partially substantiating Weide's hypothesis comes from SDi-5669 along San Diego River west of the Peninsular Ranges. An associated 14C date on ceramics was obtained bracketed between 760 ± 110 A.D. to 1030 ± 120 A.D. (Berryman 1981). Some of the lithic material suggests desert origin and at least cultural knowledge of Lake Cahuilla may have been possessed by the population west of the mountains. Whether actual transhumance or even periodic travel was made to the lake is impossible to discern. Nevertheless, the possibility exists that groups may have been seasonally exploiting areas on both sides of the Peninsular ranges as early as 700-800 A.D. These early dates suggest that the dessication of Lake Cahuilla may not have been entirely responsible for the late prehistoric occupation of the Peninsular Range Province. Obviously more data are needed to test hypotheses regarding the effect of the dessication of prehistoric Lake Cahuilla.

Kumeyaay oral history suggests that the Kumeyaay did exploit the lacustrine habitat around Lake Cahuilla. E. W.

Gifford's Imperial Valley Kumeyaay (Kamia) informants, when relating the origin story, mentioned occupation of the eastern lakeshore and consequent dispersal after dessication. The story told illuminates the relationship between lineages in the Imperial Valley and the Peninsular Range area.

> The Kamia ancestors camped on the eastern side of Salton Sea [Lake Cahuilla], from which place the latter scattered, some settling in Imperial Valley, others going to the mountains of San Diego and becoming Diegueno. The story says there was water in Salton Sink at the time of entry, not merely low salt land. The dispersal of the people from their camping place at Salton Sea was due to fear created by the appearance from the north of a female transvestite (Warharmi) and two male twins called Madkwahomai. These were the introducers of Kamia culture. This scattering of the Kamia accounts for lineages such as kwaxa and paipa being found among the Diegueno as well as the Kamia, informants said. The absence of agriculture among the Diegueno was due to their having entered their habitat before the arrival of the transvestite and the twins, who were the bearers of the seeds of cultivated plants. (Gifford 1931:12)

Tom Lucas, a Kumeyaay (Kwaaymii lineage) from Laguna Mountains in the Peninsular Ranges, remembers older members of his village talking about the days when their ancestors fished in Lake Cahuilla (Cline 1979:27).

According to available archaeological and ethnographic data, there is considerable evidence to suggest physical, linguistic, and cultural relationships between Kumeyaay groups in Imperial Valley and the Peninsular Range Province at least as early as 1500 A.D. and possibly as much as 700 years earlier. There is as large a body of data suggesting that strong relationships continued until and even after Spanish and Anglo contact.

Lineage organization and territoriality. The Kumeyaay were organized into hunting and gathering, patrilineal, patrilocal, exogamous lineages called cimul (Luomala 1976). In addition to general hunting and gathering, Kumeyaay groups in Imperial Valley were involved in flood plain agriculture at times when the Colorado River reached spring high water stage and back flooded the New and Alamo Rivers (Barker 1976; Gifford 1931; Hicks 1963; D. Weide 1976). As mentioned above, residence is usually patrilocal, but neolocality occurred (Luomala 1976:250). For the Kumeyaay there were two different types of groups: the consanguineal kin group called cimul, and a residential group called by the Spanish rancheria. More than one lineage may reside at a village or rancheria when the resource base could support them (Luomala 1976; Spier 1923).

Most ethnographers state that Kumeyaay lineages were localized and "each group moved seasonally within a familiar restricted habitat" (Luomala 1976:246).

Spier reported:

> The occupancy of the gentile [lineage] territories was seasonal. Winter found them living in groups of mixed gentile affiliation among the foothills on the edge of the Colorado desert. In the spring they returned to the mountains, keeping pace with the ripening of the wild food staples, and passing the summer

> in their respective territories, where they lived in little groups about the valleys. The whole territory was not occupied at one time: When a locality was hunted out or fruits ripened elsewhere, they moved on. In the course of a year or so, all of the recognized settlements would have been occupied. (Spier 1923:306)

A footnote adds "Heintzleman notes that the Jacum Indians (Diegueno) located in the mountains, were more numerous in summer than in winter."

Most importantly in the context of resource exploitation, the ethnographies all agree that most resources were not owned by a particular lineage, but were available to anyone, presumably regardless of lineage affiliation. The only exception mentioned is the Hilmiarp lineage ownership of patches of Prunus sp., Quercus dumosa, and Quercus agrifolia, as well as eagle nests, in particular locales (Spier 1923:307).

Gifford (1931) mentions that Imperial Valley Kumeyaay had direct access privileges to granite, steatite, and ochre (hematite). These direct access rights to resources may have been a result of several variables.

As mentioned earlier, it seems probable that a large portion of the Kumeyaay were living together prior to the dessication of Lake Cahuilla in the 1500s. In the nineteenth century that would have been only 300 years previous and still within the memory kept alive by oral tradition. The relatively recent dissemination of the Kumeyaay lineages and maintenance of similar oral traditions probably contributed to a certain amount of affinity between widely separated lineages.

The ability to move anywhere within the territory from eastern Imperial Valley to the Pacific Coast and encounter groups that speak the same language, with only minor dialectical differences, also would contribute to amity.

Lineages with the same name existed throughout Kumeyaay territory. Individuals who belong to a given lineage of the same name, no matter in which area they live and even though they cannot trace their exact relationship, nonetheless regard each other as kinsmen and address each other by kin terms (Luomala 1976:250-51).

Spier's (1923) Kumeyaay informant, in recounting names of lineages he knew for Baja California, voiced the belief that the lineage he mentioned that was the same as his own was distantly related to him. Gifford (1931:10) also stated that Imperial Valley Kumeyaay extend their rule of exogamy "to include members of corresponding Diegueno lineages" whom they address with kin terms. This factor is probably a result of the relatively recent fracturing of lineages as a consequence of the dessication of Lake Cahuilla.

In addition to the above relationships, intermarriage between Kumeyaay and bordering Yuman groups, particularly Quechan, was frequent (Gifford 1931; Lee 1937:138). This opened the possibility for direct access procurement in a larger area and a more generalized system of exchange. Gifford mentions frequently the "extremely friendly relations of the Kamia and Dieguenо . . . " (1931:2, 3, 17).

Because of weak territorial definition between Kumeyaay lineages and the existence of the same recognized lineages in a variety of areas, the probability of fluid resource movement throughout the Kumeyaay area seems high.

Seasonal transhumance and direct access. Although an abundance of data exist as a result of archaeological and ethnographical research of the Far Southwest concerning transhumance and direct access procurement, little has been done to address these variables and their relationship to exchange (Bolton 1930; Coues 1900; Hicks 1963; Shackley 1980; True 1970).

The extent which the Kumeyaay traveled within the greater territory is demonstrated in the following examples. As mentioned earlier, some of these movements were a result of the seasonal transhumance pattern ecologically defined, however, some of the long distance journeys were for the explicit purpose of exchange, possibly with relatives.

In August 1771, Garces encountered a Kumeyaay lineage at the farming village of San Jacome near Cerro Prieto in the Mexicali Valley of Baja California. In March 1774 he returned and found it abandoned. That same month when he reached the village of San Sebastian at the confluence of Carrizo and San Felipe Creeks (about 85 kilometers northwest), he met the same people. The Kumeyaay he met informed him that some of their lineage members were in the foothills gathering agave and some had traveled as far away as San Diego Bay (Bolton 1930 :334-35, 341-43; Coues 1900:165-67,443-44; Hicks 1963:61) (Figure 2-1).

Agriculture and transhumance. It is important at this point to discuss the importance of agriculture among the Kumeyaay and its effect on movements throughout the greater territory.

During times of drought in the Colorado River Basin, the discharge from the Colorado River is not sufficient to flood the Alamo and New rivers (D. Weide 1976) (Figure 2-1).

In 1774, Garces was told that the reason the rancheria of San Jacome was not inhabited that year was because the water was insufficient for farming (Garces 1774, in Bolton 1930:334). Garces' recording of seasonal movements at least between the Colorado delta and the desert foothills and possibly as far as the Pacific Coast, suggests considerable opportunistic transhumance.

Drucker's informant of the Koʔal lineage described his homeland as being in wipuk (literally "base of mountains"). Wipuk is a general term in Paipai and Kumeyaay for the Colorado Desert Foothills, in this case south of Jacumba (Drucker 1937; Spier 1923). His informant further describes the seasonal movements of his lineage as ranging from the mountains in the west to the Imperial Valley where they occasionally planted (Drucker 1937:5). Gifford also observed that five lineages (Nixkai, Kwatl (Koʔal), Lycharp, Hilmiarp, and Tumau) planted crops at Wikwinil in the Imperial Valley and lived in Jacumba (Gifford 1931:11, 22).

As stated by Hicks, there:

> were members of a few villages whose regular summer gathering areas were here in the east rather than in the Sage Scrub area or the Pacific Coast, and who occasionally planted crops when the river floods in the Mexicali Valley were especially extensive. (Hicks 1963:221)

Spier's informant reported villages and temporary camps he had traveled to that were located between eastern Imperial Valley and central San Diego County, many were habitation areas for his particular lineage (Spier 1923).

> Some Kamias occasionally traveled to the Colorado River from the coast. In 1856-59 a San Diego Indian asserted that his people made a practice of annually taking a large number of shells to the Colorado tribes as presents. (Forbes 1965:62)

Bolton reports the traveling of Kumeyaay to the Colorado River to visit the Yuma. Some Kumeyaay arrived while Garces was in a Cocopa village in the Colorado delta area in December 1775 (Coues 1900:196-97).

Delfina Cuero (1968), a Kumeyaay born at Jamacha in San Diego County, recalled that her ancestors

> used to go a long way to trade for what they needed. There were no roads then, just trails, and we walked and carried everything on our backs. (Cuero 1968:33)

Direct access and exchange. Direct access procurement and references to exchange are reported frequently in the ethnographical literature, some have already been mentioned.

As referenced earlier, Gifford's Imperial Valley Kumeyaay informants were allowed direct access to steatite, granite, and hematite in the upper Carrizo Creek area (Gifford 1931). According to Gifford, the Imperial Valley groups engaged in balanced reciprocity, exchanging agricultural foods for acorns, prepared agave "cakes," yucca fibre sandals, and eagles from desert foothill groups. Gifford reports that the upland groups most frequently "brought the acorns to the Kamia" (1931:23). Presumably, granite, steatite, and hematite were procured during the visits to the upland groups near Jacumba.

Unfortunately, Gifford (or his informants) were not explicit in describing the difference between the transfer of goods by direct access with the five Jacumba lineages in a transhumance pattern between Jacumba and Imperial Valley, and exchange between valley and Jacumba groups. Was both direct access and reciprocal exchange engaged in or did direct access only apply to nonsubsistence items? There were other lineages in the Jacumba area that apparently did not travel to the valley such as Oswai and Paipa. These lineages may have been involved in balanced reciprocal agreements with the valley groups. There seemed to be several methods of exchange engaged in during and after contact in the Imperial Valley and Jacumba areas. The apparent confusion may be a result of differential ethnographic recording or post-contact stress and alteration of general lifeway patterns.

Delfina Cuero recalled that her ancestors near San Diego traveled to the desert to exchange salt, dried sea food, and dried greens for mesquite beans, gourds, acorns, agave, honey, and "other things" (Cuero 1968:33). Apparently the acorns were procured from mountain groups. She also recalled direct procurement of shellfish (*Haliotis*, *Olivella*, and others), acorns in Cuyamaca and Laguna, pine nuts at Torrey Pines near La Jolla and La Rumorosa south of Jacumba, and agave in the desert foothills (Cuero 1968).

Tom Lucas, whose lineage territory was in the Laguna Mountains and the desert foothills, recalled members of his lineage traveling to the coast to "camp near friends or relatives. It served a dual purpose . . . winter camping and trading" (in Cline 1979:16).

Although difficult to detect ethnographically and nearly impossible to test archaeologically, the exchange of ideas is a logical consequence of reciprocal exchange (Bean 1972; Sahlins 1972).

Spier's informant recalled traveling from Jacumba to Vallecito to participate in a Toloache (Datura) male initiation ceremony (Spier 1923:316-17). At the ceremony were shamans mainly from Iipai lineages occupying the Mesa Grande area (Spier 1923:317). This type of ceremony may have presented an opportunity for exchange of material as well as ideas.

Mourning Anniversary ceremonies, performed one year after a death, brought relatives together from all areas (DuBois 1908). The lineage performing the ceremony (burning of death images and the deceased possessions) was required to offer food and gifts to visiting lineages. This is an example of generalized reciprocity--gifting with no immediate expectation of return. There probably was a certain amount of balance involved, as mourning ceremonies were probably held throughout the region over time.

Evidence for pooling. The transhumant pattern of at least some Kumeyaay lineages may provide an opportunity for a type of exchange similar to Sahlins' concept of pooling, a centralized movement exchange strategy (Sahlins 1972). In the late summer and early fall, many Kumeyaay groups traveled to the Peninsular Ranges to harvest acorns of *Quercus kellogii* (Hicks 1963; Lee 1937; Shackley 1980; True 1970). The months spent in the mountains presented an opportunity for material and social exchange between lineages from east and west of the mountains

(Foster 1981; Shackley 1980). Exotic material such as Obsidian Butte obsidian, Colorado Buffware, and Pacific Coast shell material exists in sites in the Laguna Mountains, but only one site (SDi-860) has been systematically excavated (Foster 1981; True 1970). An interesting phenomenon from SDi-860 is the extremely high percentage (29%) of obsidian projectile points (True 1970). This will be discussed in a later chapter. It is sufficient to say now that the Laguna Mountains may have afforded an opportunity to "pool" resources from lineages east and west of the mountains during the annual acorn harvest.

Incidental traders. A final possibility for material movement comes from irregularities in the patterns of descent, exogamy, and residence. Bean (1972) in his research on the Cahuilla, mentioned the possibility of specific traders within the society. "Most trade was carried on by specialists, with the 'net' as a chief trader for a lineage" (Bean 1972:123).

Nowhere in the existing ethnographic literature researched was there mention of specific individuals engaged in exchange among the Kumeyaay. This is probably a function of the lack of enforced territorial boundaries and the migrational fluidity of Kumeyaay lineages. Cahuilla social organization was highly structured with respect to territoriality and would probably necessitate a specialist trader. Cahuilla settlement patterns were considerably less fluid than the Kumeyaay data suggest. Villages were occupied year-round, and territorial boundaries remained static (Bean 1972:71). One of Bean's informants characterized traders as "people who were very important . . . They were the newspapers of the people at that time. These people went about everywhere" (Bean 1972:123).

Full-time traders would not be necessary where the transhumant pattern involved long distance movements and where considerable individual and lineage migrational freedom existed.

The possibility does exist for individuals to move material incidentally through the Kumeyaay continuum, but no specific data are available. Drifters, called Kwitxal, occurred among the Kumeyaay apparently without lineage affiliation (Luomala 1976; Spier 1923). Kumeyaay individuals and small groups existed who possessed no lineage and drifted from lineage to lineage as a vagrant or "hobo" (Luomala 1976:258-65). They were looked on with suspicion, and even though they may have claimed membership in the lineage, were usually cast out as itinerants. Luomala's informant suggested a considerable amount of movement throughout the territory by the Kwitxal. Although they were generally a disfavored member of the society, they may have been a mechanism for exchanging material and ideas throughout the territory in an incidental mode.

Mechanisms for Exchange

As discussed in the foregoing background, a variety of mechanisms were utilized by the Kumeyaay to transfer material goods and ideas throughout the greater area. Some of the mechanisms utilized were somewhat fortuitous, such as procurement of resources discovered or incidentally brought into the system as a result of seasonal transhumance. Some exchange mechanisms were deliberate attempts to procure exotic material, such as premeditated travel to acorn and agave resource areas. Most probably, there were various combinations of these mechanisms. For instance, Imperial Valley lineages could procure steatite, granite, or hematite when traveling to visit Jacumba lineages to "purchase" agave "cakes," yucca fibre sandals, and acorns.

Below is a list of mechanisms most likely utilized by the Kumeyaay and probably their late prehistoric ancestors to exchange goods and ideas, and procure exotic resources.

1. Seasonal transhumance
   A. pooling resources in the Peninsular Ranges
2. Direct access
3. Premeditated exchange journeys
4. Incidental traders (Kwitxal movement)

As can be seen in Table 2-1, the only materials procured outside the linguistic area were gourds and seeds, and these may also have been supplied by the Imperial Valley Kumeyaay.

The ethnographic data suggest that the Kumeyaay were relatively self-sufficient, requiring virtually no exotic resources outside the linguistic territory. As will be evident

TABLE 2-1

Ethnographically Recorded Resources Exchanged

Resource	Zone Procured	Reference
Steatite	Jacumba Mountains	Gifford (1931)
Hematite	Jacumba Mountains	Gifford (1931)
Manganese	Jacumba Mountains	Gifford (1931)
Limonite	Andrade, N. Baja Cal.	Rogers (1936)
Granite	Jacumba Mountains	Gifford (1931)
Clay	Mason Valley Manzanita Imperial Valley (lacustrine)	Rogers (1936)
Sandstone	W. Imperial Valley	Holmes (1902)
Salt	Salton Sink Indian Wells, Imperial Co.	Drucker (1941)
Acorns	Peninsular Ranges	Gifford (1931) Spier (1923) Cuero (1968)
Tobacco	Peninsular Ranges	Gifford (1931)
Agave	Desert Foothills	Gifford (1931) Cuero (1968)
Yucca fibre sandals	Desert Foothills	Gifford (1931) Spier (1923)
Baskets and carrying nets	Peninsular Range lineages	J. Davis (1961)
Eagles and feathers	Desert Foothills	Spier (1923) Gifford (1931)
Mesquite beans	Imperial Valley	Cuero (1968) Hicks (1963)

TABLE 2-1 (continued)

Resource	Zone Procured	Reference
Pinon nuts	Torrey Pines Desert Foothills	Cuero (1968)
Gourds and seeds	Quechan and Mohave	Gifford (1931) J. Davis (1961)
Shells	Pacific Coast and Gulf of California	Gifford (1931) Cuero (1968)
Dried seafood	Pacific Coast	Cuero (1968)
Dried greens	Western Foothills	Cuero (1968)
Honey	Peninsular Ranges and Imperial Valley	Cuero (1968) (after contact)

later when archaeological and geological data are presented, the list of resources exploited intraregionally increases substantially.

Trail Systems

Trail systems in the Far Southwest received considerable attention in ethnographic and ethnohistoric research (Barker 1976; Cline 1979; J. Davis 1961; Johnston 1980).

Most of the early Spanish utilized these communication routes when entering California, particularly in the desert where aboriginal trails connected springs and water holes.

Trails were used so frequently that many segments still survive in desert areas, some deeply cut into canyon hillsides and desert pavement.

A well developed trail system existed in the Far Southwest and many of the major routes and corridors have been recorded (Figures 2-2 and 2-3). Tom Lucas recalled many of the trails used by his ancestors, and a large portion have been used by him personally (in Cline 1979).

Two major trails are important to the research discussed in the next chapter. The northern east-west trail is the Maricopa Trail (Johnston 1980). This trail was the route Anza followed in 1771 (Bolton 1930). The Maricopa Trail

> dropped southerly from San Bernardino to Pala, then easterly through what is now Harper's Well near the confluence of Carrizo Creek and San Felipe Creek [Village of San Sebastian], and across desert land at the Salton Sea to the Colorado River in the vicinity of Picacho and Tumco. (Johnston 1980:95).

A major southern east-west trail was the Yuha-Yuma Trail (Barker 1976; J. Davis 1961; Gifford 1931). The route ran from somewhere west of Campo, through Jacumba Valley, In-ko-pah Gorge and Mountain Spring to Yuha Spring and then to Indian Wells (Xachupi) and points east. The trip along this trail was said to take three to four days (Gifford 1931). It was necessary to have a dry camp the first day out from Indian Wells, about half way between there and Yuha Spring. Camps on the second, third, and forth nights were probably at Yuha Spring, Mountain Spring, and Jacumba, respectively (Barker 1976:29).

Another north-south trail is vaguely mentioned by Gifford:

> A spring, possibly Sunset Spring, was the Kamia place called Xakwinimis. There was a tiny spring there, about 1 foot in diameter. This was on an important trail which ran from Campo and other points in Diegueno territory northeasterly across Imperial Valley to the Colorado River. Xachupai [Indian Wells] lay considerably to the south of this trail and was reached from Diegueno territory by another trail passing Yuha Spring. This trail branched from the Xakwinimis Trail in the mountains. (1931:8)

Although it is obvious that Gifford's Imperial Valley informants were not certain of the location of this trail, they were cognizant of its importance. Gifford even suggests that this Xakwinimis Trail was more important than the Yuha Trail (Gifford 1931:8).

Somewhere "in the mountains" this trail branches off the Yuha Trail and joins the Maricopa Trail, probably near San Sebastian. Barker states that

> field reconnaissance indicates that a probable route would be from Campo to Jacumba Valley and then down Carrizo Creek to the historic village of San Sebastian . . . (1976:29)

Additional evidence comes from Tom Lucas. Lucas plots a major trail moving down through Carrizo Gorge and joining another trail near the Coyote Mountains and proceeding on to San Sebastian (Cline 1979:18) (Figures 2-2 and 2-3). This trail follows the route described by Gifford quite closely.

A well developed trail system was utilized by the Kumeyaay in the Far Southwest. The use of this recorded ethnographic and ethnohistoric data may be valuable in the generation of hypotheses relating to exchange systems in the late prehistoric period. The archaeological investigation of exchange in the area of the Xakwinimis Trail through Carrizo Gorge is the main focus of this thesis.

CHAPTER III

ARCHAEOLOGICAL MODELS OF ECONOMIC EXCHANGE

Introduction

In the last chapter ethnological and ethnographically derived models of egalitarian exchange were presented. These models were based on existing band level societies or groups which were functioning at this level of organization in the ethnographic present, such as the Kumeyaay of the Far Southwest.

The investigation of prehistoric exchange networks presents its own matrix of problems and explanation related to spatial distribution, complexity, magnitude, directionality, and other research-specific variables. The breadth of methodological techniques utilized in the investigation of exchange systems is quite diverse. This chapter is not meant to be an exhaustive treatment of techniques presently used in archaeology to investigate exchange systems. Earle and Ericson (1977), Hodder and Orton (1976), and Fry (1980), among others, have treated this subject well. This chapter seeks to present a brief overview of current prehistoric exchange theory and emphasize models appropriate to the level of exchange anticipated in the region based on ethnographic analogy and the known archaeological record.

Function of Exchange

The data presented in the last chapter on materials exchanged within the Kumeyaay sphere of interaction illuminates the importance of subsistence items exchanged within the territory. A probable explanation for this emphasis on exchange of subsistence items is the ability of subsistence material exchange to relax the constraints of natural resource availability (Kirch 1980:139). Rathje (1972), Webb (1974), and Kirch (1980) have directed attention to the importance of exchange as an adaptive mechanism. Exchange "buffers" local subsistence fluctuations, and can act to provide homeostasis, adding energy when needed to supplement the specific resource constraints of some restricted lineage territories (Hodder 1980). The ecological function of exchange is in line with the new "establishment doctrine in much of archaeology, especially in America" (Hodder 1980:154).

The Imperial Valley Kumeyaay traded for agave, probably in the late Spring, when their agricultural products were in low supply from the previous fall harvest (Gifford 1931:23). This view of an ecological basis for exchange is, according to Hodder, "lagging well behind developments in the new economic anthropology" (1980:154). Exchange may also be seen as a function outside integration and homeostasis, even to the point of separation and division.

Changes in economic anthropology incorporating both neo-Marxism and structuralism have been identified by Clammer

(1978). From a neo-Marxist point of view, much prehistoric exchange, and in particular, control over the influx of valuables, may allow one group to derive surplus from its neighbors and achieve local dominance (Harris 1979:64-5). This situation may occur among tribal, chiefdom, and state level societies, but there is little evidence for this on an egalitarian level, particularly among the Kumeyaay. The mention by Spier of local control of certain subsistence resources (e.g., Prunus), alluded to no dominance of other groups (Spier 1923).

Structuralist archaeology seeks to problematize the fitting of theories of society to archaeological data, since material culture is seen as transforming society, not reflecting it (Hodder 1980:155). Structuralists would address the acceptance of a given class of exchanged material and the rejection of others in a society as the conscious choice of that society to fit new styles and items into local schemes--logical, mental, social, and economic. The importation of the Toloache (Datura) religion among the Kumeyaay definitely had a transforming effect on the ideological conceptualization of the group. The importation of eagle feathers and eagles for the Keruk ceremony, however, was a reflection of an existing ideology and cannot be interpreted with a structuralist approach.

In this thesis the ecological relationships of exchange and possible structuralist alternatives will be addressed.

The neo-Marxist approach is compelling on a level higher than egalitarian groups, such as those found in the study area, and will not be dealt with here.

Characteristics of the Exchange Network

As mentioned by Plog (1977), two of the most useful literatures dealing with exchange relations are those of network analysis and locational geography. Locational concepts and decay models will be discussed in the next section. A network model is not used per se, but the concept of a network--"a series of elements linked by specified exchanges of goods, behavior, and information" (Plog 1977:128), will be used as a basis for building an exchange model and identifying characteristics of exchange networks. Fred Plog's (1977) characteristics of exchange networks will be accepted, with certain modifications, to realize the organization of the network in the Far Southwest and the relationship of the Carrizo Gorge area to that network.

Content of network. The content of the network is simply the range of materials that are exchanged. The materials recorded ethnographically have already been listed, those that are recorded archaeologically and geologically will follow later.

Magnitude of network. This is simply the quantity of goods that are being exchanged.

Diversity of materials. This refers to the range of items exchanged. This is a homogeneity index.

Size of exchange network. This concerns the territory over which it extended.

Temporal direction. What period or periods of time did it exist?

Directionality of exchange. A network may involve the flow of goods from locus A to B, from B to A, or in both directions.

Symmetry of exchange. Directionality is but a presence/absence measure. Symmetry seeks to explain possibilities of differential flow from one locus to another.

Network centralization. A centralized pattern is where substantially greater quantities of the resources in question occur at some few loci (see Renfrew 1977; Sahlins 1972).

Network complexity. This variable refers to variation in symmetry, directionality, centralization, and diversity over the territory covered by the network. If distinctly different patterns of exchange link the loci in the network, it is complex.

At a descriptive level the investigator's primary task is to define the existence of a network. Sites are located by survey and probablistic samples are taken. Using appropriate techniques to establish that exchanges of goods have occurred is a final step (Plog 1977). None of the above characteristics, or steps in the definition of prehistoric exchange networks, has been attempted in the Far Southwest beyond Ericson's (1977a, 1977b) general treatment of the area.

Models for Exchange and Spatial Distribution

Spatial and locational analysis of prehistoric exchange systems has been borrowed mainly from geography (Haggett 1965; Haynes 1974). Various approaches have been made toward a regression analysis of the fall-off with distance of exchanged material (Hodder and Orton 1976; Renfrew 1977). Log-linear regression models also attempt to explain distance decay of exchanged material (Renfrew 1977). Synagraphic mapping (Ericson 1977a, 1977b) and trend surface analyses (Hodder and Orton 1976) have also proved valuable, particularly in the assessment of network symmetry and complexity.

When a commodity is available only at a highly localized source or procurement zone, its distribution in space usually conforms to a general pattern, where the given material is abundant near the source and there is a fall-off in frequency or abundance as distance increases away from that source. This is Renfrew's (1977:72) law of monotonic decrement.

> In circumstances of uniform loss or deposition, and in the absence of highly organized directional (i.e., preferential, nonhomogeneous) exchange, the curve of frequency or abundance of occurrence of an exchanged commodity against effective distance from a localized source will be a monotonic decreasing one. (Renfrew 1977:72)

An important point is that effective distance is implied. This is not necessarily the same as the distance between points. "Deserts and mountains, acting as barriers or impediments will increase effective distance" (Renfrew 1977:72). By the same token, rivers, canyons, and passes may decrease the effective distance. This is particularly important for this thesis. Carrizo Gorge is a natural pass through extremely rugged mountain terrain, and as an integral part of the Xakwinimis trail, may be detected as a distance-decay irregularity in the archaeological record. Deviations from regular constant fall-off may indicate centralization or perturbations in effective distance.

The shape of fall-off can be plotted using linear regression log-linear or log-log regression models as well as random walk or flight models (Hodder and Orton 1976; Renfrew 1977). Not all the models will be explained here. There are as many statistical interpretations of exchange networks as there are exchange networks. Explanations of approaches to regression analysis will be made, however. The choice of this model is based on the assumption of "fitness" to the data at hand and to the large amount of data available on the technique. Explanations of other appropriate measures of association will be treated in relevant sections.

Regression Analysis

A common type of quantitative information collected archaeologically is, for example, the percentage of ceramic types or obsidian debitage frequencies relative to total ceramic types or total lithic debitage from a known source of a number of excavated or surveyed sites. Information about two variables is then available--the percentages at each site and the distance from the source. A method appropriate in the examination of the relationship of these two variables is regression analysis (Hodder and Orton 1976:98). Mueller, Schuessler, and Costner (1977), Hodder and Orton (1976), and Thomas (1976) offer detailed explanations of this form of analysis. Only the important features of the statistic as it applies to exchange network analysis will be mentioned here.

The frequency of the attribute or artifact is generally assigned the Y or dependent variable and the distance to source as the X or independent variable. The simplest form of the relationship between two variables is a linear one expressed by the theoretical equation:

$$Y = a - b X + e. \quad (1)$$

The terms a and b represent unknown constants determining the form of the relationship: "a" giving the value of Y when X is zero and "b" giving the rate at which Y decreases as X increases, higher values of "b" indicating a higher rate of decrease, and a zero value of "b" indicating that there is no linear relationship. The error term "e" expresses the fact that the relationship between X and Y is not exact, but that Y has a random component to it.

The regression line can then be fitted by a relatively simple method, such as the least squares (Mueller et al. 1977), which minimizes the sum of the squared deviations at each observed Y from the fitted line. Hodder and Orton (1976:99) point out that it is rare to find a controlled variable in an archaeological situation, both X and Y tend to be random variables.

For most distance decay studies some form of curvilinear relationship is found, and a strictly linear equation is not adequate (Renfrew 1977). The forms of the curve can be described in terms of a straight line by transforming either one or both variables into a logarithm, and by varying an exponent of distance (the distance transformation, α). The distance-decay functions met with in interaction data can be divided into single or double log cases.

Single log:

$$\log Y = a - BX^{\alpha} + e. \quad (2)$$

Double log:

$$\log Y = a - b \log X^{\alpha} + e. \quad (3)$$

In the log-normal model $\alpha = 2$, and in the "pareto" model α has a value of 1 (Hodder and Orton 1977:101).

Plotted examples of the above models can be seen in Renfrew (1977:74-6), and Hodder and Orton (1976:111, 116, 118).

An important measure of the scatter of the Y values about the fitted regression line is Pearson's product-moment correlation coefficient (r) or squared (r^2). This allows for an assessment of the strength of the relationship between X and Y, an important factor in exchange studies.

Regression analysis is used in this thesis to assess the degree of linear association between materials exchanged and the position of sites in the region.

CHAPTER IV

IDENTIFICATION OF EXOTIC RESOURCES IN THE FAR SOUTHWEST

Introduction

The identification of exchanged resources recorded ethnographically was made in Chapter II. Due mainly to the large number of sites investigated as a result of the cultural resource management process, a large body of data has accumulated identifying cultural material exotic to the areas near the investigated sites. In most cases little research has been directed toward identifying the source for the exotic material other than general statements like: "This material is derived from the desert area." Implicit in exchange network analyses is the necessity to identify resource procurement sites and zones and communication systems in order to assess the exchange mechanisms, distance decay effects, and competing source effects operative within that system (Ericson 1977a; Hammond et al. 1977; Singer and Ericson 1977). This chapter will deal with specific resource procurement sites and zones that have been identified archaeologically and geologically.

Resource Identification

Table 2-1 lists items exchanged that have been recorded ethnographically. Noticeably lacking is the mention of lithic material utilized for flaked tools. Perhaps by the time the Kumeyaay were systematically studied by early historicists, steel tools had replaced flaked lithics. This pattern is well documented among the Eskimo, Plains, and Southeastern groups (Oswalt 1978). Nevertheless, flaked lithic material has been found in late prehistoric sites in San Diego County 150 or more kilometers away from the source.

Obsidian. Obsidian is one of the most common exotic materials mentioned as an exchanged resource in archaeological sites. The chemical characterization of obsidian, source location and distance-decay studies, are common in the literature (Ericson 1977a, 1977b; Pires-Ferreira and Flannery 1976; Sidrys 1977; Singer and Ericson 1977).

Fortunately, the obsidian source in the region (Obsidian Butte) is both chemically and morphologically distinct (Ericson 1977a; Hughes 1981). Quite unique among Southwestern obsidians is the large number of white crystalline inclusions in the black to very dark gray matrix. Some of the inclusions range upwards to 4mm or more, causing irregular conchoidal fracture. The material varies from opaque to almost clear. When translucent, the interior sometimes has a granular texture, or rarely banding. The cortex, if present, is matte black or dark brown.

Obsidian Butte located in the northeast quarter of Section 32, Township 11S, Range 13E (Obsidian Butte 7.5

Quadrangle), is the central source for Ericson's Obsidian Butte Exchange System (1977a:199-202) (Figure 2-3). According to Malcolm Rogers (handwritten notes in San Diego Museum of Man files), the material exists as veins radiating from the "dome" or butte. Personal experience at the source suggests that the material was procured as cobbles, and pre-forms may have been made on site.

Most interesting diachronically, is the elevation of the source 40 meters below sea level at the top of the Butte. This source was under Lake Cahuilla until it was completely dessicated between 1550 and 1600 A.D. (Waters 1980). It can be generally assumed that obsidian identified as Obsidian Butte material recovered from local sites, dates from post-1550-1600 A.D. Obsidian does occur in earlier sites, but appears to derive from an alternate source (Chace 1980; Shackley 1981).

In most cases obsidian should be subjected to chemical characterization analysis before conclusive judgments are made. However, the Obsidian Butte material is so distinct morphologically, inferences can be made relating to source determination (Hughes 1981). If in the future researchers record the relative frequency of white crystalline inclusions in obsidian samples from sites in the region, inferential conclusions may be reached regarding source determinations, distance-decay effects, and competing source effects.

Another obsidian source is located approximately 250 kilometers south of the international border at Arroyo Matomi in the Sierra de San Pedro Martir, Baja California (Banks 1971; Douglas 1981). Quite unlike the Obsidian Butte source, Arroyo Matomi material is commonly found as "tears" or water worn pebbles and contains few white inclusions (Douglas 1981). This morphological differentiation allows for visual source determinations that can be as high as 93% (Hughes and Bettinger 1981).

Since the obsidian used for analysis in this thesis was not subjected to chemical characterization (i.e., x-ray fluorescence), it is assumed heuristically that all obsidian originated from the Obsidian Butte source. This is justified for a variety of reasons.

In Ericson's (1977a) trace analysis of obsidian in San Diego County, all samples subjected to testing were from the Obsidian Butte source. Consequently, most of the obsidian found in post-1500 A.D. sites in San Diego County should be from this source. Based on the morphological characteristics of the Obsidian Butte source described above, only one flake of Arroyo Matomi obsidian was identified at SDi-161 (see Chapter VI). This low proportion is probably the case throughout the region.

The quantitative analysis performed on obsidian frequencies in sites in San Diego County (see Chapter VII) is contingent upon the material entering the system from the east. The two other possible competing sources, Coso in the Southwestern Great Basin and Arroyo Matomi in Baja California, would both have to enter the system from the northeast and southeast, respectively (see Figures 2-2 and 2-3).

Assuming the law of monotonic decrement, the 300 to 400 kilometer additional distance to the competing sources would cause the proportion of competing source material to be extremely small. Variables such as desirability and effective distance will relax the effect of the law somewhat. This will be discussed in Chapter VIII. For the above-stated factors, competing obsidian source interaction is not considered significant.

Clay. Clay sources and their relationship to ceramic wares and types has been used recently in the Southwest and Mesoamerica in the analysis of exchange networks (Deutchman 1980; Rands and Bishop 1980; Toll, Windes, and McKenna 1980).

By understanding the clay source procurement zones and production centers, and the distribution of the ceramic types throughout a region, inferences can be made regarding regional exchange networks. Because most ceramics are portable, and the clay materials equally portable, the problem of identifying source areas is difficult. Even more frustrating locally is the lack of readily identifiable attributes in the local ceramic assemblage that are amenable to exchange studies. May (1978) and Waters (in press) have both attempted type and ware analyses, but particularly in the case of May's analysis, have been mostly unsuccessful.

Generally, ceramics in the interaction area can be divided into two broad ware categories: (1) those derived from residual clays, the Brownwares, and (2) those derived from sedimentary clays, the Buffwares (Rogers 1936). Residual clays result from the breakdown of plutonic rock bodies in the Peninsular Ranges. Sedimentary clays are a result of lacustrine and riverine deposition in Imperial Valley (Waters in press).

Experience with Waters' type collection of Buffwares at the San Diego Museum of Man has demonstrated considerable general temporal and spatial sensitivity in the ware categories. The Brownwares contain so much variability that there appears little diachronic or spatial sensitivity. This is probably due to the large number of residual clay sources available (see Table 4-1).

In this thesis Brownwares will be considered to originate from any point west of the desert foothills and Buffwares east into Imperial Valley.

May (1978) suggests that there is a direct correspondence between ware types and the "regional land use pattern" (1978:2). If this is true, then groups such as those exploiting resource areas in both the Peninsular Ranges and Imperial Valley would apparently have a proportionately equal distribution of Brownwares

TABLE 4-1

Archaeologically Recorded Resources Exchanged

Resource	Zone or Site Procured	Reference
Obsidian	Obsidian Butte, Imperial Valley; Arroyo Matomi, Baja California	Banks (1971) Douglas (1981) A. Christenson (1980)
Chalcedony	Coyote Mtn. Pliocene Terraces, Imperial Valley; Oceanside, San Diego County; Palo Verde Wash, Imperial County	Personal observation; Eidsness et al. (1979); Brown & Allen (1957)
Jasper	Coyote Mtn. Pliocene Terraces, Imperial Valley; Imperial Beach; San Diego County	Personal observation; Weber (1963)
Chert	Coyote Mtn. Pliocene Terraces, Imperial Valley	Personal observation
Silicified wood	Yuha Basin, Imperial Valley	Heizer & Treganza (1944); personal observation
Porphyritic volcanics	Jacumba Valley and San Dieguito River Valley	Heizer & Treganza (1944); personal observation
Metavolcanics	Otay Mountains, San Miguel Mountains	Eidsness et al. (1979)
Quartz	Throughout the Peninsular Ranges--Ramons, Pala, Jamul, Jacumba Mtns.	Heizer & Treganza (1944)
Tourmaline	Throughout Peninsular Ranges--Jamul, Cosmit, Mesa Grande, Ramona, Pala, Bucksnort Mtns.	Heizer & Treganza (1944); Kidder (1981)
Steatite	Jacumba Mtns., Laguna Mtns., Cuyamaca; and Storm Canyon, Laguna Mtns.	Personal observation

TABLE 4-1 (continued)

Resource	Zone or Site Procured	Reference
Prophyllite schist	Bucksnort Mtns.	Kidder (1981)
Sandstone	Yuha Basin, Imperial Valley	Holmes (1902)
Clay:		
Sedimentary	Lacutrine and riverine clay deposits in Imperial Valley-Coyote Mtn., Fish Creek, Yuha Basin, Colorado River Terraces	Personal observation; Rogers (1936)
Residual	Spring Valley, Alpine, Cosmit, Jewell Valley, Manzanita, Mason Valley, Jacumba, Dos Cabezas--throughout the Peninsular Range Province	Rogers (1936); Heizer & Treganza (1944); personal observation
Shell:		
(general)	Pacific Coast; Gulf of California; Prehistoric shoreline of Lake Cahuilla	Fisher, Foster, & Oxendine (1979); Haury (1938)
Olivella sp.	Gulf of California; Pacific Coast	Haury (1938)
Laevicardium elatum	Gulf of California	Morris (1966)
Haliotis sp.	Pacific Coast	Haury (1938)

and Buffwares. May further states that Buffwares are common in "sand dune sites" on the desert floor, and Brownwares are common in "mountain canyon sites" (1978:6). Unfortunately, no quantitative information was supplied in May's paper in order to assess variability between these site types. Implicit in May's paper is the assumption that specific ware categories correspond to a regional pattern not yet explicitly defined (May 1978:2-6). Careful recording of contrasting frequencies of Buffware to Brownware types in sites in the region will allow for an assessment of this assumption. Accordingly, ware types in Carrizo Gorge should be predominately Brownwares.

Obsidian and ceramic ware categories will be utilized in this thesis as both time sensitive artifacts, in a general sense, and sensitive items of exchange. Other resources exchanged within the network will be treated in tabular and graphic formats (Table 4-1).

Table 4-1 identifies exchanged resources found in the archaeological record in the region and source locations. This analysis is an ongoing study and cannot be construed as a comprehensive body of data on exchanged material in the region. Petrological terminology is derived from Pough (1955) and Brown and Allen (1957).

CHAPTER V

CARRIZO GORGE: ENVIRONMENT AND ARCHAEOLOGY

Introduction

In the late 1930s and early 1940s a young man named Adan Treganza spent a good portion of his spare time investigating prehistoric sites in northern Baja California and Southern California (Allen 1981). In 1942 he published "An Archaeological Reconnaissance of Northeastern Baja California and Southeastern California." Carrizo Gorge was part of the area covered in his survey, and his paper was the first to deal specifically with late prehistoric sites in the region. One site he discovered, SDi-161, is the focus of Chapter VI.

Natural Environment

Carrizo Gorge is a very steep canyon dropping over 500 meters in less than 10 kilometers (Figure 5-1). It can take less than one day to walk from Jacumba to Bow Willow. This extreme drop and relatively rapid access to the desert floor of Jacumba Valley was probably a major factor in its use as a communication corridor.

The gorge itself can be located on the northern half of the Jacumba 7.5' Quadrangle and the southern half of the

Sweeney Pass 7.5' Quadrangle in the far eastern portion of San Diego County (Figures 5-1 and 5-2). Figure 5-2 demonstrates the steep gradient of the canyon sides and the proximity to the desert floor.

Geology/geomorphology. Remarkable cutting by Carrizo Creek because of its low outlet to the Salton Sink to the east has produced the spectacular Carrizo Gorge and will eventually destroy the Jacumba Basin (Brooks and Roberts 1954).

This is probably the best description of the formation of Carrizo Gorge extant in the literature.

The gorge itself is on the eastern scarp of the Peninsular Range Province, a relatively recent product of the uplifting Southern California Batholith and down faulting of the Salton Trough (Larson, Menard, and Smith 1968). The gorge is formed predominately of metasedimentary Julian Schists of pre-Jurrasic age. Abundant plutonic bodies, mainly grano-diorite, exist as part of the batholith. Near the junction of Rockhouse Canyon and Carrizo Creek approximately 3 kilometers below the study area, as well as at SDi-161, large bodies of Jacumba pyroclastics exist. Strike and dip foliation of the meta-sedimentary and bedded granitic rock occurs along the course of Carrizo Gorge (Weber 1963).

Petrology. Metamorphic rock with smaller inclusions of sedimentary rock dominate the geology. Within the

An interesting demonstration of the aridity occurred during the field work at SDi-161. Rain fell quite heavily most of one day and night in April above the gorge in the In-Ko-Pah Mountains, but barely a drop fell into the canyon bottom.

Hydrology. Carrizo Creek possesses a relatively large stream basin extending south into Baja California and draining most of the In-Ko-Pah and Jacumba Mountains (Figure 5-2). Due to the extensive drainage basin, Carrizo Creek flowed steadily the last two years as a result of the higher annual precipitation recently. As of June 1981, the creek had dessicated up past Goat Canyon and flowed intermittently above that point.

According to Strahler's (1964) classification, Carrizo Creek is a Rank III stream, fed by many Rank II streams. This classification is based on cumulative counts of stream junctures.

Because of the constant stream flow during the investigation springs and seeps were not encountered.

Biotic Environment

The biotic environment includes the vegetation, fauna, and general biotic regimes encountered during the project.

Vegetative communities. Thorne's (1976) vascular plant community scheme will be used here to classify community level plant associations. Two main plant associations exist in the study area: (1) the semi-succulent scrub community, and (2) the desert microphyll woodland.

The semi-succulent scrub community exists primarily on the rocky, steep sides of the gorge. Most commonly encountered plants are Agave (Agave deserti), Nolina (Nolina bigelovii), Barrel Cactus (Ferocactus acanthodes), Jumping Cholla (Opuntia bigelovii), Ocotillo (Fouquiera splendens), and smaller proportions of Desert Trumpet (Eriogonum inflatum) and Jojoba (Simmondsia chinensis) (B. Collins 1976).

The desert microphyll woodland is present along the washes and on most of the sites in the study area (Figure 5-3 and 6-3). At SDi-161, this community included Honey Mesquite (Prosopis glandulosa Torr.), Brittle Bush (Encelia farinosa), Desert Mistletoe (Phoradendron californicum), Chuparosa (Beloperone californica), Saltbush (Atriplex lentiformis), and Bladder Pod (Isomeris arborea).

Plants growing in the dry wash area near Carrizo Creek, but not associated with a definite plant community included Jimson Weed (Datura meteloides), Wild Squash (Cucurbita foetidissima HBK), and immature Willow (Salix spp), probably a result of dispersal from recent floods.

Growing in the stream and directly beside it at SDi-161 was Arroweed (Pluchea sericea), Common Reed (Carrizo) (Phragmites communis), and Cattail (Typha latifolia L.). These hydrophitic plants have all grown since the onset of the recent wet winters (B. Collins 1976).

Ethnobotanical uses for these plants can be found in Bean and Saubel (1972) and Wirth Associates (1978:Appendix D).

Fauna. A large range of desert fauna were recognized directly and indirectly in the gorge. Included in the inventory were: Bighorn Sheep (Ovis canadensis cremnobates), Coyote (Canis latrans), Desert Cottontail Rabbit (Sylvilagus audobonii), Blacktailed Jack Rabbit (Lepus californicus), Ground Squirrel (Spermophilus beecheyi), Desert Woodrat (Neotoma lepida), Kangaroo Rat (Dipodomys spp.), Red-Tailed Hawk (Buteo jamaicensis), Raven (Corvus corax), Roadrunner (Geococyx californianus), Great Horned Owl (Bubo virginianus), Gambel's Quail (Lophortyx gambelii), Mourning Dove (Zenaidura macroura), California Thrasher (Toxostoma redivivum), Costa Hummingbird (Calypte costae), Side-Blotched Lizard (Uta stansburiana), Desert Horned Lizard (Phrynosoma spp.), Granite Spiny Lizard (Sceloporus orcutti), Common King Snake (Lampropeltis getulus), California Striped Whipsnake (Masticophis lateralis), Red Diamond-Back Rattlesnake (Crotalus ruber), Common Toad (Bufo boreas), Western Spade Foot Toad (Scaphiopus hammondi), and Pacific Tree Frog (Hyla regilla).

The tremendous faunal variability recorded is probably due to the length of time spent in the gorge in the course of the field work and the oasis effect of a flowing stream in an arid environment.

Previous Research

As mentioned in the introduction to this chapter, Adan Treganza (1942) was the first to publish research on the late prehistory of the area.

An older resident of San Diego County, who is quite familiar with the Jacumba area is Norton Allen of La Mesa. He recalls in the 1920s and 1930s "many ollas and some basketry" collected from the gorge (Allen 1981). One site at the upper end of Carrizo Gorge at the junction of Tule Canyon and Carrizo Creek (SDi-165) is a complex site located by Treganza and described as having ollas and "pieces of basketry" removed by collectors.

Bob Begole (1973, 1974, 1976, 1981) has completed various research programs within Anza-Borrego Desert State Park, focusing on early period sites (San Dieguito). His 1973 report was a result of a survey that included portions of the study area. Begole has located and re-recorded a large number of sites in the area, but his problem-oriented research focusing on early period sites left large areas unsurveyed in relation to late prehistoric sites. His site records, however, recorded the location of late period sites "nearby" or below terraces where early sites were located. This information was quite valuable in choosing the specific study area within the gorge.

Students of Jay von Werlhof and Lora Cline of Imperial Valley College have surveyed and re-recorded sites in the gorge, particularly SDi-1262 and 1263 (E. Collins 1981).

Various State Park personnel have been through the area. Daniel McCarthy's excellent recording of the two rock art sites in the gorge (SDi-1262 and 1263) are remarkably accurate and well done (Getty 1981).

The upper reaches of Carrizo Gorge, particularly when dry, remains relatively isolated and remote, and has discouraged both collector and professional researcher.

Site Descriptions

Seven new and four previously recorded sites were located in the project area during the course of field work. Each site will be described beginning at the downstream end in Section 24 T16S Sweeney Pass Quadrangle and working upstream to Section 31 T16S Jacumba Quadrangle.

SDi-8919. This site is located on Sweeney Pass 7.5' Quadrangle in Section 24 UTM 11 573530E 3624630N. It is a high density complex site containing milling (1 mortar, 3 basins, and 5 slicks), ground stone fragments, large stone tools, Buffware and Brownware ceramics, obsidian, quartz, and porphyritic volcanic flakes, and two shell fragments, one *Haliotis* spp. and one *Laevicardium* spp. The site itself is on the west bank of Carrizo Creek in alluvium punctuated with boulders of granodiorite. *Prosopis*, and *Atriplex* is common. Faunal remains are present, and there appears to be a semicircular midden area with a radius of 20+ meters (Figures 5-3 and 5-4).

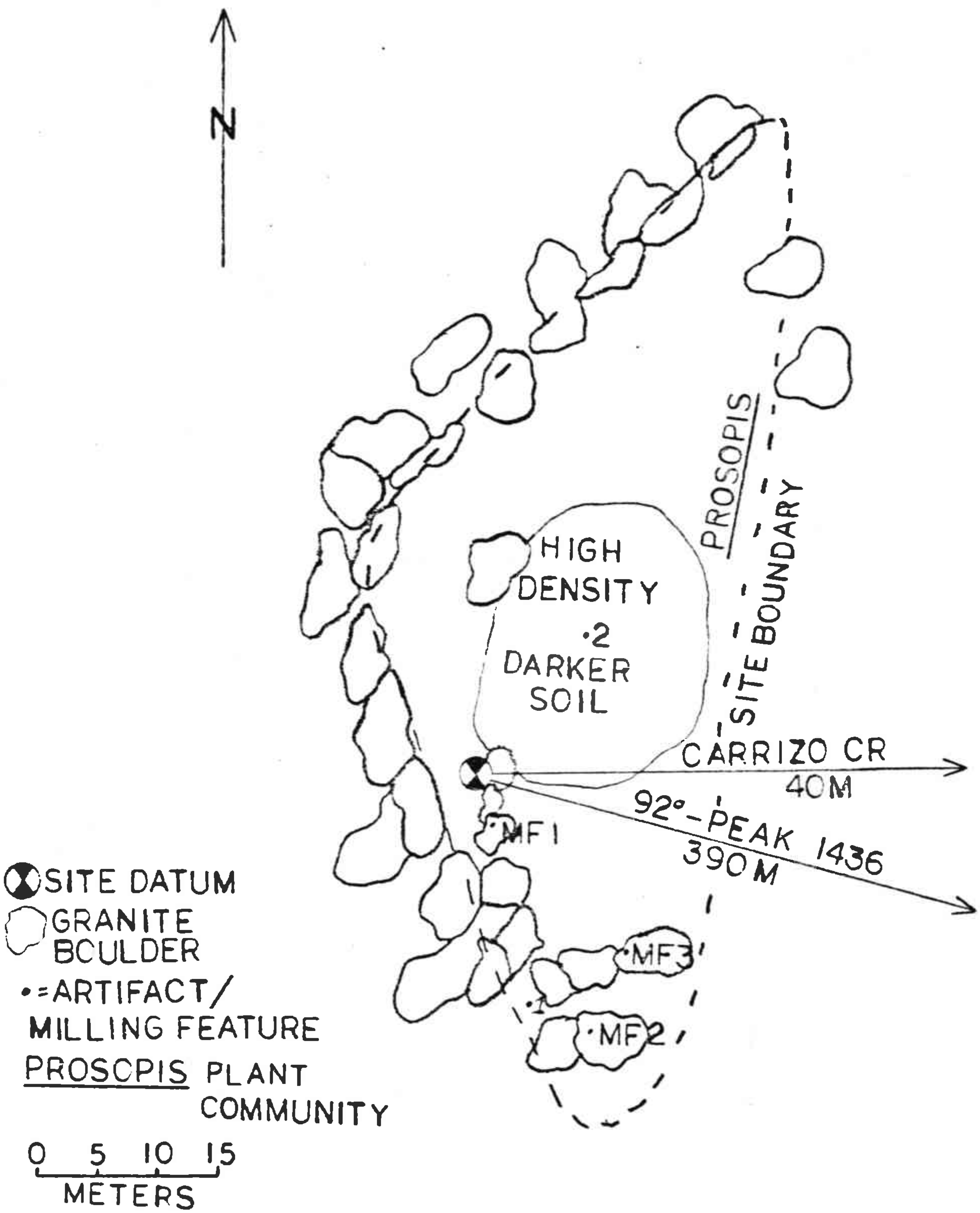

Figure 5-4. SD1-8919 (Site Map).

SDi-1262. This site located approximately 200 meters upstream from SDi-8919 on the east side of the creek, is a rock shelter containing a gallery of well executed rock art (Figure 5-6). The design attributes characterized by sauromorphs, sunbursts, anthropomorphic figures, various grid patterns, circular motifs, and in this case a white bordered cross, are associated with the La Rumarosa Style (Hedges 1980:166-67). Based on time-sensitive artifacts, historic design elements at some sites, and ethnographic data on two sites, this style leaves "little doubt that it was produced by the historic Kumeyaay and their immediate ancestors" (Hedges 1980:167).

The figures are located in a rock shelter facing west. In association are two bedrock mortars, 10+ cupules, Brownware and Buffware ceramics, porphyritic volcanic and quartz flakes, and two granitic pestle fragments. The artifacts are medium density, and are scattered over an area 10 x 10 meters. No distinct midden was present. Definite association of this site with the other late period sites in the gorge is impossible. However, according to the associated time-sensitive artifacts, the rock art was at least in the same tradition as the habitation sites in the gorge, and probably had a ceremonial association with minimally some of the habitation sites in the gorge (Hedges 1980:171-74). Both SDi-8918 and SDi-8919 are late period complex habitation sites within 200 meters north and south of this site. In the McCain Valley study area (on both sides of the gorge), 44% of rock art sites were in association with habitation sites; N = 27 (Hedges 1980:168-69).

SDi-8918. This is another complex site located approximately 200 meters upstream from SDi-1262 in the same section UTM 11 573920E 3624410N. The site is located east and well above Carrizo Creek in alluvium (Figure 5-5). *Atriplex* and *Encelia* are common on the site; no *Prosopis* is in the immediate vicinity, however. A light midden is present underlying the highest artifact concentration. Artifacts on the surface included a granitic unifacial slick metate, a chalcedony projectile point tip, a granite bifacial mano fragment and less than 10 Brownware sherds. The artifact scatter is light density.

SDi-9027. This site is in Section 25, UTM 11 573720N 3623910E on Sweeney Pass 7.5' Quadrangle (see Appendix C). SDi-9027 is a widely scattered light density lithic/ceramic scatter with bedrock milling located on a wide alluvial bench west of Carrizo Creek. Thirty-seven slicks, one rub and one basin were located along with one porphyritic basalt hammer-chopper, Tizon Brownware sherds, and porphyritic volcanic and quartz flakes. The artifacts were extremely light density. The large frequency of bedrock milling was probably a result of mesquite processing.

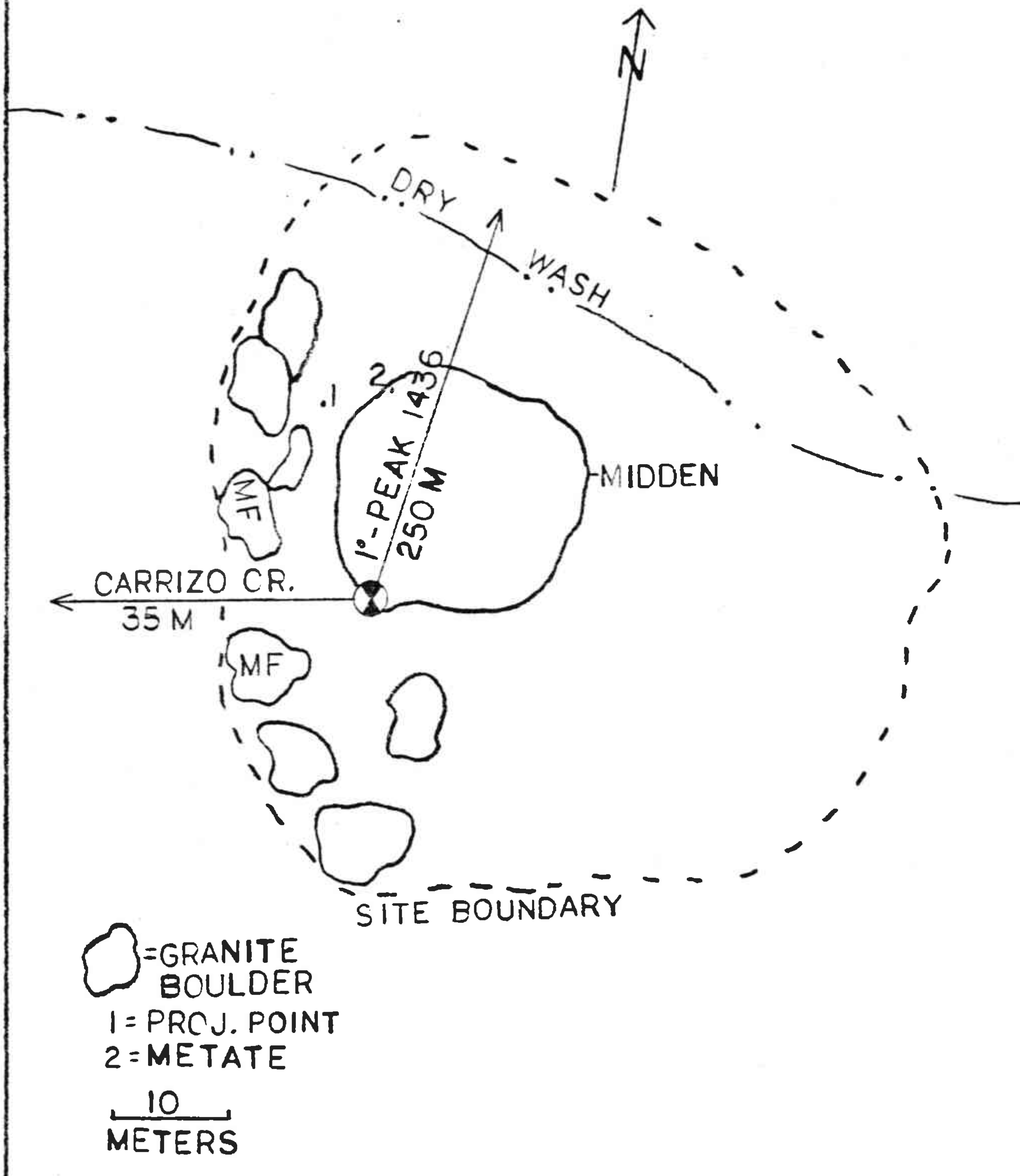

Figure 5-5. SDi-8918. (Site Map).

SDi-1263. This site is another rock art site. In 1971 Bob Begole recorded five design elements. Only three were recognized during the project, but considerable water damage was apparent. Unique at this site is a concentric circle petroglyph on a vertical face. The site is located approximately 450 meters upstream from SDi-9027 well above and northeast of Carrizo Creek UTM 11 574140E 3623850N. The site is situated among boulders and the rockshelter contains one mortar and 15+ cupules. On the terrace outside the shelter is a light density lithic/ceramic scatter including Tizon Brownware, porphyritic volcanic and quartz flakes. Fouquieria and Ferocactus were on site.

SDi-9026. This site is a milling station with 10 slicks and 1 possible basin, all highly exfoliated. It is located in alluvium below and 100 meters upstream from SDi-1263 UTM 11 574260E 3623750N. No artifacts were found in association with this site. Encelia was the predominate plant on site. Prosopis was located near Carrizo Creek (Appendix C).

SDi-161. This site will be discussed in a separate chapter.

SDi-9024. This site is an isolated milling station with an associated lithic/ceramic scatter. It is located on the east side of Carrizo Creek in alluvium, Section 30, UTM 11 574790E 3623800N, Jacumba 7.5' Quadrangle. The site consists of three slicks on one granitic boulder and a very light scatter of porphyritic volcanic and quartz flakes, and Tizon Brownware sherds. Prosopis and Encelia are in association (Appendix C).

SDi-223. This site was originally recorded by Treganza in 1942. He describes it as a "black petroglyph (sic) of a man sitting before a Christian cross." This site was not relocated, but is recorded on the east bank of Carrizo Creek, Section 30, UTM 11 575290E 3623310N Jacumba 7.5' Quadrangle.

SDi-9025. This site is a milling isolate with associated lithics. The site is located on an alluvial bench west of Carrizo Creek in Section 30 UTM 11 575550E 3623640N Jacumba 7.5' Quadrangle. The site contains 1 mortar and 1 basin and 5+ porphyritic basalt flakes. The ground cover and Prosopis was heavy and may have obscured some artifacts. One metamorphic pestle was "in situ" on bedrock milling (Appendix C).

SDi-8917. This site located southeast of Carrizo Creek on an elevated alluvial bench in Section 31 UTM 575210E 3621230N, is a complex site with a rock shelter (Figures 5-6 and 5-7). Although no midden was present, the site contained a light density scatter of porphyritic volcanic and quartz flakes, Brownware and Buffware ceramics inside and outside and rock shelter and 8 basins and 13 slicks. Acacia gregii and Fouquiera was on site.

This site constitutes the southern (upstream) boundary of the study area.

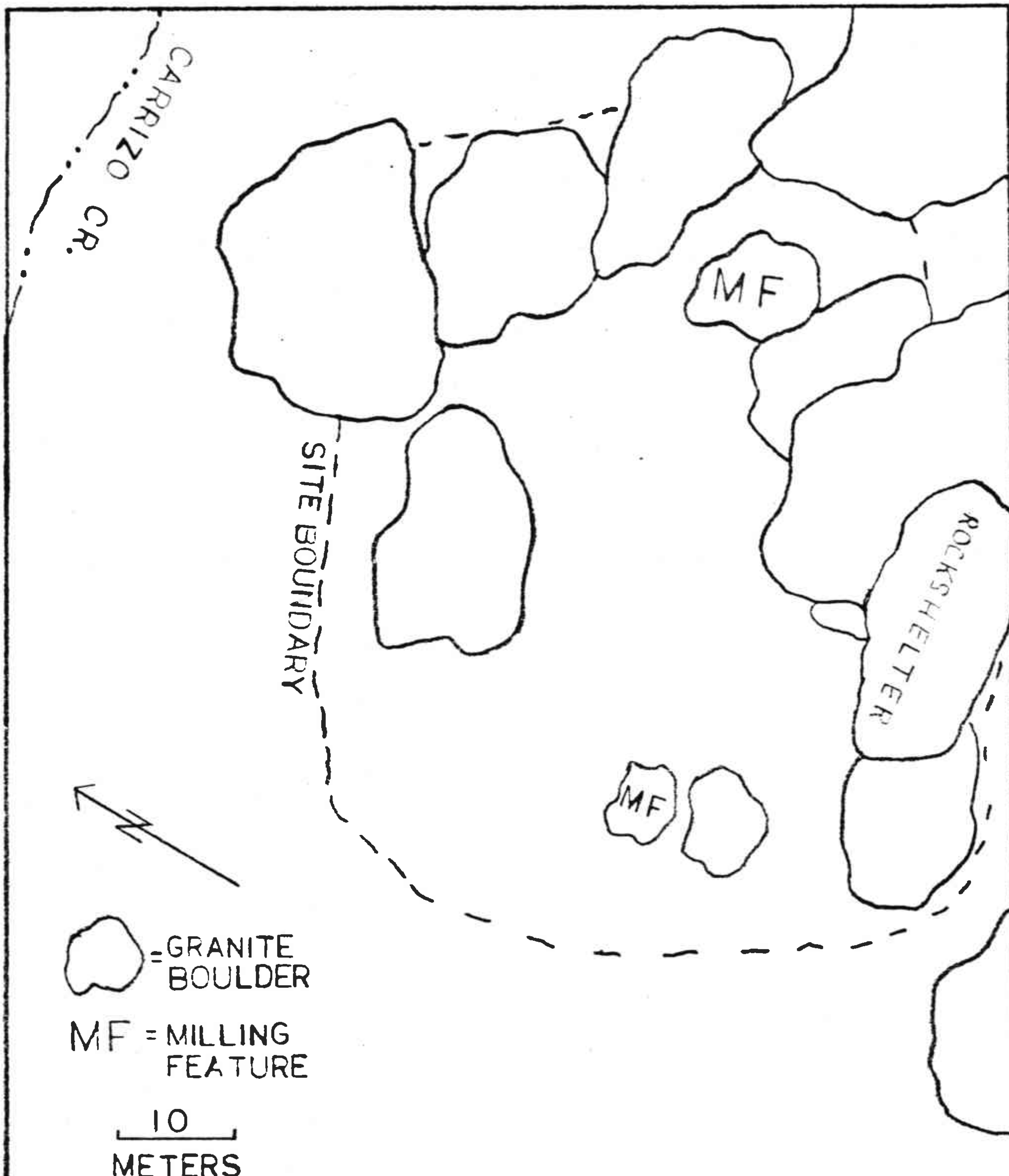

Figure 5-7. SDi-8917 (Sketch Map).

Research Design and Methodology

The research design and methodology for the Carrizo Gorge project was structured such that: (1) it would be amenable to further, more comprehensive research in the gorge (e.g., subsurface testing, excavation, and special ancillary analyses), and (2) the data could be utilized as a comparative base for future exchange studies in the region. As such, the research in this thesis is preliminary to a multistage design where each stage of tested assumptions and hypotheses provides a basis for further field testing and analysis. This multistage approach is beneficial in a variety of ways.

Since the research is being conducted in a state park where preservation is paramount, the survey and problem specific surface collection of design selected sites, assures limited impact to the micro-environments on archaeological sites. The multistage framework is structured such that the results of preliminary surveys and surface inventories can offer guidance to subsequent field work, refine the classification systems, and provide interpretive results at varying levels of detail (Redman 1978).

A multistage approach is particularly valuable in exchange studies in this region where problem specific exchange studies have not been done. Preliminary surveys can isolate sites and trail systems that contain attributes necessary to analysis.

Frequently the multistage approach isolates attributes or variables modifying the range of attributes necessary to test the hypothesis. Discriminent and factor analyses, both available in the Statistical Package for the Social Sciences (SPSS), can isolate essential attributes during the first stage of research (Nie et al. 1975).

Project Area Selection

As stated in Chapter II, Carrizo Gorge was mentioned by several early Kumeyaay informants as being part of an important communication trail--the Xakwinimis Trail. This ethnographic data conditioned the choice of Carrizo Gorge as a general study area.

The area around the gorge is quite remote and the chance for high site integrity was potentially good. Additionally, enough previous research has been done so that a general pattern of site distribution was discernible.

As stated in the site description for SDi-1262, habitation sites are common near rock art sites. This factor further conditioned the choice of the specific research area. SDi-161, recorded by Treganza, was located near a rock art site and appeared to be a complex site, with a high probability of containing exotic material. Complex sites are recorded between SDi-1262 and county highway S-2 near Bow Willow, but the heavy ORV traffic in this area would have contributed to site disturbance. For these reasons and for time and fiscal efficiency, the inclusive area between Section 24, Sweeney Pass 7.5' Quadrangle and Section 31 Jacumba 7.5' Quadrangle in the gorge was chosen for survey. These sections promised to provide a sufficient quantity of complex sites not too distant from the maximum point that could be traveled by four-wheel-drive vehicle, and should yield sites exhibiting low impact.

This area is approximately 7 kilometers in length. Because of the extremely narrow canyon bottom, less than 14 square kilometers, or about 1400 hectares was surveyed (see Figure 5-1).

All terraces and rock shelters were surveyed by a two-person crew, with the specific focus of locating complex late prehistoric sites with a high density of surface cultural material. SDi-161 was chosen for these reasons. Complex sites were instrument mapped with a Brunton pocket transit, tripod, and meter tape, except for SDi-161, which was alidade-plane table mapped. Collections were made pursuant to the antiquities permit issued by the State of California, Department of Parks and Recreation (DPR412/3.28.81).

CHAPTER VI

SDi-161

Introduction

The site chosen for analysis is SDi-161. This site located in Carrizo Gorge at the far northern end of the Jacumba 7.5' Quadrangle in Sections 25 and 30 UTM 11 574590E 3623410N (Figure 5-1) was found to contain the cultural material necessary to examine the hypotheses formulated relative to the research at hand. The site was close enough to the end of the Carrizo Creek jeep trail to afford adequate accessibility but remote enough to exhibit high site integrity. Upon first examination the site surface was found littered with a very high density of cultural material including diagnostic ceramics, obsidian and silicate flakes, shell material, faunal material, projectile points, portable ground stone, and a variety of lithic tools. This site exhibited precisely the range and frequency of cultural material desired.

Site Environment

SDi-161 is located on the inside curve of a sharp bend in Carrizo Creek. This position avoids flooding during flash floods, although the existence of alluvium on the site suggests flooding some time before the last occupation, probably during the early Holocene.

Referring to the site photographs and Figure 6-1 in the back pocket, the site is seen to consist of two ancient alluvial terraces, one terrace approximately 1 meter higher than the other. Large grano-diorite boulders on the south side of the site provide some protection. The site dimensions are 214 by 55 meters, 11,770 square meters, or about 118 hectares (Figure 6-2).

Mesquite (Prosopis glandulosa) is probably the most significant plant on the site (Figures 6-2 and 6-3). The large stands of Mesquite probably provided shelter, as well as an extremely valuable and storable food supply in early summer (Bean and Saubel 1972).

During the field work (January to May 1981), Carrizo Creek was flowing through deep pools along the edge of SDi-161. The faunal and floral resource base at that time was probably more than adequate to support a reasonable size population at the site.

Its position at the junction of three drainages and easy access through those drainages to both the In-Ko-Pah and Jacumba Mountains also probably contributed to the choice of this location for a habitation site.

Surface Sampling Rationale

The entire data base extracted from SDi-161 was derived from surface artifacts and features. Archaeologists have always

used surface artifacts and assemblages to establish the existence of a site, elucidate regional culture histories, and determine areas to excavate within a site (Lewarch and O'Brien 1981).
In the last decade the use of surface material has been expanded to include surface phenomena in research problems that used to be exclusively studied by excavation alone (Thomas 1979). Lewarch and O'Brien (1981:297) best state the approach by suggesting: " . . . our basic tenet is that surface artifacts are useful in more situations and for more kinds of research problems than might commonly be appreciated." Many arguments against the use of surface materials are based on assumptions that must be carefully reevaluated in the light of formation processes and an expanding body of positive results (Lewarch and O'Brien 1981).

Development of an underlying rationale for intensive surface collection in the Southwest and the Great Basin in various large-scale regional projects is well documented (Bettinger 1975; E. L. Davis 1975; Thomas 1971, 1973; Whalen 1977).

The use of intensive surface collection within a single site to obtain quantitative data on frequencies of artifact classes present, as well as answer other inter- and intraregional research questions is also well documented (Flannery 1976; Longacre and Ayres 1968).

The large corpus of surface analyses yielding positive results is accepted here as ample justification for designing an intensive surface inventory sample at SDi-161. This sample will be used to obtain quantitative data on frequencies of artifact classes and material type that are not of local origin.

Site Sampling Design

The site, as described in the site environment, consists of two elevated alluvial benches, one approximately 1 meter higher than the other (see Figure 6-1 in pocket in back cover). The upper bench is designated stratum 2 and the lower bench stratum 1. The lower bench appeared significantly lighter in artifact density than stratum 2. The midden color was correspondingly lighter on stratum 1. As stipulated in the antiquities permit application, ten 2 x 2 meter surface inventory units would be collected.

The inventory units were selected on a stratified unaligned sampling design. A 4 x 4 meter grid pattern was laid over the site map on the plane table. To allow for disproportionate strata size, five units were selected on the lower stratum and three were selected on the upper stratum. Each unit was selected in the field using a table of random numbers.

It must be emphasized here that one of the primary reasons for utilizing random selection was the scattered and lighter artifact density of the lower stratum and the inability to choose areas yielding large frequencies of cultural material. To avoid alignment another random assignment was made within each 4 x 4 to designate the position of the 2 x 2 meter unit. Two additional

2 x 2 meter units (Units 8 and 9) were judgmentally placed in the densest area at stratum 2.

Although the sampling design is such that the different strata can be statistically compared, this was not the focus of the thesis. A representative sample of the site surface assemblage was the desired result, however. Due to the two judgmentally sampled units, no intrasite analyses will be made at this time.

Unit Summaries

A tabular disc readout of artifacts recovered at SDi-161 is included as Appendix A. Since the data from the site overall are used in intersite analysis, no unit by unit summarization will be made here. Intrasite patterning, such as activity loci, may be detectable at SDi-161, but the data base may be too small, and is assumed irrelevant to the present study.

Milling Features

An abundance of bedrock and portable milling was exhibited at SDi-161. Ten discrete milling loci were discovered on the site. The majority of these were above stratum 1 (Figure 6-4; 6-1 in the back pocket). All bedrock milling was on granodiorite boulders (see Table 6-1).

In addition to the bedrock milling features, 19 isolated groundstone artifacts were located and mapped on the surface of SDi-161. The majority of these were metates and metate fragments

TABLE 6-1

Milling Features

No.	Boulder Dimensions	Type	Elements	Length	Width	Depth
1	200 x 150 cm	Slicks	2	54	22	cm
				25	20	cm
2	210 x 140 cm	Slicks	2	18	12.5	cm
				50	25	cm
3	(3 boulders)					
	A - 180 x 100 cm	Slicks	2	24	14	cm
		Basin	1	31	22	3 cm
	B - 170 x 90 cm	Slick	1	30	23	cm
	C - 170 x 90 cm	Basins	2	30	26	2.5
				40	36	2.0 cm
4	120 x 120 cm	Slick	1	26	20	cm
5	190 x 90 cm	Slick	1	50	30	cm
6	180 x 100 cm	Slick	1	25	18	cm
7	(3 boulders)					
	A - 290 x 190 cm	Slicks	3	35	18	cm
				32	20	cm
				21	18	cm
		Basins	3	26	18	1.5 cm
				26	26	4.5 cm
				22	20	1.5 cm
	B - 200 x 200 cm	Slick	1	16	15	cm
	C - 160 x 140 cm	Rub	1	55	45	cm
8	90 x 70 cm	Slick	1	13	12	cm
9	(2 boulders)					
	A - 170 x 110 cm	Basins	4	19	17	1.5 cm
				24	24	3.0 cm
				19	15	2.0 cm
	B - 120 x 70 cm	Basin	1	17	15	2.0 cm
10	110 x 95	Basins	2	40	26	4.3 cm
				27	19	2.5 cm

or manos. One portable granite mortar fragment was located in stratum 2 (Map Point 22).

The high frequency of milling features and isolates on the site may be a result of mesquite (Prosopis) processing in the early summer. Table 6-2 lists the provenience and description of isolated groundstone at the site.

All groundstone was made of locally procurable granitic or metamorphic materials with the exception of two sandstone metate fragments (Map Points 12 and 25). Sandstone is procurable in the Yuha Basin in Imperial Valley (see Table 4-1).

Additional Artifactual and Ecofactual Material

Obsidian flakes and debitage were common on the surface of SDi-161. Seven obsidian flakes were arbitrarily collected from the surface (see Appendix A) for future hydration analysis and sourcing. A formal analysis of bone material recovered from the units and selected faunal isolates is tabulated in Appendix B. Of the identifiable species, none are exotic to the local environment except for a fragmentary fish vertabrae. *Ovis canadensis cremnobates* material could not be positively identified, but the ungulate metapodial fragments are probably *Ovis*. *Ovis* was seen in the gorge during the field work.

The large number of burned artifacts and ecofacts indicate some pattern of burning (over 80% of the faunal material was burned). As noted by L. Christenson (1981), burned bone may

TABLE 6-2

Groundstone Isolates (Measurements in Centimeters)

Map Point	Dimensions (L W Th)	Ground Face Dimensions	Material	Thermal Alteration	Fragmentary	Comments
1	21 x 14 -	1.0 deep 1.5 deep	White granite	No	Yes	Bifacial metate
2A	13 x 10	N/A	Granite	Yes	Yes	Metate
3	18 x 16	Slick, entire face remaining	Granite	No	Yes	Metate
4	17 x 10	17 x 10	Gray metamorphic	No	Yes	Probably mano
6	9 x 7 x 4.5	N/A	Red granite	No	Yes	Mano
7	43 x 25 -	21 x 18 x 1.4	White granite	No	No	Metate
8	23 x 23	N/A	Gray granite	No	Yes	Metate
9	36 x 29	One face complete slick; other face 19 x 13 x 0.4	White granite	Yes	No	Bifacial metate

TABLE 6-2 (continued)

Map Point	Dimensions (L W Th)	Ground Face Dimensions	Material	Thermal Alteration	Fragmentary	Comments
12	10 x 3 x 4	Entire remaining face - slight basin	Sandstone	No	Yes	Metate
13	17 x 14	Slight basin	White granite	No	Yes	Metate
17	8 x 3	N/A	Red quartzite	No	Yes	Mano frag.
20	22 x 20	Slight basin	Dark gray schist	Yes	Yes	Metate
22	22 x 19	7.5 depth remaining	White granite	Yes	Yes	Mortar
25	14 x 12	Slight basin-one face; 2 cm other face	Sandstone	No	Yes (pie shaped)	Metate (well made)
26	13 x 13	N/A	White granite	No	Yes	Metate
27a	11 x 8 x 3	N/A	Yellow granite	No	Yes	Oval mano
27b	7 x 7 x 5	Entire face	White granite	No	Yes	Metate
35	40 x 27 x 8	40 x 27 slight basin	White quartzite	No	No	Metate
38	32 x 23 x 9	17 x 7 slick	White granite	Yes	No	Metate

result from cultural or natural factors. Lewis (1973) and Aschmann (1959) also note the burning of vegetative communities to proliferate density. With the present evidence the cause of burning cannot be surmised.

Exotic Resources at SDi-161

A large variety of exotic (nonlocal) material was exhibited in the sample from SDi-161. Refer to Table 6-3 for tabulations of lithic material from SDi-161.

Obsidian frequencies contributed to 2% of the lithic flake and debitage assemblage. All the flakes exhibited the morphological attributes of the Obsidian Butte Source 73 kilometers distant, except for one (Map Point 11). This flake is a definite "tear" or water-worn pebble fragment, with a portion of the tumbled cortex remaining. This is most likely from the Arroyo Matomi source in Baja California (Douglas 1981).

Ten percent of the flaked lithic assemblage are silicates: .04 chalcedony, .02 jasper, .02 chert, .01 silicified wood, and .008 banded agate. All the silicates except silicified wood are available on the Pliocene non-marine terraces just south of Coyote Mountain (see Figure 6-7). Silicified wood was procured in the Yuha Basin in formations of the same approximate age. Quartz and porphyritic volcanics are procurable on site and in the immediate area and contribute 43% and 43%, respectively, to

TABLE 6-3

Lithic Material Frequencies
(Units 1-10, SDi-161)

Material Type	f	Percentage (Rounded)
Quartz	153	.43
Porphyritic Volcanics	154	.43
Chalcedony	13	.04
Jasper	7	.02
Chert	8	.02
Silicified wood	4	.01
Agate	3	.008
Obsidian	8	.02
Quartzite	4	.01
Other	3	.008
	N = 357	1.0 (rounded)

the inventory. Quartzite, also a local stone, contributed only 1% to the inventory, probably due to its poor workability for knapping.

Ceramic ware categories present an interesting variable. Tizon Brownware constituted 81% of the ceramic assemblage, Buffwares 19% (N = 96).

If ware types can be associated with lineage transhumant patterns, then the surface ceramics at SDi-161 suggest a predominant habitat in the Peninsular Ranges. These percentages are based on count. Using weights, the range is 86% Tizon and 14% Buffware which indicates that there are similar breakage patterns within the two ware categories, slightly higher for Tizon.

Malacological remains have been frequently used as an easily sourcable material in exchange studies (Haury 1938; Pires-Ferreira 1976). Haury (1938) analyzed shell material from both the Pacific Coast and the Gulf of California from Snaketown in Central Arizona. Pacific Coast species includes Olivella biplicata and Haliotis rufescens. Shells from the Gulf included Glycymeris spp. and Cardium (Laevicardium) elatum (Haury 1938:135). It is possible that the Pacific Coast material moved east to the Hohokam area via the Far Southwestern exchange network.

The shell species recovered from Carrizo Gorge originate from both the Pacific Coast and the Gulf of California (Morris 1966). Laevicardium elatum, Olivella spp., and a freshwater snail shell bead were all found at SDi-161. The Olivella is a broken bead (spire lopped) and the freshwater snail exhibits a punctured lip (Figure 6-6). The Laevicardium do not exhibit intentional modification (Figure 6-5).

SDi-8919 also yielded shell material. A fragment of Haliotis spp., probably H. cracherodii from the Pacific Coast, and a Laevicardium elatum fragment was recovered from the surface (Figure 6-5). These materials demonstrate the extent of the network at least south to the Gulf of California and west to the Pacific Coast.

In Unit 3, SDi-161, a small unidentified fish vertabrae was recovered. Fish are not native to inland San Diego County, but were taken from Lake Cahuilla during the last stand (Wilke 1978), and the New, Alamo, and Colorado Rivers (Gifford 1931). Species taken included Colorado River bonytail chub (Gila elegans), humpback suckers (Xyrauchen texanus), and striped mullet (Mugil cephalus). The vertabrae recovered is perhaps small enough to represent the desert pupfish (Cyprinodon macularius californiensis), but positive identification is difficult. Cyprinodon existed in Fish Creek (20 kilometers distant) until recently (Hubbs and Miller 1948). It is possible that Carrizo Creek could have been the source for fish. During the survey a deep pool was discovered near SDi-8917 containing a half-dozen or more bluegill sunfish (an introduced specie). Given a long period of wet rain cycle, the freshwater fish evidence from SDi-161 may have originated from a local source.

Chronological Placement

Obsidian Butte obsidian and ceramic ware types have both been used as relative dating indicators in the Far Southwest (Chace 1980; Waters in press).

Lake Cahuilla covered the Obsidian Butte source between 950 and 1550 A.D. (see Chapter IV). Obsidian Butte obsidian on the surface of SDi-161 indicates that the last occupation of site was either after 1550 A.D. or some time before 950 A.D. The late prehistoric cultural chronology would indicate the former--post-1550 A.D.

The ceramic assemblage further suggests the later time frame. As mentioned in Chapter IV, Buffware is particularly amenable to general temporal and spatial analysis, due to Waters' recent research. Within the Buffware subassemblage: 72% is Lower Colorado Buffware dated A.D. 1500 to post-1900; 5% is Salton Buffware dated A.D. 950 to 1500; 5% Tumco Buff dated A.D. 1000 to 1500; and 18% unidentifiable (see Appendix A for a complete inventory).

The relative dating association between obsidian availability and Buffware ceramic chronology suggests a final (surface) occupation of SDi-161 most likely after 1500 A.D., and possibly as late as the late 1800s. Subsurface archaeology may indicate a longer chronology or yield more accurate time-sensitive data. The obsidian and ceramic relative dating must be held tentative until further analyses confirm or refute the data.

CHAPTER VII

REGIONAL RELATIONSHIPS: QUANTITATIVE AND QUALITATIVE ANALYSIS

Introduction

The foregoing chapter identified the range and variability of exotic resources occurring at SDi-161 in Carrizo Gorge. The probability of Carrizo Gorge functioning as a portion of the ethnographically recorded Xakwinimis communication route was stated in Chapter II. In this chapter statistical hypotheses will be tested involving the probabilities of Carrizo Gorge functioning as part of the Xakwinimis Trail, and measures will be presented designed to test the directionality, symmetry, and complexity of the exchange network in the late prehistoric Far Southwest.

Obsidian and Buffware/Brownware proportions will be the materials used for network analysis. The sensitivity of these materials for exchange analysis has already been discussed. Communication routes, and resource procurement sites and zones have been examined as well, in Chapters II and IV.

Although the treatment of specific local and regional exchange has been as complete as possible, the data base has been limited. As discussed throughout the thesis, research in the Far Southwest has rarely been directed toward prehistoric exchange, however the following analysis has been as parsimonious as the data allows.

Research Hypotheses

The exotic materials identified at SDi-161 included the variables of type, quantity, and variability. In order to possibly establish this site's position in a local and regional network, certain statistical tests will be applied.

Referring to Figures 2-2 and 7-2, two sites are located in the desert area near SDi-161 (BW-9 and SDi-2537). Both sites were investigated by William Wallace for the California Department of Parks and Recreation (Wallace 1962; Wallace and Taylor 1958, 1960a, 1960b).

SDi-2537. This site, also known as Indian Hill, is located 3 to 4 kilometers due east of SDi-161 at the base of the eastern scarp of the Jacumba Mountains. It consists of a large rock-shelter and open site with midden extending more than 150 cm deep. The site was both excavated and surface-collected in the late 1950s and early 1960s (Wallace 1962). The material recovered indicated an early Pinto-Amargosan component overlain by a late prehistoric ceramic bearing component (Wallace 1962). Comparative data used from this site come from the ceramic-bearing level above 106.7 cm.

Although not quantitatively compared to SDi-161, malacological remains at Indian Hill included similar species plus a variety of others (Wallace 1962). Included in the inventory were one Anodonta californiensis from the prehistoric Lake Cahuilla shoreline; and four Pacific Coast species, Haliotis spp., Cerithedea californica, Mytilus californicus, and Zonaria spadicea. Two species of shell from the Gulf of California were recovered: Levicardium elatum, and Glycymeris maculata. Additionally, the two fragments of Cardium spp. and the two Olivella spp. beads could have originated from either source (Morris 1966). It is interesting to note the presence of shell material from both sources in these sites.

According to the ethnographic data, SDi-2537 is located on a communication route running north through the Jacumba Mountains and eventually connecting with routes heading east-west (Figures 2-2 and 7-2).

BW-9. This site is located in Bow Willow Canyon approximately 8 kilometers NNW of SDi-161 (Figures 2-2 and 7-2). BW-9 is environmentally very similar to SDi-161. Both are canyon sites occupying elevated alluvial benches punctuated by granitic rock bodies along canyon watercourses (Wallace 1962; Wallace and Taylor 1958). Mesquite (Prosopis glandulosa), however, was not present at BW-9. The site was surface-collected and excavated with six 5 x 5 foot test units. The units, extending 24 inches (61 cm) deep exhibited a ceramic associated assemblage (Wallace 1962).

Gulf of California shell material recovered included *Laevicardium elatum*. *Haliotis* spp., originating on the Pacific Coast, was also recovered. The *Megathura crenulata* (Sowerby) pendant recovered is procurable at both marine sources (Morris 1966).

This site is also located on a communication route following Bow Willow Creek into the In-Ko-Pah Mountains from an intersection of an east-west route and the trail running through Carrizo Gorge (Figures 2-2 and 7-2).

Research assumptions. The two sites described above (BW-9 and SDi-2537) were chosen as a comparative data base to SDi-161 for a variety of reasons:

1. They are located within a 10-km radius.
2. They are in similar environments.
3. They are both located on ethnographically recorded communication trails.
4. They contain an adequate sample for quantitative analysis.
5. They exhibit a late prehistoric assemblage compatible temporally with SDi-161.

It is assumed that (1) sites located along communication routes should contain exotic resources as a product of the cultural formation process (see Schiffer 1976), and (2) any given site should exhibit a high correlation of the frequency of a given exotic material with other sites in similar natural and cultural environments.

It should be mentioned here that the most adequate test of these assumptions should include a site or sites that are not located along communication routes. This is nearly an impossibility for two reasons. The first is simply the lack of data. No sites conforming to that criteria have been investigated. Secondly, significantly large sites rarely exist distant from communication corridors (see Hodder and Orton 1976). The cultural mass of complex sites is such that regular travel to these points is frequent. In regions where no analogical background is available, communication routes have been formulated based on exotic material mass using gravity and least cost models (Ericson 1977a; Haggett 1965; Irwin-Williams 1977).

This may be useful in the Far Southwest, particularly in northern San Diego County, where few routes have been recorded; however, testing models against existing analogic data first is probably a more robust approach.

Quantitative analysis. The data for all the statistical tests were entered on to disc on an Apple II microprocessor. Pennsylvania State University's "canned" Minitab II package was used through central timesharing on the VAX large frame computer system at San Diego State University. A TI-55-II programmable calculator assisted in the computations.

Research proposition 1. Based on the above assumptions--If Carrizo Gorge is part of the Xakwinimis Trail, frequencies of exotic material at SDi-161 should be equal to or greater than frequencies of exotic material at sites in similar cultural and natural environments along other trails, such as BW-9 and SDi-2537.

Statistical hypotheses. The null hypothesis can be stated:

H_o: Exotic material frequencies at SDi-161 will be less than those at BW-9 and SDi-2537.

H_o: SDi-161 < BW-9.

SDi-161 < SDi-2537.

The alternate hypothesis is:

H_1: Exotic material frequencies at SDi-161 will be greater than or equal to BW-9 and SDi-2537.

H_1: SDi-161 $\geq$ BW-9.

SDi-161 $\geq$ SDi-2537.

Statistical Model

To test the above-stated paired hypotheses, a correlation matrix, based on the Pearson product-moment correlation coefficient, was applied to relative lithic material frequencies at SDi-161, BW-9, and SDi-2537 (Table 7-1 and 7-2).

Pearson's product-moment correlation coefficient is used to denote the strength of the linear relationship between the

TABLE 7-1

Lithic Debitage Material Frequencies for Three Sites in the Carrizo Gorge Area

	Site		
	SDi-161	SDi-2537	BW-9
Quartz	.43	.57	.30
Porphyritic volcanics	.43	.30	.25
Silicates (pooled)	.10	.10	.20
Obsidian	.02	.02	.05
Quartzite	.01	.01	.18
Other	.01	0	.02

TABLE 7-2

Correlation Matrix Based on Data in Table 7-1

	SDi-161	SDi-2537	BW-9
SDi-161	1.0000		
SDi-2537	.9267	1.0000	
BW-9	.8121	.8120	1.0000

exotic material in the given sites. A maximum of *r* = +1.00 would indicate a perfect statistical similarity between any two given site's exotic commodities. A relationship of *r* = 0.0 would mean that no statistical relationship existed between the exotic material in the sites. Local quartz, porphyritic volcanics, and quartzite were included to "smooth" the relationship between the sites by increasing the *n*.

The correlation coefficient is simply the slope constant b multiplied by the ratio of the sample standard deviations of X and Y:

$$r = b_{y.x}\frac{Sx}{Sy} \quad . \qquad (4)$$

Since there was a discrepancy between investigator silicate category classification, all silicates except quartz were pooled. This was deemed justified since most of the material is derived from the Coyote Mountain Pliocene terrace source (see Chapter IV).

Region of rejection. For this statistical test, a .05 level of significance will be accepted for defining the region of rejection. The .05 level is a standard level of statistical significance used in the social sciences (Mueller et al. 1977; Thomas 1976). The significance of *r* (Pearson product-moment correlation coefficient) is derived from the significance probability table, based on the *t* statistic (Thomas 1976:392).

Since hypothesis 1 suggests the presence of a positive relationship between the sites evaluated, then it is considered a one-tailed test and the critical value of .05 must be doubled to .10 on the table (Thomas 1976:392). The test is still considered significant at the .05 level, however.

Referring to Table 7-2, four degrees of freedom (df = 4) is present in the matrix. Applied to the significance table based on the t statistic for a one-tailed test, a 0.7293 is the required level necessary to claim that there is no significant statistical difference between any two sites given. Table 7-2 demonstrates an r of 0.8121 between SDi-161 and BW-9, an r of 0.9267 between SDi-161 and SDi-2537, and an r of 0.8120 between BW-9 and SDi-2537.

Discussion. All the sites tested showed a high correlation based on data in Table 7-1, ranging from r = 0.8120 to r = 0.9267. The null hypothesis that:

H_o: SDi-161 < BW-9

SDi-161 < SDi-2537

can be rejected. The extremely high correlation between the samples indicates a high level of similarity, and at the .05 level the alternate hypothesis:

H_1: SDi-161 $\geq$ BW-9

SDi-161 $\geq$ SDi-2537

can be accepted.

Based on this small sample, there is a probability that SDi-161 and Carrizo Gorge are positioned on a communication corridor. Whether it was a segment of the important Xakwinimis Trail is probably an untestable proposition.

The range of correlation between the sites may be significant. A high level of correlation exists between SDi-161 and SDi-2537 ($\underline{r}$ = 0.9267). What is interesting is the $\underline{r}$ of .81 for BW-9 with both other sites.

Referring to Figure 2-2, the placement of the sites in the trail network may be significant. BW-9 is placed near a juncture of two trails, unlike SDi-161 and SDi-2537. The high frequency of silicates and obsidian relative to local material may be due to this phenomenon or network directionality and symmetry. As explained in Chapter III, directionality may be a positive factor influencing the frequency of exotic material occurring in a given site. Also, BW-9 is a few kilometers closer to the Obsidian Butte source, and by the law of monotonic decrement, may be correlated with the higher frequency of obsidian (.05). The effective distance, due to network symmetry, may also be shorter. Examination of regional network complexity is quantitatively and qualitatively examined in the next section.

Greater Relationships

In 1977, Jonathan Ericson (1977a, 1977b) published his dissertation and a following paper on prehistoric exchange systems in California. The system complexity was based primarily on obsidian sources and movement throughout the state in the late prehistoric period. Ericson characterized the network in the Far Southwest as the "Obsidian Butte Exchange System" (1977a, 1977b). The system was characterized by a radius of 159 km (to the coast), 70% within California, and had a prospective consumer rate of ca. 21,000 persons (Ericson 1977a:200). Based on synagraphic mapping, Ericson (1977a:201-02) describes the network symmetry as asymmetrical and triangular in shape. The highest "apex" of the triangle is shown "pointing" north from Obsidian Butte, and the fall-off toward the coast is computed as monotonically decreasing at a normal rate (Ericson 1977a:Plate 6-1). The synagraphic map was based on an N of two sites and a competing source model (Ericson 1977a).

To test Ericson's proposed network symmetry for the study area, 10 sites were selected in San Diego County that:

1. Were complex enough to probably contain exotic material.

2. Had received a substantial amount of subsurface investigation, or probabilistic surface inventory.

3. Exhibited a late prehistoric assemblage amenable to comparative analysis.

Again the problem of sample size was inherent in the data. Due to the definition of the cultural resource management process, few sites have been tested beyond determination of significance, and even fewer were excavated with exchange-related problems in mind. Taking this into account, the following preliminary analysis of network complexity is presented.

The first analysis will involve obsidian as the measurable variable. Frequencies of obsidian relative to the entire flaked lithic debitage assemblage were computed for ten sites. Table 7-3 exhibits the frequencies and distance from Obsidian Butte for the ten sites. Figure 2-2 defines the location of these sites.

As mentioned in Chapter III, regression analyses are frequently used as a measure of association within an exchange system. According to Renfrew's Law of Monotonic Decrement, sites near the coast should demonstrate lower relative frequencies of obsidian than sites inland, closer to the Obsidian Butte source (Renfrew 1977).

Research Proposition 2

According to the law of monotonic decrement and Ericson's (1977a) analysis of the Obsidian Butte Exchange System, relative frequencies of obsidian in sites in the Far Southwest should demonstrate regular fall-off of obsidian frequency as the distance from the source increases.

Because of the ethnographic data used in this research, and to avoid competing source influence due to linguistic

TABLE 7-3

Relative Obsidian Frequencies and Distance to Obsidian Butte for 10 Sites in San Diego County

Site No.	Obsidian Frequency	Distance From Source
SDi-5017	.02	152 km
SDi-4606	.09	135 km
SDi-5669	.03	130 km
SDi-6738	.008	125 km
W-417	.003	123 km
SDi-8762	.008	120 km
W-2237	0	114 km
SDi-161	.02	73 km
SDi-2537	.02	70 km
BW-9	.05	66 km

affinities, only sites within the ethnographically defined Kumeyaay territory were chosen (see Chapter II).

Based on the above data, the null hypothesis can be stated:

H_o: Obsidian frequencies in late prehistoric sites in San Diego County should not demonstrate a normal monotonic decreasing fall-off as the distance increases from Obsidian Butte.

H_o: Regional Obsidian f $\neq$ monotonic decrement.

The alternate hypothesis states:

H_1: Obsidian frequencies in late prehistoric sites in San Diego County should demonstrate a regular monotonic decreasing fall-off as the distance increases from Obsidian Butte.

H_1: Regional Obsidian f = monotonic decrement.

To test this pair of hypotheses, the data in Table 7-3 were subjected to linear regression using the distance to source as the independent variable (X) and the relative frequency of obsidian at each site as the dependent variable (Y). The principles of linear regression have already been described in Chapter III. The only further explanation offered is the specific formula used for the linear relationship:

$$Y = \alpha + \beta X \qquad (5)$$

where: X = the predictor variable,

Y = the predicted variable,

α = the Y-intercept, and

β = the slope of the line (Thomas 1976).

Since the prediction is for <u>decreasing</u> frequency based on distance, a negative relationship should occur. If X is a perfect predictor for Y, then *r* would equal -1.00. Again, the .05 confidence level is accepted.

Analysis and Discussion

The scattergram and regression for the data is shown in Figure 7-1. The solid line represents an r of -.001, or almost no relationship at all; Y = 0.0250 + (0.000012)X. Within 8 degrees of freedom at the .05 confidence level (.10 using the significance table due to specifying directionality), an r of -0.5494 would be necessary.

In order to test for a possible spurious effect created by the extreme case (SDi-4606), elimination of this case raised the correlation to -0.46 (dashed line, Figure 7-1); Y = 0.4289 + (-0.000233)X. This still is not high enough at the level of significance accepted. With a df of 7, the correlation coefficient would have to be -0.5822.

According to this statistical analysis, the null hypothesis

H_o: Regional Obsidian f $\neq$ monotonic decrement

must be accepted. A linear relationship does not exist between distance to source and relative obsidian frequency in the ten sites tested.

Alternative explanations. According to the quantitative analysis, obsidian in late prehistoric sites in San Diego County does not conform to the law of monotonic decrement. As aptly stated by Renfrew:

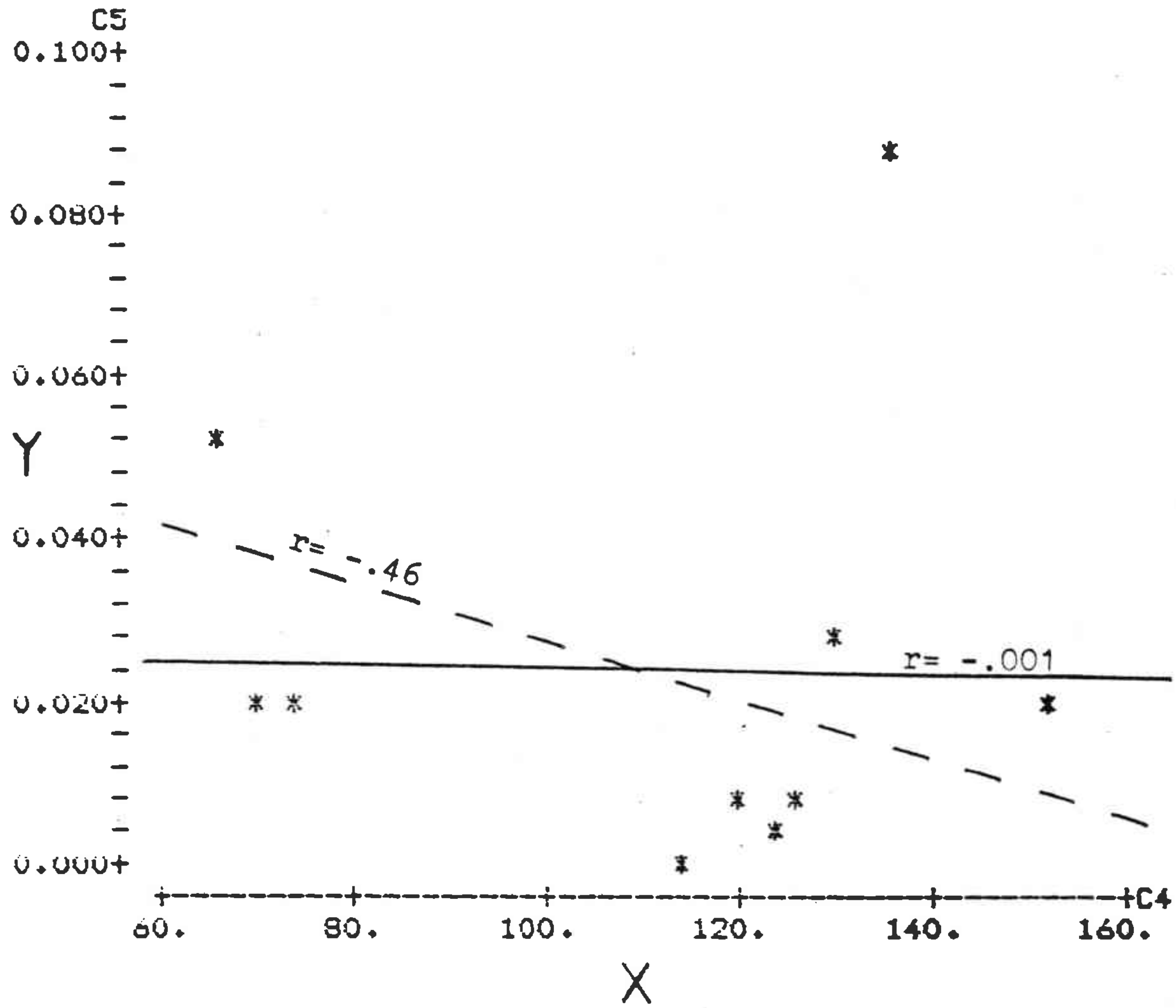

Figure 7-1. Computer plotted scattergram and regression lines of relative obsidian frequencies for 10 sites in San Diego County. Solid line=N of 10 sites; dashed line= minus SDi-4606.

> The generality that there is a fall-off in frequency or abundance with distance from source, shows signs of implying further and more interesting regularities. Moreover departures from it are likely to be of interest and significance [emphasis added]. (Renfrew 1977:72)

Effective distance can be defined as cultural or natural constraints on the exchange network (Plog 1977; Renfrew 1977). These constraints serve to define the network symmetry, directionality, and centralization.

One site that was not included in analysis is SDi-860 on East Mesa in Cuyamaca Rancho State Park. In Chapter II reference was made to the possibility for pooling or centralization in late prehistoric San Diego County. SDi-860 exhibited a frequency of .29 of obsidian projectile points. Obsidian point frequencies are commonly higher within a given assemblage than debitage due to curation and other cultural factors. SDi-2537 (Indian Hill) had .17 obsidian projectile points with .02 debitage. Even with this N of two sites, the law of monotonic decrement appears not to apply. Unfortunately, the flaked lithic debitage frequencies from SDi-860 were not available. However, personal observation on sites in the Cuyamaca and Laguna Mountains suggests a high percentage of obsidian in that region (Shackley 1980). Additionally, little comprehensive excavation has taken place in the region beyond limited testing. Whether pooling and centralization occurred during the fall acorn harvest, must be left to speculation until further analysis is performed.

Synagraphic mapping, similar to Ericson's (1977b) application has been used to assess symmetry and directionality of exchange systems. A SYMAP computer mapping program has been formulated by the Laboratory for Computer Graphics and Spatial Analysis, Harvard University. The program essentially provides a method for interpolating irregularly spaced data values and graphically displaying trend surface analyses.

Originally it was planned to SYMAP the above data, but the small N of sites and time constraints did not allow this analysis. However, an isogram contour map connecting sites of similar frequencies was drawn (Figure 7-2). Without a trend surface analysis the data are, of course, predominately subjective. A larger population may also change the symmetry. However, with the tight cluster of sites exhibiting less than .01 obsidian in the southern part of the county, the southern half of the isograms can be drawn with relative certainty. The northern half is more subject to spurious conclusions at this point.

Subjectivity aside, a strong directional and triangular symmetry appears evident in San Diego County. A tentative continuous isogram was drawn around the Cuyamaca/Laguna area, pending further data.

If the isograms are correct, then much of the obsidian was moving through Sweeney Pass, up the canyons on the north-east scarp of the Lagunas, and down the San Diego River drainage toward the coast. Whether the material was pooled in the mountain areas or not is not discernible with the data at hand.

An interesting point is the correspondence of low obsidian frequency and the lack of recorded major trails in south-central San Diego County. Effective distance influence may be operating in this area of the network.

Figure 7-3 exhibits the clustering of the arbitrarily selected sites within isograms. Contour 1, the most dispersed, could use the most data accumulation. Contour 2 has a larger N, but contains a "gap" of 57 kilometers. Contour 3 is tightly clustered and may be the most sound statistically. The low obsidian frequency may be a result of the fine-grained meta-volcanics located in this region functioning as an effective competing source (see Table 4-1).

This analysis demonstrates the problems of assessing exchange network symmetry and directionality by using a strictly linear analysis. This is also discussed by Hodder and Orton (1976) and Renfrew (1977).

Although not offered as a definitive statistical statement due to a small population, ceramic ware differentiation suggests directionality also. Table 7-4 exhibits an inventory of Buffware/Brownware proportions in six sites. They are listed by proportionate distances from Imperial Valley, from SDi-2537 on the western edge of the valley, west to SDi-5017 on the

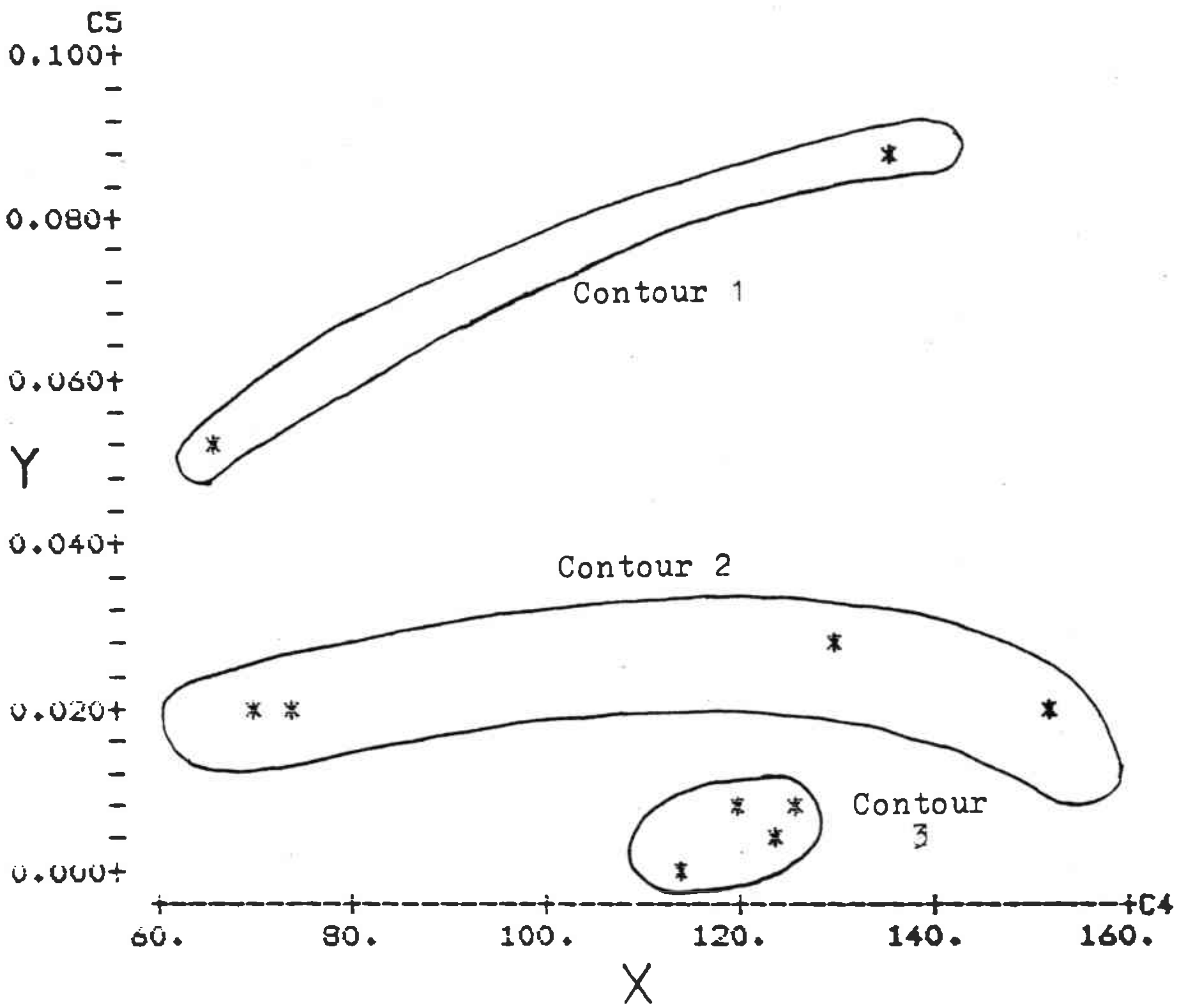

Figure 7-3. Scattergram with site clusters based on isogram contours in Figure 7-2.

TABLE 7-4

Proportionate Ceramic Frequencies from Six Sites in San Diego County

	Site Number[a]					
	2537	161	BW-9	860	7116	5017
Buffware	.07	.19	.14	.02	0	0
Brownware	.93	.81	.86	.98	1.00	1.00

Note. SDi numbers except where noted. See Figure 7-2 for location.

[a]Relative distance from Imperial Valley (increasing left to right).

Pacific Coast. The expected inverse relationship is obvious in Table 7-4, and correspondingly $\underline{r} = -0.60$ for Buffware where $Y = 0.120 + (-.001688)X$, and $\underline{r} = +0.60$ where $Y = 0.879 + (.001688)X$ for Brownware. Buffwares predominate in the eastern (desert) region and Brownwares occur most commonly in the Peninsular Ranges and west to the coast. The high percentage of Brownware overall is presumably a factor of the proximity to the Peninsular Ranges with the population sampled. SDi-161 exhibited a higher frequency of Buffware (.19) than BW-9 (.14) or SDi-2537 (.07). This may be due to deviations based on count rather than weight.

CHAPTER VIII

DISCUSSION AND SUMMARY

One of the greatest problems in spatial analysis is that of inferring process from form. One spatial pattern may be produced by a variety of different spatial processes (Hodder and Orton 1976). The conclusions presented in this thesis test but one set of spatial variables relating to the spatial patterning of the exchange network in the Far Southwest. The task now is to determine the possible range and variety of spatial processes available to produce the patterning of the regional network.

It is inferred that based on the preliminary data available, exchanged material followed a predictable directional pattern. Even within relatively "simple" hunter-gatherer groups, there is such a large number of decisions being made, rarely coincident in time and motivation, that the comprehension of rationality on a wide scale is impossible. There is no way of knowing, for instance, the approximate "value" of obsidian to a late prehistoric Kumeyaay, and the single variable "value" is primarily responsible for the movement of exotic material across space. This is not meant to invalidate the conclusions presented in this thesis. Rather, these considerations are offered to encourage a rigorous approach to spatial analysis and exchange-related distributions in the region.

Social science in general moves toward understanding of human behavior in three main stages: exploration, description, and explanation (Babbie 1979). Most studies have elements of all three, the emphasis on any one or combination of levels is directly dependent on the amount of data available for analysis. For this reason, the research presented here has been primarily exploratory and descriptive, offering only a preliminary explanation of the exchange network complexity, symmetry, and directionality.

Ideally, explanation of the late prehistoric exchange network in the Far Southwest should combine the data from both ethnography/ethnohistory, and archaeology. Ethnographic data help explain why material moved across space, what mechanisms were available to move the material, what the content of the network was historically, and in the case of this region, where the communication routes were. Archaeological explanation may supply data relevant to the quantity of material exchanged (magnitude), a point rarely covered by ethnographers (but see Bean 1972). Archaeological investigation of exchange networks can also be utilized in the definition of the diversity of materials within the network. As discussed in the thesis, obsidian so common in late prehistoric and protohistoric sites, is not mentioned as an exchanged item in the ethnographies. Temporal direction is also amenable to archaeological research. Directionality and symmetry were tested and discussed in the last chapter. These variables are particularly testable archaeologically.

There is a tremendous potential for explanation of the late prehistoric protohistoric exchange network in the Far Southwest, combining the veritable spate of ethnographical data and the growing frequency of archaeological research.

Mechanisms for Exchange

In Chapter II, four main and one subsidiary mechanism were offered to explain the movement of material through the Kumeyaay territory.

Seasonal transhumance. Material moved throughout the interaction area as a result of the seasonal migration movements of lineages environmentally constrained. Pooling resources, such as obsidian and shell, may have occurred in the Peninsular Ranges as a result of lineages from diverse areas aggregating during the fall acorn harvest.

Direct access. Ethnographic data explain the direct access procurement of certain commodities such as agave, hematite, granite, and steatite.

Premediated exchange journeys. At least some Kumeyaay made periodic journeys for the express purpose of exchange. This mechanism is distinct from exchange as a result of seasonal transhumance.

Incidental traders (Kwitxal movement). This form of exchange carries the least amount of substantiation ethnographically, and is inferred as a possibility. Kwitxal were lineage outcasts and itinerant travelers and could have transferred goods incidentally.

Archaeological Explanation

The following is an attempt to explain the exchange network in the Far Southwest as "a series of elements linked by specified exchanges of goods, behavior, and information" (Plog 1977:128).

As discussed in Chapter VII, the late prehistoric obsidian exchange network in the Far Southwest, based on available evidence, is directional and triangular. Apparently the majority of exchanged material moved both directions along the San Diego River Basin, through the Cuyamaca/Laguna area, down through the desert foothill canyons skirting the eastern scarp of the Peninsular Ranges and on into the Imperial Valley and points east.

Ceramics seem to correlate in a pattern reminiscent of May's (1978) "sand dune-mountain canyon" spatial variability. Sedimentary Buffware ceramics were found to be most common near the desert, and residual Brownware ceramics were most common from the Peninsular Ranges west. Although Buffware sherds have been found west of the mountains and Brownwares east, the extremely low frequency observed indicates a low value as an exchanged item. One olla can yield hundreds of sherds.

Ericson's monotonic fall-off predicted for San Diego County obsidian frequencies was not substantiated, although the "apex pointing" north could not be tested due to a lack of data in the northern part of the study area.

Carrizo Gorge was shown to be statistically highly correlated with two other Desert Foothill sites located on protohistoric exchange routes. The possibility of Carrizo Gorge functioning as a portion of the protohistoric Kumeyaay Xakwinimis Trail exists, but is untestable with the present data.

Network Characterization

In Chapter III, characteristics of exchange networks were examined amenable to utilization for generation of exchange system modeling. The following is an examination of these in light of the data discussed in this thesis.

Content of network. As discussed earlier, Tables 2-1 and 4-1 document the materials exchanged based on ethnographical and archaeological evidence. The large range of material includes those "goods, behavior, and information" defined as a network (Plog 1977:128).

Diversity of materials. As an index of homogeneity, the diversity of goods and ideas exchanged is high (see above).

Size of exchange network. The network extended at least from the Sand Hills in Imperial Valley to the Pacific Coast and south into Baja California (see Figures 2-1, 2-2, and 2-3). The network also extended an unknown distance north and east to the Colorado River and points east.

Temporal direction. Based on obsidian and ceramic relative dating, the exchange system extended back at least to 1500 A.D. and perhaps as far as 750 A.D. (see Chapter II).

Directionality of exchange. As discussed earlier, a large portion of the exchanged material moved back and forth along the eastern scarp of the Peninsular Ranges, up through the desert canyons, such as Carrizo Gorge, In-Ko-Pah Gorge, and Bow Willow Canyon, through the Cuyamaca and Laguna Mountains, and down the San Diego River Basin to the coast.

Symmetry of exchange. This has already been discussed and is related to directionality. The system apparently is asymmetrical and triangular (see Figure 7-2).

Network centralization. There is a possibility that some materials, such as obsidian and shell, were taken to the fall acorn harvest areas by eastern and western lineages for the express purpose of exchange. But as yet there is not enough data to support the proposition.

Network complexity. The economic system in the Far Southwest in the late prehistoric period was a complex organization, linking lineages from the Sand Hills to the Pacific Coast in a network of egalitarian reciprocal exchange. Shell and other marine products were traded for obsidian, silicates, subsistence goods, and other material from the interior as far east as the Colorado River and perhaps as far east as the Hohokam area during the early period. Direct procurement was made possible by traveling over trails moving up coastal canyons, mountain passes, desert gorges, and on to the desert floor. The considerable migrational fluidity afforded the descendants of the Kumeyaay was a result of both environmental exploitation patterns and the lack of linguistic and cultural variability over a large geographic area. In short, exotic material moved freely throughout the late prehistoric Far Southwest bound only by time and space, two factors easily negotiable to the late prehistoric Kumeyaay.

Research Programs for Exchange Studies in the Far Southwest

As discussed in the Introduction (Chapter I), the research presented in this thesis is meant to be preliminary to further testing of regional band level economic theory in the Far Southwest. Any research in a region that is "new," can logically best offer a matrix of questions that can be rigorously tested.

The program offered here is in no way presented as the full range of questions available to regional research and spatial analysis in the Far Southwest. Each explanation carries its own set of problems and further questions. The lack of data in a given region, for instance, is not an adequate justification for not investigating regional exchange patterns, for "an 'advantage' of archaeological data is its incomplete nature" (Hodder and Orton 1976:5).

The following research program is generated from the exploration, description, and preliminary explanation of the exchange network in the region under discussion. This program should allow the generation of statistically testable paired hypotheses.

To directly test the explanations offered in this thesis, the accurate characterization and identification of exotic material in an increasing number of sites in the interaction area should be a primary focus of the program. With a larger data base questions can be asked like:

1. Is the symmetry of the network actually "triangular, pointing" toward the coast (see Figure 7-2)?

2. Does the majority of exchanged material move in the direction indicated in this analysis?

A test of symmetry and content would involve the identification of possible competing obsidian sources such as Coso and Arroyo Matomi. X-ray fluorescence and trace element analyses are the most rigorous testing mechanisms.

1. What proportion of the obsidian inventory originates from the competing sources?

2. Does this material move in a different directional pattern?

3. What obsidian source was utilized pre-1500 A.D. when Obsidian Butte was covered by Lake Cahuilla?

An examination of the proportion of ceramic ware categories in sites throughout the region will help determine the movement of ceramics (if there is a substantial amount) through the region. Again chemical characterization may be the necessary test mechanism.

1. Are the particular ware categories temporally and spatially sensitive?

2. Is there a preference for particular clay sources?

Obsidian and, to a lesser degree, ceramic material was spatially examined in this study.

1. Are other materials amenable to exchange-related quantitative analysis?

2. Can shell material be proportionately quantified to ascertain content and directionality within the system?

Given enough data, it may be possible to discern value levels of certain exotica, although this is the most difficult variable to isolate in nonstratified societies (see Winter and Pires-Ferreira (1976) and Pires-Ferreira (1976) for examples from Formative Mesoamerica). No specific questions will be presently generated concerning "value."

With the present attitude of Mexico toward foreign archaeological research, the extent of the exchange network in what is now Baja California remains essentially unknown. Williams' (1973) fine overview of prehistory of the peninsula is virtually the only comprehensive work on the region. Unfortunately, due to the small quantity of Mexican research that has been done in the area, Williams (1973) offers little that is not already available in U.S. publications.

The extent of the network south of the present border is a necessary aspect of system complexity, an aspect that has only slight hope of intensive investigation.

Perhaps most important in a more general theoretical position: What is the characterization of the pooling or centralization in the Cuyamaca and Laguna Mountain area, if indeed it exists at all? Centralized exchange in egalitarian band level groups is rare. The investigation of this proposition has ramifications for anthropological economic theory.

The Far Southwest lends itself well to exchange network analysis. The large body of ethnographic and ethnohistoric data, as well as the growing corpus of archaeological research, presents the prehistorian with a data base quite capable of testing propositions of egalitarian economic theory.

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APPENDICES

APPENDIX A

SDi-161 INVENTORY DATA

**********RECORD NUMBER 1**************

NO. : 1
UNIT : 1
LEVEL : SUR
DESCRIPTIO : 2 PORPH BASALT FLAKES
LENGTH : N/A
WIDTH : N/A
THICKNESS : N/A
WEIGHT : 25.5G
COMMENTS : JACUMBA VOLCANICS SOURCE

**********RECORD NUMBER 2**************

NO. : 2
UNIT : 1
LEVEL : SUR
DESCRIPTIO : RED JASPER PRIMARY FLAKE CORE REDUCTION
LENGTH : N/A
WIDTH : N/A
THICKNESS : N/A
WEIGHT : 0.5G
COMMENTS : COYOTE MTN PLIOCENE TERR ACE SOURCE

**********RECORD NUMBER 3**************

NO. : 3
UNIT : 1
LEVEL : SUR
DESCRIPTIO : 1 PORPH BASALT FLAKE PRI MARY
LENGTH : N/A
WIDTH : N/A
THICKNESS : N/A
WEIGHT : 1.7G
COMMENTS :

**********RECORD NUMBER 4**************

NO. : 80
UNIT : 1
LEVEL : SUR
DESCRIPTIO : FAUNAL REMAINS (UNDIFFER ENTIATED)
LENGTH : N/A
WIDTH : N/A
THICKNESS : N/A
WEIGHT : 1.3G
COMMENTS : SEE FAUNAL RECORD FOR DE TAIL

**********RECORD NUMBER 5**************

NO. : 83
UNIT : 1
LEVEL : SUR
DESCRIPTIO : 1 COLORADO BUFF BODY SHE RD
LENGTH : N/A
WIDTH : N/A
THICKNESS : N/A
WEIGHT : 2.0G
COMMENTS : VALLECITO BUFF VARIATION

**********RECORD NUMBER 6**************

NO. : 97
UNIT : 1
LEVEL : SUR
DESCRIPTIO : 1 COLORADO BUFF BODY SHE RD VAR/CARRIZO
LENGTH : N/A
WIDTH : N/A
THICKNESS : N/A
WEIGHT : 4.5G
COMMENTS : CARRIZO VARIATION

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**********RECORD NUMBER 7************

NO.        : 105
UNIT       : 1
LEVEL      : SUR
DESCRIPTIO : 2 TIZON BROWNWARE BODY S
             HERDS
LENGTH     : N/A
WIDTH      : N/A
THICKNESS  : N/A
WEIGHT     : 14.2G
COMMENTS   :

**********RECORD NUMBER 8************

NO.        : 19
UNIT       : 10
LEVEL      : SUR
DESCRIPTIO : 16 PORPH BASALT FLAKES

LENGTH     : N/A
WIDTH      : N/A
THICKNESS  : N/A
WEIGHT     : 90.1G
COMMENTS   : 3 PRIMARY 13 SECONDARY

**********RECORD NUMBER 9************

NO.        : 20
UNIT       : 10
LEVEL      : SUR
DESCRIPTIO : 22 QUARTZ FLAKES

LENGTH     : N/A
WIDTH      : N/A
THICKNESS  : N/A
WEIGHT     : 12.2G
COMMENTS   :

**********RECORD NUMBER 10************

NO.        : 21
UNIT       : 10
LEVEL      : SUR
DESCRIPTIO : 2 RED-BROWN JASPER FLAKE
             S1PRI 1SEC
LENGTH     : N/A
WIDTH      : N/A
THICKNESS  : N/A
WEIGHT     : 3.2G
COMMENTS   : COYOTE MTN PLIOCENE TERR
             ACE SOURCE

**********RECORD NUMBER 11************

NO.        : 22
UNIT       : 10
LEVEL      : SUR
DESCRIPTIO : 1 PINK CHERT PRIMARY FLA
             KE
LENGTH     : N/A
WIDTH      : N/A
THICKNESS  : N/A
WEIGHT     : 0.5G
COMMENTS   : COYOTE MTN PLIOCENE TERR
             ACE SOURCE

**********RECORD NUMBER 12************

NO.        : 23
UNIT       : 10
LEVEL      : SUR
DESCRIPTIO : 1 OBSIDIAN FLAKE SECONDA
             RY
LENGTH     : N/A
WIDTH      : N/A
THICKNESS  : N/A
WEIGHT     : 0.1G
COMMENTS   : OBSIDIAN BUTTE SOURCE
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**********RECORD NUMBER 13*************

NO.        : 24
UNIT       : 10
LEVEL      : SUR
DESCRIPTIO : 1 CHALCEDONY FLAKE SECON
             DARY
LENGTH     : N/A
WIDTH      : N/A
THICKNESS  : N/A
WEIGHT     : 0.2G
COMMENTS   : COYOTE MTN PLIOCENE TERA
             CE SOURCE

**********RECORD NUMBER 14*************

NO.        : 25
UNIT       : 10
LEVEL      : SUR
DESCRIPTIO : 1 BRN&GRAY CHERT PROJ PO
             INT FRAG
LENGTH     : 15.7MM
WIDTH      : 14MM
THICKNESS  : 2.9MM
WEIGHT     : 0.7G
COMMENTS   : COYOTE MTN PLIOCENE TERR
             ACE SOURCE

**********RECORD NUMBER 15*************

NO.        : 83
UNIT       : 10
LEVEL      : SUR
DESCRIPTIO : FAUNAL REMAINS (UNDIFFER
             NTIATED)
LENGTH     : N/A
WIDTH      : N/A
THICKNESS  : N/A
WEIGHT     : 13.4G
COMMENTS   : SEE FAUNAL RECORD FOR DE
             TAIL

**********RECORD NUMBER 16*************

NO.        : 89
UNIT       : 10
LEVEL      : SUR
DESCRIPTIO : 2 COLORADO BUFF BODY SHE
             RDS
LENGTH     : N/A
WIDTH      : N/A
THICKNESS  : N/A
WEIGHT     : 10.0G
COMMENTS   :

**********RECORD NUMBER 17*************

NO.        : 98
UNIT       : 10
LEVEL      : SUR
DESCRIPTIO : 6 TIZON BROWNWARE SHERDS

LENGTH     : N/A
WIDTH      : N/A
THICKNESS  : N/A
WEIGHT     : 36.8G
COMMENTS   : 2 RIM AND 4 BODY SHERDS

**********RECORD NUMBER 18*************

NO.        : 4
UNIT       : 3
LEVEL      : SUR
DESCRIPTIO : 6 PORPH BASALT FLAKES SE
             CONDARY
LENGTH     : N/A
WIDTH      : N/A
THICKNESS  : N/A
WEIGHT     : 6.5G
COMMENTS   :
```

```
**********RECORD NUMBER 19*************

NO.        : 5
UNIT       : 3
LEVEL      : SUR
DESCRIPTIO : 1 UTILIZED OBSIDIAN FLAK
             E
LENGTH     : 10.5MM
WIDTH      : 7.8MM
THICKNESS  : 1.8MM
WEIGHT     : 0.1G
COMMENTS   : UNIFACIAL RETOUCH  OBSID
             IAN BUTTE SOURCE
```

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**********RECORD NUMBER 20*************

NO.        : 6
UNIT       : 3
LEVEL      : SUR
DESCRIPTIO : 1 RED JASPER FLAKE PRIMA
             RY
LENGTH     : N/A
WIDTH      : N/A
THICKNESS  : N/A
WEIGHT     : 1.3G
COMMENTS   : COYOTE MTN PLIOCENE TERR
             ACE SOURCE
```

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**********RECORD NUMBER 21*************

NO.        : 7
UNIT       : 3
LEVEL      : SUR
DESCRIPTIO : 9 SECONDARY QUARTZ FLAKE
             S
LENGTH     : N/A
WIDTH      : N/A
THICKNESS  : N/A
WEIGHT     : 4.5G
COMMENTS   : 7 MILKY 2 CLEAR
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**********RECORD NUMBER 22*************

NO.        : 78
UNIT       : 3
LEVEL      : SUR
DESCRIPTIO : FAUNAL REMAINS (UNDIFFER
             ENTIATED)
LENGTH     : N/A
WIDTH      : N/A
THICKNESS  : N/A
WEIGHT     : 1.2G
COMMENTS   : SEE FAUNAL RECORD FOR DE
             TAIL
```

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**********RECORD NUMBER 23*************

NO.        : 101
UNIT       : 3
LEVEL      : SUR
DESCRIPTIO : 2 TIZON BROWNWARE BODY S
             HERDS
LENGTH     : N/A
WIDTH      : N/A
THICKNESS  : N/A
WEIGHT     : 1.7G
COMMENTS   :
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```
**********RECORD NUMBER 24*************

NO.        : 15
UNIT       : 4
LEVEL      : SUR
DESCRIPTIO : 6 PORPH BASALT FLAKES

LENGTH.    : N/A
WIDTH      : N/A
THICKNESS  : N/A
WEIGHT     : 39.3G
COMMENTS   :
```

```
**********RECORD NUMBER 25*************

NO.         : 16
UNIT        : 4
LEVEL       : SUR
DESCRIPTIO  : 1 QUARTZITE SECONDARY FL
               AKES
LENGTH      : N/A
WIDTH       : N/A
THICKNESS   : N/A
WEIGHT      : 1.7G
COMMENTS    : COYOTE MTN PLIOCENE TERR
               ACE SOURCE


**********RECORD NUMBER 26*************

NO.         : 17
UNIT        : 4
LEVEL       : SUR
DESCRIPTIO  : 1 CHALCEDONY FLAKE PRIMA
               RY
LENGTH      : N/A
WIDTH       : N/A
THICKNESS   : N/A
WEIGHT      : 0.3G
COMMENTS    : COYOTE MTN PLIOCENE TERR
               ACE SOURCE


**********RECORD NUMBER 27*************

NO.         : 18
UNIT        : 4
LEVEL       : SUR
DESCRIPTIO  : 1 QUARTZ FLAKE

LENGTH      : N/A
WIDTH       : N/A
THICKNESS   : N/A
WEIGHT      : 0.4G
COMMENTS    :


**********RECORD NUMBER 28*************

NO.         : 79
UNIT        : 4
LEVEL       : SUR
DESCRIPTIO  : FAUNAL REMAINS (UNDIFFER
               ENTIATED)
LENGTH      : N/A
WIDTH       : N/A
THICKNESS   : N/A
WEIGHT      : 2.0G
COMMENTS    : SEE FAUNAL RECORD FOR DE
               TAIL


**********RECORD NUMBER 29*************

NO.         : 99
UNIT        : 4
LEVEL       : SUR
DESCRIPTIO  : 2 TIZON BROWNWARE BODY S
               HERDS
LENGTH      : N/A
WIDTH       : N/A
THICKNESS   : N/A
WEIGHT      : 11.9G
COMMENTS    :


**********RECORD NUMBER 30*************

NO.         : 8
UNIT        : 5
LEVEL       : SUR
DESCRIPTIO  : 6 PORPH BASALT FLAKESE

LENGTH      :
WIDTH       : N/A
THICKNESS   : N/A
WEIGHT      : 16.1G
COMMENTS    : 1 PRIMARY 5 SECONDARY
```

```
**********RECORD NUMBER 31************

NO.        : 9
UNIT       : 5
LEVEL      : SUR
DESCRIPTIO : 4 QUARTZ SECONDARY FLAKE
             S
LENGTH     : N/A
WIDTH      : N/A
THICKNESS  : N/A
WEIGHT     : 1.1G
COMMENTS   : 3 MILKY 1 CLEAR
```

```
**********RECORD NUMBER 32************

NO.        : 10
UNIT       : 5
LEVEL      : SUR
DESCRIPTIO : 1 BROWN SILICIFIED WOOD
             FLAKE PRIMARY
LENGTH     : N/A
WIDTH      : N/A
THICKNESS  : N/A
WEIGHT     : 0.2G
COMMENTS   : YUMA BASIN/MT SIGNAL SOU
             RCE
```

```
**********RECORD NUMBER 33************

NO.        : 11
UNIT       : 5
LEVEL      : SUR
DESCRIPTIO : 2 OBSIDIAN FLAKES SECOND
             ARY
LENGTH     : N/A
WIDTH      : N/A
THICKNESS  : N/A
WEIGHT     : 0.5G
COMMENTS   : OBSIDIAN BUTTE SOURCE
```

```
**********RECORD NUMBER 34************

NO.        : 77
UNIT       : 5
LEVEL      : SUR
DESCRIPTIO : FAUNAL REMAINS (UNDIFFER
             ENTIATED)
LENGTH     : N/A
WIDTH      : N/A
THICKNESS  : N/A
WEIGHT     : 0.4G
COMMENTS   : SEE FAUNAL RECORD FOR DE
             TAIL
```

```
**********RECORD NUMBER 35************

NO.        : 100
UNIT       : 5
LEVEL      : SUR
DESCRIPTIO : 4 TIZON BROWNWARE BODY S
             HERDS
LENGTH     : N/A
WIDTH      : N/A
THICKNESS  : N/A
WEIGHT     : 7.1G
COMMENTS   :
```

```
**********RECORD NUMBER 36************

NO.        : 26
UNIT       : 6
LEVEL      : SUR
DESCRIPTIO : 6 PORPH BASALT FLAKES

LENGTH     : N/A
WIDTH      : N/A
THICKNESS  : N/A
WEIGHT     : 10.9G
COMMENTS   :
```

```
**********RECORD NUMBER 37************

NO.        : 27
UNIT       : 6
LEVEL      : SUR
DESCRIPTIO : 1 GRAY QUARTZITE GROUNDS
              TONE FRAG (MANO)
LENGTH     : 5.92CM
WIDTH      : 4.19CM
THICKNESS  : 3.55CM
WEIGHT     : 82.5G
COMMENTS   : SEE SPECIFIC ARTIFACT CA
              RD FOR DETAILS
```

```
**********RECORD NUMBER 38************

NO.        : 28
UNIT       : 6
LEVEL      : SUR
DESCRIPTIO : 10 QUARTZ FLAKES MILKY

LENGTH     : N/A
WIDTH      : N/A
THICKNESS  : N/A
WEIGHT     : 7.7G
COMMENTS   :
```

```
**********RECORD NUMBER 39************

NO.        : 29
UNIT       : 6
LEVEL      : SUR
DESCRIPTIO : 1 BROWN JASPER FLAKE SEC
              ONDARY
LENGTH     : N/A
WIDTH      : N/A
THICKNESS  : N/A
WEIGHT     : 0.4G
COMMENTS   : COYOTE MTN PLIOCENE TERR
```

```
**********RECORD NUMBER 40************

NO.        : 30
UNIT       : 6
LEVEL      : SUR
DESCRIPTIO : 3 CHALCEDONY FLAKES 1 PR
              IM 2 SECONDARY
LENGTH     : N/A
WIDTH      : N/A
THICKNESS  : N/A
WEIGHT     : 0.5G
COMMENTS   :
```

```
**********RECORD NUMBER 41************

NO.        : 81
UNIT       : 6
LEVEL      : SUR
DESCRIPTIO : FAUNAL REMAINS (UNDIFFER
              ENTIATED)
LENGTH     : N/A
WIDTH      : N/A
THICKNESS  : N/A
WEIGHT     : 5.8G
COMMENTS   : SEE FAUNAL RECORD FOR DE
              TAIL
```

```
**********RECORD NUMBER 42************

NO.        : 96
UNIT       : 6
LEVEL      : SUR
DESCRIPTIO : 1 TUMCO BUFF BODY SHERD

LENGTH     : N/A
WIDTH      : N/A
THICKNESS  : N/A
WEIGHT     : 0.8G
COMMENTS   :
```

```
***********RECORD NUMBER 43*************

NO.        : 104
UNIT       : 6
LEVEL      : SUR
DESCRIPTIO : 3 TIZON BROWNWARE BODY S
             HERDS
LENGTH     : N/A
WIDTH      : N/A
THICKNESS  : N/A
WEIGHT     : 4.8G
COMMENTS   :

***********RECORD NUMBER 44*************

NO.        : 12
UNIT       : 7
LEVEL      : SUR
DESCRIPTIO : 10 PORPH BASALT FLAKES

LENGTH     : N/A
WIDTH      : N/A
THICKNESS  : N/A
WEIGHT     : 38.2G
COMMENTS   : JACUMBA VOLCANICS SOURCE

***********RECORD NUMBER 45*************

NO.        : 13
UNIT       : 7
LEVEL      : SUR
DESCRIPTIO : 1 GRAY CHERT FLAKE PRIMA
             RY
LENGTH     : N/A
WIDTH      : N/A
THICKNESS  : N/A
WEIGHT     : 0.7G
COMMENTS   : COYOTE MTN PIOCENE TERRA
             CE SOURCE

***********RECORD NUMBER 46*************

NO.        : 14
UNIT       : 7
LEVEL      : SUR
DESCRIPTIO : 2 MILKY QUARTZ SECONDARY
             FLAKES
LENGTH     : N/A
WIDTH      : N/A
THICKNESS  : N/A
WEIGHT     : 0.4G
COMMENTS   :

***********RECORD NUMBER 47*************

NO.        : 82
UNIT       : 7
LEVEL      : SUR
DESCRIPTIO : FAUNAL REMAINS (UNDIFFER
             ENTIATED)
LENGTH     : N/A
WIDTH      : N/A
THICKNESS  : N/A
WEIGHT     : 1.8G
COMMENTS   : SEE FAUNAL RECORD FOR DE
             TAIL

***********RECORD NUMBER 48*************

NO.        : 46
UNIT       : 8
LEVEL      : SUR
DESCRIPTIO : 41 PORPH BASALT FLAKES

LENGTH     : N/A
WIDTH      : N/A
THICKNESS  : N/A
WEIGHT     : 107.2G
COMMENTS   : 7 PRIMARY 34 SECONDARY
```

```
***********RECORD NUMBER 49*************

NO.         : 47
UNIT        : 8
LEVEL       : SUR
DESCRIPTIO  : 41 QUARTZ FLAKES

LENGTH      : N/A
WIDTH       : N/A
THICKNESS   : N/A
WEIGHT      : 27.9G
COMMENTS    : 32 MILKY 9 CLEAR
```

```
***********RECORD NUMBER 50*************

NO.         : 48
UNIT        : 8
LEVEL       : SUR
DESCRIPTIO  : 1 PINK CHERT FLAKE SECON
                DARY
LENGTH      : N/A
WIDTH       : N/A
THICKNESS   : N/A
WEIGHT      : 0.2G
COMMENTS    : COYOTE MTN PLIOCENE TERR
                ACE SOURCE
```

```
***********RECORD NUMBER 51*************

NO.         : 49
UNIT        : 8
LEVEL       : SUR
DESCRIPTIO  : 2 RHYOLITE FLAKES 1 PRIM
                ARY 1 SECONDARY
LENGTH      : N/A
WIDTH       : N/A
THICKNESS   : N/A
WEIGHT      : 1.9G
COMMENTS    : SOURCE UNKNOWN
```

```
***********RECORD NUMBER 52*************

NO.         : 50
UNIT        : 8
LEVEL       : SUR
DESCRIPTIO  : 1 AGATE FLAKE SECONDARY

LENGTH      : N/A
WIDTH       : N/A
THICKNESS   : N/A
WEIGHT      : 1.2G
COMMENTS    : COYOTE MTN PLIOCENE TERR
                ACE SOURCE
```

```
***********RECORD NUMBER 53*************

NO.         : 51
UNIT        : 8
LEVEL       : SUR
DESCRIPTIO  : 2 CHALCEDONY SECONDARY F
                LAKES
LENGTH      : N/A
WIDTH       : N/A
THICKNESS   : N/A
WEIGHT      : 0.5G
COMMENTS    : COYOTE MTN PLIOCENE TERR
                ACE SOURCE
```

```
***********RECORD NUMBER 54*************

NO.         : 52
UNIT        : 8
LEVEL       : SUR
DESCRIPTIO  : 1 OBSIDIAN SECONDARY FLA
                KE
LENGTH      : N/A
WIDTH       : N/A
THICKNESS   : N/A
WEIGHT      : 0.2G
COMMENTS    : OBSIDIAN BUTTE SOURCE
```

**********RECORD NUMBER 55************

NO. : 53
UNIT : 8
LEVEL : SUR
DESCRIPTIO : 1 SILICIFIED WOOD FLAKE SECONDARY
LENGTH : N/A
WIDTH : N/A
THICKNESS : N/A
WEIGHT : 0.4G
COMMENTS : YUHA BASIN/MT SIGNAL SOURCE

**********RECORD NUMBER 56************

NO. : 54
UNIT : 8
LEVEL : SUR
DESCRIPTIO : 1 JASPER FLAKE SECONDARY
LENGTH : N/A
WIDTH : N/A
THICKNESS : N/A
WEIGHT : 0.4G
COMMENTS : COYOTE MTN PLIOCENE TERRACE SOURCE

**********RECORD NUMBER 57************

NO. : 55
UNIT : 8
LEVEL : SUR
DESCRIPTIO : 1 QUARTZ CONCAVE-BASED P
LENGTH : 13.2MM
WIDTH : 16.0MM
THICKNESS : 3.0MM
WEIGHT : 0.8G
COMMENTS :

**********RECORD NUMBER 58************

NO. : 56
UNIT : 8
LEVEL : SUR
DESCRIPTIO : 1 AGATE STRAIGHT BASED SIDE NOTCH POINT
LENGTH : 12.7MM
WIDTH : 10.6MM
THICKNESS : 2.6MM
WEIGHT : 0.5G
COMMENTS : COYOTE MTN PLIOCENE TERRACE SOURCE

**********RECORD NUMBER 59************

NO. : 76
UNIT : 8
LEVEL : SUR
DESCRIPTIO : FAUNAL REMAINS (UNDIFFERENTIATED)
LENGTH : N/A
WIDTH : N/A
THICKNESS : N/A
WEIGHT : 23.7G
COMMENTS : SEE FAUNAL RECORD FOR DETAIL

**********RECORD NUMBER 60************

NO. : 90
UNIT : 8
LEVEL : SUR
DESCRIPTIO : 2 COLORADO BUFF BODY SHERDS
LENGTH : N/A
WIDTH : N/A
THICKNESS : N/A
WEIGHT : 2.1G
COMMENTS :

**********RECORD NUMBER 61*************

NO.   : 102
UNIT   : 8
LEVEL   : SUR
DESCRIPTIO : 27 TIZON BROWNWARE BODY
              SHERDS
LENGTH   : N/A
WIDTH   : N/A
THICKNESS   : N/A
WEIGHT   : 55.1G
COMMENTS   : 25 BODY AND 2 RIM SHERDS

**********RECORD NUMBER 62*************

NO.   : 31
UNIT   : 9
LEVEL   : SUR
DESCRIPTIO : 60 PORPH BASALT FLAKES

LENGTH   : N/A
WIDTH   : N/A
THICKNESS   : N/A
WEIGHT   : 113.7G
COMMENTS   : 9 PRIMARY 51 SECONDARY

**********RECORD NUMBER 63*************

NO.   : 32
UNIT   : 9
LEVEL   : SUR
DESCRIPTIO : 64 QUARTZ FLAKES

LENGTH   : N/A
WIDTH   : N/A
THICKNESS   : N/A
WEIGHT   : 46.3G
COMMENTS   : 52 MILKY 12 CLEAR

**********RECORD NUMBER 64*************

NO.   : 33
UNIT   : 9
LEVEL   : SUR
DESCRIPTIO : 3 QUARTZITE FLAKES
LENGTH   : N/A
WIDTH   : N/A
THICKNESS   : N/A
WEIGHT   : 4.3G
COMMENTS   : 1 PRIMARY 2 SECONDARY

**********RECORD NUMBER 65*************

NO.   : 34
UNIT   : 9
LEVEL   : SUR
DESCRIPTIO : 1 RED JASPER BLOCK FLAKE
              SECONDARY
LENGTH   : N/A
WIDTH   :
THICKNESS   :
WEIGHT   : 0.5G
COMMENTS   : COYOTE MTN PLIOCENE TERR
              ACE SOURCE

**********RECORD NUMBER 66*************

NO.   : 35
UNIT   : 9
LEVEL   : SUR
DESCRIPTIO : 1 FRACTURED BLACK BASALT
              COBBLE
LENGTH   : N/A
WIDTH   : N/A
THICKNESS   : N/A
WEIGHT   : 4.5G
COMMENTS   : MATERIAL SOURCE UNKNOWN

**********RECORD NUMBER 67************

NO. : 36
UNIT : 9
LEVEL : SUR
DESCRIPTIO : 2 POLYCHROME AGATE FLAKE
S SECONDARY
LENGTH : N/A
WIDTH : N/A
THICKNESS : N/A
WEIGHT : 0.6G
COMMENTS : COYOTE MTN PLIOCENE TERR
ACE SOURCE

**********RECORD NUMBER 68************

NO. : 37
UNIT : 9
LEVEL : SUR
DESCRIPTIO : 5 CHERT FLAKES SECONDARY

LENGTH :
WIDTH : N/A
THICKNESS : N/A
WEIGHT : 3.0G
COMMENTS : COYOTE MTN PLIOCENE TERR
ACE SOURCE

**********RECORD NUMBER 69************

NO. : 38
UNIT : 9
LEVEL : SUR
DESCRIPTIO : 6 CHALCEDONY FLAKES 1 PR
IM 5 SECONDARY
LENGTH : N/A
WIDTH : N/A
THICKNESS : N/A
WEIGHT : 0.7G
COMMENTS : COYOTE MTN PLIOCENE TERR
ACE SOURCE

**********RECORD NUMBER 70************

NO. : 39
UNIT : 9
LEVEL : SUR
DESCRIPTIO : 2 SILICIFIED WOOD FLAKES
1 PRIM 1 SECON
LENGTH : N/A
WIDTH : N/A
THICKNESS : N/A
WEIGHT : 2.8G
COMMENTS : YUMA BASIN/MT SIGNAL SOU
RCE

**********RECORD NUMBER 71************

NO. : 40
UNIT : 9
LEVEL : SUR
DESCRIPTIO : 4 OBSIDIAN FLAKES SECOND
ARY
LENGTH : N/A
WIDTH : N/A
THICKNESS : N/A
WEIGHT : 0.5G
COMMENTS : OBSIDIAN BUTTE SOURCE

**********RECORD NUMBER 72************

NO. : 41
UNIT : 9
LEVEL : SUR
DESCRIPTIO : 1 CHALCEDONY BIFACE FRAG

LENGTH : 17.9MM
WIDTH : 7.7MM
THICKNESS : 4.6MM
WEIGHT : 0.5G
COMMENTS : COYOTE MTN PLIOCENE TERR
ACE SOURCE

**********RECORD NUMBER 75************

NO. : 44
UNIT : 9
LEVEL : SUR
DESCRIPTIO : 1 UNIDENT SHELL FRAGMENT

LENGTH : 10.3MM
WIDTH : 6.0MM
THICKNESS : 1.2MM
WEIGHT : 0.2G
COMMENTS :

**********RECORD NUMBER 73************

NO. : 42
UNIT : 9
LEVEL : SUR
DESCRIPTIO : 1 CONCAVE SIDE NOTCH CHE
RT POINT
LENGTH : 8.9MM
WIDTH : 12.9MM
THICKNESS : 2.4MM
WEIGHT : 0.3G
COMMENTS : COYOTE MTN PLIOCENE TERR
ACE SOURCE

**********RECORD NUMBER 74************

NO. : 43
UNIT : 9
LEVEL : SUR
DESCRIPTIO : GRAY-GREEN PORPH VOLCANI
C HAMMERSTONE
LENGTH : 7.76CM
WIDTH : 6.5CM
THICKNESS : 5.23CM
WEIGHT : 393.7G
COMMENTS :

**********RECORD NUMBER 76************

NO. : 45
UNIT : 9
LEVEL : SUR
DESCRIPTIO : 1 FRESHWATER SNAIL SHELL
BEAD LIP PUNCT
LENGTH : 12.8MM
WIDTH : 6.6MM
THICKNESS : N/A
WEIGHT : 0.1G
COMMENTS :

**********RECORD NUMBER 77************

NO. : 75
UNIT : 9
LEVEL : SUR
DESCRIPTIO : FAUNAL REMAINS (UNDIFFER
ENTIATED)
LENGTH : N/A
WIDTH : N/A
THICKNESS : N/A
WEIGHT : 30.05G
COMMENTS : SEE FAUNAL RECORD FOR DE
TAIL

**********RECORD NUMBER 78************

NO. : 91
UNIT : 9
LEVEL : SUR
DESCRIPTIO : 1 SALTON BUFF BODY SHERD

LENGTH : N/A
WIDTH : N/A
THICKNESS : N/A
WEIGHT : 1.8G
COMMENTS :

```
**********RECORD NUMBER 79*************

NO.        : 92
UNIT       : 9
LEVEL      : SUR
DESCRIPTIO : 1 COLO. BUFF BODY SHERD
               W/WHITE SCUMCOAT
LENGTH     : N/A
WIDTH      : N/A
THICKNESS  : N/A
WEIGHT     : 0.7G
COMMENTS   :
```

```
**********RECORD NUMBER 80*************

NO.        : 93
UNIT       : 9
LEVEL      : SUR
DESCRIPTIO : 2 COLORADO BUFF BODY SHE
               RDS
LENGTH     : N/A
WIDTH      : N/A
THICKNESS  : N/A
WEIGHT     : 2.7G
COMMENTS   :
```

```
**********RECORD NUMBER 81*************

NO.        : 94
UNIT       : 9
LEVEL      : SUR
DESCRIPTIO : 4 COLORADO BUFF BODY SHE
               RDS VAR/CARRIZO
LENGTH     : N/A
WIDTH      : N/A
THICKNESS  : N/A
WEIGHT     : 3.3G
COMMENTS   : CARRIZO VARIATION
```

```
**********RECORD NUMBER 82*************

NO.        : 95
UNIT       : 9
LEVEL      : SUR
DESCRIPTIO : 3 UNIDENT. BUFF BODY SHE
               RDS
LENGTH     : N/A
WIDTH      : N/A
THICKNESS  : N/A
WEIGHT     : 4.2G
COMMENTS   :
```

```
**********RECORD NUMBER 83*************

NO.        : 103
UNIT       : 9
LEVEL      : SUR
DESCRIPTIO : 32 TIZON BROWNWARE SHERD
               S
LENGTH     : N/A
WIDTH      : N/A
THICKNESS  : N/A
WEIGHT     : 65.8G
COMMENTS   : 30 BODY AND 2 RIM SHERDS
```

```
**********RECORD NUMBER 84*************

NO.        : 89-1
UNIT       : MP1
LEVEL      : SUR
DESCRIPTIO : 1 HALIOTIS SP. PROB H. C
               RACHERODII FRAG
LENGTH     : N/A
WIDTH      : N/A
THICKNESS  : N/A
WEIGHT     : 3.1G
COMMENTS   : PACIFIC COAST HABITAT
```

```
**********RECORD NUMBER 85*************

NO.        : 60
UNIT       : MP10
LEVEL      : SUR
DESCRIPTIO : 1 OBSIDIAN FLAKE SECONDA
             RY
LENGTH     : N/A
WIDTH      : N/A
THICKNESS  : N/A
WEIGHT     : 0.2G
COMMENTS   : OBSIDIAN BUTTE SOURCE
```

```
**********RECORD NUMBER 86*************

NO.        : 61
UNIT       : MP11
LEVEL      : SUR
DESCRIPTIO : 1 OBSIDIAN FLAKE PRIMARY
             W/CORTEX
LENGTH     : N/A
WIDTH      : N/A
THICKNESS  : N/A
WEIGHT     : 0.4G
COMMENTS   : POSS "TEAR" FROM BAJA AR
             ROYO MATOMI SOURCE
```

```
**********RECORD NUMBER 87*************

NO.        : 62
UNIT       : MP14
LEVEL      : SUR
DESCRIPTIO : 1 CHERT STRAIGHT BASED P
             ROJ POINT FRAG
LENGTH     : 14.4MM
WIDTH      : 15.0MM
THICKNESS  : 2.6MM
WEIGHT     : 0.4G
COMMENTS   : COYOTE MTN PLIOCENE TERR
             ACE SOURCE
```

```
**********RECORD NUMBER 88*************

NO.        : 63
UNIT       : MP15
LEVEL      : SUR
DESCRIPTIO : 1 AGATE CONCAVE-BASED PR
             OJ POINT FRAG
LENGTH     : 18.6MM
WIDTH      : 11.0MM
THICKNESS  : 3.0MM
WEIGHT     : 0.6G
COMMENTS   : COYOTE MTN PLIOCENE TERR
             ACE SOURCE
```

```
**********RECORD NUMBER 89*************

NO.        : 68
UNIT       : MP15
LEVEL      : SUR
DESCRIPTIO : 1 OBSIDIAN FLAKE SECONDA
             RY
LENGTH     : N/A
WIDTH      : N/A
THICKNESS  : N/A
WEIGHT     : 0.8G
COMMENTS   : OBSIDIAN BUTTE SOURCE
```

```
**********RECORD NUMBER 90*************

NO.        : 64
UNIT       : MP16
LEVEL      : SUR
DESCRIPTIO : 1 OBSIDIAN FLAKE PRIMARY

LENGTH     : N/A
WIDTH      : N/A
THICKNESS  : N/A
WEIGHT     : 0.5G
COMMENTS   : OBSIDIAN BUTTE SOURCE
```

```
**********RECORD NUMBER 91************

NO.        : 65
UNIT       : MP18
LEVEL      : SUR
DESCRIPTIO : 1 OBSIDIAN BIFACE OR PRO
              J POINT FRAG
LENGTH     : 18.4MM
WIDTH      : 11.6MM
THICKNESS  : 4.3MM
WEIGHT     : 1.0G
COMMENTS   : OBSIDIAN BUTTE SOURCE
```

```
**********RECORD NUMBER 92************

NO.        : 66
UNIT       : MP19
LEVEL      : SUR
DESCRIPTIO : MILKY QUARTZ DRILL TIP

LENGTH     : 22.2MM
WIDTH      : 13.7MM
THICKNESS  : 5.9MM
WEIGHT     : 2.0G
COMMENTS   :
```

```
**********RECORD NUMBER 93************

NO.        : 89-2
UNIT       : MP2
LEVEL      : SUR
DESCRIPTIO : 1 LAEAVICARDIUM ELATUM F
              RAGMENT
LENGTH     : N/A
WIDTH      : N/A
THICKNESS  : N/A
WEIGHT     : 4.5G
COMMENTS   : GULF OF CALIFORNIA HABIT
              AT
```

```
**********RECORD NUMBER 94************

NO.        : 67
UNIT       : MP21
LEVEL      : SUR
DESCRIPTIO : 1 OBSIDIAN FLAKE TOOL PO
              SSIBLE SHAVE
LENGTH     : 22.0MM
WIDTH      : 13.9MM
THICKNESS  : 5.1MM
WEIGHT     : 1.2G
COMMENTS   : OBSIDIAN BUTTE SOURCE
```

```
**********RECORD NUMBER 95************

NO.        : 69
UNIT       : MP23
LEVEL      : SUR
DESCRIPTIO : 1 MILKY QUARTZ T-BASED D
              RILL OF POINT
LENGTH     : 15.5MM
WIDTH      : 12.6MM
THICKNESS  : 4.5MM
WEIGHT     : 0.6G
COMMENTS   :
```

```
**********RECORD NUMBER 96************

NO.        : 70
UNIT       : MP24
LEVEL      : SUR
DESCRIPTIO : 1 OBSIDIAN FLAKE SECONDA
              RY
LENGTH     : N/A
WIDTH      : N/A
THICKNESS  : N/A
WEIGHT     : 0.3G
COMMENTS   : OBSIDIAN BUTTE SOURCE
```

**********RECORD NUMBER 97************

NO. : 71
UNIT : MP28
LEVEL : SUR
DESCRIPTIO : 1 QUARTZ STRAIGHT BASED SINGLE NOTCH POI
LENGTH : 13.4MM
WIDTH : 17.2MM
THICKNESS : 5.3MM
WEIGHT : 1.4G
COMMENTS :

**********RECORD NUMBER 98************

NO. : 84
UNIT : MP29
LEVEL : SUR
DESCRIPTIO : FAUNAL REMAINS (UNDIFFER ENTIATED)
LENGTH : N/A
WIDTH : N/A
THICKNESS : N/A
WEIGHT : 2.0G
COMMENTS : SEE FAUNAL RECORD FOR DE TAIL

**********RECORD NUMBER 99************

NO. : 57
UNIT : MP28
LEVEL : SUR
DESCRIPTIO : 2 FRAGS LAEVICARDIUM ELA TUM (SHELL)
LENGTH : N/A
WIDTH : N/A
THICKNESS : N/A
WEIGHT : 3.6G
COMMENTS : GULF OF CALIFORNIA HABIT

**********RECORD NUMBER 100************

NO. : 58
UNIT : MP28
LEVEL : SUR
DESCRIPTIO : 1 OBSIDIAN SECONDARY FLA KE
LENGTH : N/A
WIDTH : N/A
THICKNESS : N/A
WEIGHT : 0.5G
COMMENTS : OBSIDIAN BUTTE SOURCE

**********RECORD NUMBER 101************

NO. : 85
UNIT : MP30
LEVEL : SUR
DESCRIPTIO : FAUNAL REMAINS (UNDIFFER ENTIATED)
LENGTH : N/A
WIDTH : N/A
THICKNESS : N/A
WEIGHT : 4.2G
COMMENTS : SEE FAUNAL RECORD FOR DE TAIL

**********RECORD NUMBER 102************

NO. : 86
UNIT : MP31
LEVEL : SUR
DESCRIPTIO : FAUNAL REMAINS (UNDIFFER ENTIATED)
LENGTH : N/A
WIDTH : N/A
THICKNESS : N/A
WEIGHT : 6.3G
COMMENTS : SEE FAUNAL RECORD FOR DE TAIL

**********RECORD NUMBER 103************

NO. : 72
UNIT : MP32
LEVEL : SUR
DESCRIPTIO : AGATE BIFACE FRAGMENT
LENGTH : 22.8MM
WIDTH : 16.4MM
THICKNESS : 6.3MM
WEIGHT : 2.0G
COMMENTS : COYOTE MTN PLIOCENE TERR ACE SOURCE

**********RECORD NUMBER 104************

NO. : 87
UNIT : MP33
LEVEL : SUR
DESCRIPTIO : FAUNAL REMAINS (UNDIFFER ENTIATED)
LENGTH : N/A
WIDTH : N/A
THICKNESS : N/A
WEIGHT : 3.0G
COMMENTS : SEE FAUNAL RECORD FOR DE TAIL

**********RECORD NUMBER 105************

NO. : 73
UNIT : MP34
LEVEL : SUR
DESCRIPTIO : 1 OBSIDIAN FLAKE SECONDA RY
LENGTH : N/A
WIDTH : N/A
THICKNESS : N/A
WEIGHT : 0.3G
COMMENTS : OBSIDIAN BUTTE SOURCE

**********RECORD NUMBER 106************

NO. : 74
UNIT : MP36
LEVEL : SUR
DESCRIPTIO : 1 OLIVELLA SP BEAD FRAG BROKEN LONGITUD
LENGTH : 9.5MM
WIDTH : N/A
THICKNESS : N/A
WEIGHT : 0.3G
COMMENTS : GULF OF CA OR PACIFIC CO AST SOURCE

**********RECORD NUMBER 107************

NO. : 59
UNIT : MP5
LEVEL : SUR
DESCRIPTIO : 1 LAEVICARDIUM SP. FRAG (SHELL)
LENGTH : N/A
WIDTH : N/A
THICKNESS : N/A
WEIGHT : 1.0G
COMMENTS : GULF OF CA OR PACIFIC CO AST HABITATS

****

APPENDIX B

FAUNAL INVENTORY: SDi-161

TABLE A

Faunal Inventory: SDi-161

Unit/ Map Point	Total						Burned						Identifiable
	Large Mammal		Small Mammal		Unit Total		Large Mammal		Small Mammal		Unit Total		
	No.	Wt.	No.	Wt.	No.	Wt.	No.	Wt.	No.	Wt.	No.	Wt.	
9	18	18.05g	58	12.0g	76	30.05g	11	8.4g	35	8.4g	46	16.8g	<u>Sylvilagus auduboni</u> 1 L distal mandible frag. 1 L scapula frag. <u>Lepus californicus</u> 1 L distal tibia frag.
8	6	9.2g	47	14.5g	53	23.7g	6	9.2g	41	13.0g	47	22.2g	
2	0												No faunal material recovered
5	0		3	0.4g	3	0.4g			3	0.4g	3	0.4g	
3	0		6	1.2g	6	1.2g			6	1.2g	6	1.2g	Unidentified fish vertabra fragment
4	1	2.0g	0		1	2.0g	1	2.0g			1	2.0g	
1	1	1.3g	0		1	1.3g	1	1.3g			1	1.3g	
6	4	3.7g	8	2.1g	12	5.8g	4	3.7g	4	0.7g	8	4.4g	
7	1	1.5g	1	0.3g	2	1.8g	0		0				
10	4	5.9g	24	7.5g	28	13.4g	4	5.9g	22	6.8g	26	12.7g	2 ungulate metapodial frags: 1 burned 1 unburned
Point 29	1	2.0g	0		1	2.0g	1	2.0g	0		1	2.0g	
Point 30	1	4.2g	0		1	4.2g	1	4.2g	0		1	4.2g	Scapula frag. (glenoid fossa) unidentified large mammal
Point 31	2	6.3g	0		2	6.3g	2	6.3g	0		2	6.3g	1 R illium frag. (burned) <u>Procyon lotor</u>
Point 33	2	3.0g	0		2	3.0g	2	3.0g	0		2	3.0g	
TOTALS	41	57.15g	147	38.0g	188	95.15g	33	46.0g	111	30.5g	144	76.5g	

APPENDIX C

NEW SITES LOCATED DURING FIELD WORK
(RECORD FORMS)

State of California — The Resources Agency
DEPARTMENT OF PARKS AND RECREATION
ARCHEOLOGICAL SITE SURVEY RECORD

SITE No. 8917

1. Previous Site Designation ______ 2. Temporary Field No. CG-4
3. USGS Quad Jacumba 7½' X 15' ___ Year 1959
4. UTM Coordinates 11 575210 3621230
5. Twp. 16s Range 8E ; SE ¼ of SW ¼ of Sec. 31
6. Location 325 degrees 960 meters from VABM Groan (Peak 2732) on east side of Carrizo Creek in large group of boulders
7. Contour 1800 ' 8. Owner & Address Dept. of Parks and Recreation
9. Prehistoric X Ethnographic ___ Historic ___ 10. Site Description A site containing a medium density lithic/ceramic scatter, milling features(slicks and basins) and a rockshelter. No midden apaarent
11. Area 70 x 50 meters, 3500 square meters. 12. Depth of Midden n/a
13. Site Vegetation Acacia, Fouquieria · Surrounding Vegetation Fouquieria, Ferrocactus
14. Location & Proximity of Water Carrizo Creek, on site
15. Site Soil Lt. brown sandy loam Surrounding Soil lt. brown sandy loam & alluvium
16. Previous Excavation none
17. Site Disturbance none
18. Destruction Possibility probably none
19. Features Rockshelter, milling features (8 basins & 13 slicks)
20. Burials n/a
21. Artifacts Ceramics (Tizon & buffware)
22. Faunal Remains none noted
23. Comments
24. Accession No. P-340 25. Sketch Map X by MSS where attached
26. Date Recorded 4.13.81 27. Recorded By M. S. Shackley
28. Photo Roll No. ___ Frame No. ___ Film Type(s) ___ Taken By ___

SITE STATUS:

% Destroyed _____ How __________ Test Excavated ____________________%, if known.

National Register Status: Listed _____ Potential X_____ No Determination ______ Nominated _____Ineligible ______

State Historical Landmark (No.) __________ Point of Historical Interest ________________

SPECIAL ATTRIBUTES (Place an X in only those spaces which pertain to the site)

Midden/Habitation Debris _______ Lithic and/or Ceramic Scatter X______

Bedrock Mortars/Milling Surfaces X____ Petroglyphs/Pictographs _____ Stone Features ________

Burials ________ Caches _______ Hearths/Roasting Pits _______ Housepits _______ Structure Remains ________

Underwater_________ Open Air X_____ Rockshelter X_____ Cave _________ Quarry ________ Trails ______

REMARKS ____

SKETCH LOCATION MAP (Include permanent reference markers, North Arrow, and Scale)

Attached SDi-8917

SKETCH SITE MAP (Same criteria as above)

Attached

State of California — The Resources Agency
DEPARTMENT OF PARKS AND RECREATION
ARCHEOLOGICAL SITE SURVEY RECORD

SITE No. 8918

1. Previous Site Designation ______ 2. Temporary Field No. CG-7
3. USGS Quad Sweeney Pass 7½' X 15' ____ Year 1959
4. UTM Coordinates 11 573920 3624410
5. Twp. 16S Range 7E ; SW ¼ of SE ¼ of Sec. 24
6. Location 01degree 250 meters from Peak 1436 east of Carrizo Creek (35 meters) on elevated bench
7. Contour 1200' 8. Owner & Address Dept. of Parks and Recreation
9. Prehistoric X Ethnographic ____ Historic ____ 10. Site Description Probable temporary camp with light midden, groundstone, milling features, 1 chalcedony projectile point tip
11. Area 24 x 20 meters, 4800 square meters. 12. Depth of Midden unknown
13. Site Vegetation Atriplex, Encelia Surrounding Vegetation Typha, Opuntia
14. Location & Proximity of Water Carrizo Creek, 35 meters
15. Site Soil Dark Brn sandy loam Surrounding Soil lt. brown sandy loam & alluvium
16. Previous Excavation none
17. Site Disturbance erosion from wash on northern edge of site
18. Destruction Possibility flash flooding on northern edge, see above
19. Features Bedrock milling(1 basin and 2 slicks)
20. Burials n/a
21. Artifacts granite metate, chalcedony projectile point tip, granite mano fragment
22. Faunal Remains none noted
23. Comments ______
24. Accession No. P-340 25. Sketch Map X by MSS where attached
26. Date Recorded 4.14.81 27. Recorded By M. S. Shackley, L. Christenson
28. Photo Roll No. ____ Frame No. ____ Film Type(s) ____ Taken By ____

SITE STATUS:

% Destroyed 10+ How erosion Test Excavated ______ %, if known.

National Register Status: Listed ____ Potential X No Determination ____ Nominated ____ Ineligible ____

State Historical Landmark (No.) ____ Point of Historical Interest ____

SPECIAL ATTRIBUTES (Place an X in only those spaces which pertain to the site)

Midden/Habitation Debris X Lithic and/or Ceramic Scatter ____

Bedrock Mortars/Milling Surfaces X Petroglyphs/Pictographs ____ Stone Features ____

Burials ____ Caches ____ Hearths/Roasting Pits ____ Housepits ____ Structure Remains ____

Underwater ____ Open Air X Rockshelter ____ Cave ____ Quarry ____ Trails ____

REMARKS ______

SKETCH LOCATION MAP (Include permanent reference markers, North Arrow, and Scale)

Attached SDi-8918

SKETCH SITE MAP (Same criteria as above)

Attached

State of California — The Resources Agency
DEPARTMENT OF PARKS AND RECREATION
ARCHEOLOGICAL SITE SURVEY RECORD

SITE No. 8919

1. Previous Site Designation none 2. Temporary Field No. CG-1
3. USGS Quad Sweeney Pass 7½' X 15' ___ Year 1959
4. UTM Coordinates 11 573530 3624630
5. Twp. 16S Range 7E ; NE ¼ of SW ¼ of Sec. 24
6. Location On sandy alluvial bench on west side of Carrizo Creek 390 meters and 92 degrees from Peak 1436
7. Contour 1200' 8. Owner & Address Dept. of Parks and Recreation
9. Prehistoric x Ethnographic ___ Historic ___ 10. Site Description A medium size late prehistoric habitation site containing bedrock metates and mortars. Tizon and buff sherds, obsidian and other lithics.
11. Area 85 x 30 meters, 2550 square meters. 12. Depth of Midden unknown
13. Site Vegetation Prosopis, Atriplex, Surrounding Vegetation Fouquieria, Opuntia, Ferocactus
14. Location & Proximity of Water Carrizo Creek, 40 meters east
15. Site Soil Dark Brown sandy loam Surrounding Soil Alluvium (Qal)
16. Previous Excavation none
17. Site Disturbance small stream erosion bisects site
18. Destruction Possibility proximity to pictographs SDi-1262 may invite vandalism
19. Features Bedrock milling (1 mortar, 3 basins & 5 slicks)
20. Burials none noted
21. Artifacts mano fragments, large stone tools, ceramics (Tizon and buff ware), flakes (obsidian, quartz, porphyritic basalt), Haliotis and Laevicardium shell fragments (collected pursuant to Antiquities Permit)
22. Faunal Remains Large and small mammal, species not identified
23. Comments
24. Accession No. P-340 25. Sketch Map X by MSS where attached
26. Date Recorded 4.11.81 27. Recorded By M. S. Shackley, L. Christenson
28. Photo Roll No. ___ Frame No. ___ Film Type(s) ___ Taken By ___

SITE STATUS:

% Destroyed _____ How __________ Test Excavated ______________________%, if known.

National Register Status: Listed _____ Potential __X__ No Determination _____ Nominated _____ Ineligible _____

State Historical Landmark (No.) __________ Point of Historical Interest __________

SPECIAL ATTRIBUTES (Place an X in only those spaces which pertain to the site)

Midden/Habitation Debris __X__ Lithic and/or Ceramic Scatter _______

Bedrock Mortars/Milling Surfaces __X__ Petroglyphs/Pictographs _____, Stone Features _______

Burials ________ Caches _______ Hearths/Roasting Pits _______. Housepits _______. Structure Remains _______.

Underwater ________. Open Air __X__ Rockshelter _______ Cave ________ Quarry _______ Trails _______

REMARKS ____

SKETCH LOCATION MAP (Include permanent reference markers, North Arrow, and Scale)

Attached SDi-8919

SKETCH SITE MAP (Same criteria as above)

Attached

State of California — The Resources Agency
DEPARTMENT OF PARKS AND RECREATION
ARCHEOLOGICAL SITE SURVEY RECORD

SITE No. SDi-9024

1. Previous Site Designation N/A 2. Temporary Field No. CG-2
3. USGS Quad Jacumba 7½' X 15' ____ Year 1959
4. UTM Coordinates 11 574800 3623380
5. Twp. 16S Range 7E ; NW ¼ of SW ¼ of Sec. 30
6. Location On intermittently flooded bench above and east of Carrizo Creek approximately 200 meters, approximately 2600 meters downstream from junction of Goat Canyon and Carrizo Creek. 79° and 950 meters to Peak 2580 in Section 30
7. Contour 1320 ft. 8. Owner & Address Department of Parks and Recreation
9. Prehistoric X Ethnographic ____ Historic ____ 10. Site Description Isolated milling station with associated low density lithic / ceramic scatter
11. Area 10± x 10± meters, 100± square meters. 12. Depth of Midden N/A
13. Site Vegetation Prosopis, Encelia Surrounding Vegetation Fouquieria, Ferrocactus
14. Location & Proximity of Water Carrizo Creek, 20 meters
15. Site Soil Light Brown Sandy Loam Surrounding Soil same
16. Previous Excavation none
17. Site Disturbance Erosional deposition during floods.
18. Destruction Possibility Erosion
19. Features Milling Feature: 3 slicks on one boulder
20. Burials none
21. Artifacts Scattered porphyritic basalt and quartz lithics and Tizon Brown ware sherds.
22. Faunal Remains none noted
23. Comments Slicks - difficult to discern boundaries
24. Accession No. ____ 25. Sketch Map yes by MSS where reverse
26. Date Recorded 13 April 1981 27. Recorded By M. S. Shackley
28. Photo Roll No. -none Frame No. ____ Film Type(s) ____ Taken By ____

SITE STATUS:

% Destroyed unknown How ____________ Test Excavated ______________________________%, if known.

National Register Status: Listed _____ Potential ______ No Determination ______ Nominated ______ Ineligible X

State Historical Landmark (No.) ____________ Point of Historical Interest ____________

SPECIAL ATTRIBUTES (Place an X in only those spaces which pertain to the site)

Midden/Habitation Debris ________ Lithic and/or Caramic Scatter X

Bedrock Mortars/Milling Surfaces X Petroglyphs/Pictographs ______ Stone Features ________

Burials ________ Caches ________ Hearths/Roasting Pits ________ Housepits ________ Structure Remains ________

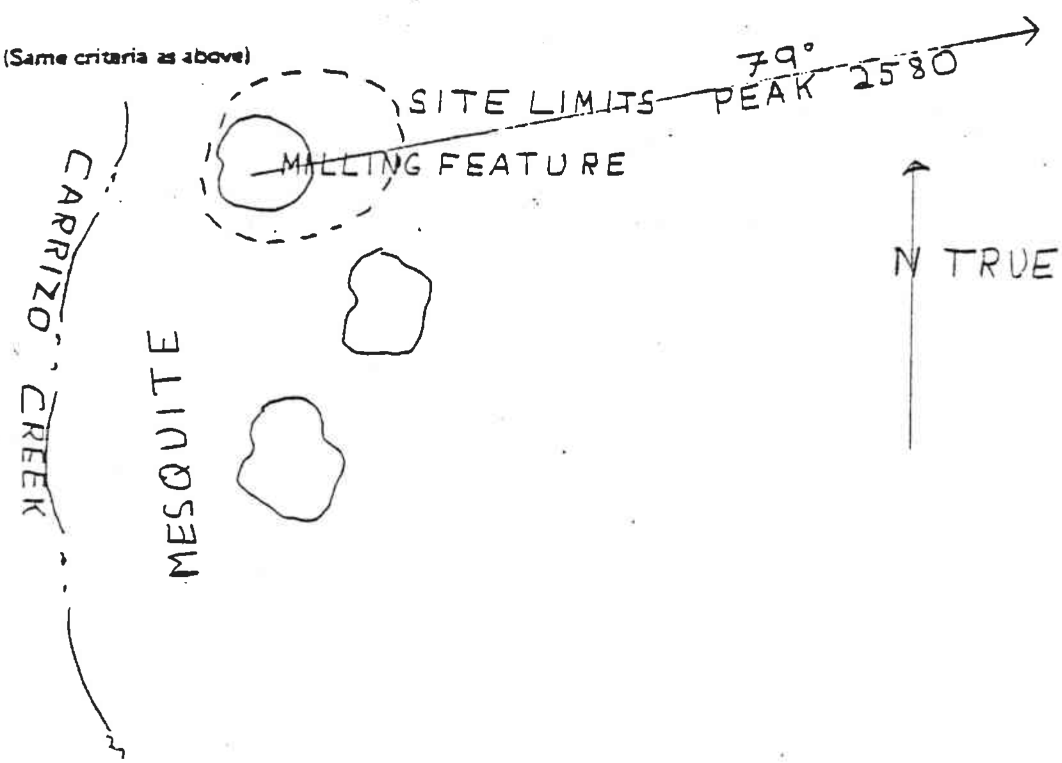
Underwater ________ Open Air ________ Rockshelter ________ Cave ________ Quarry ________ Trails ________

REMARKS ____

SKETCH LOCATION MAP (Include permanent reference markers, North Arrow, and Scale) See Attachment

SDi-9024

SKETCH SITE MAP (Same criteria as above)



State of California — The Resources Agency
DEPARTMENT OF PARKS AND RECREATION
ARCHEOLOGICAL SITE SURVEY RECORD

SITE No. SDi-9025

1. Previous Site Designation N/A
2. Temporary Field No. CG-3
3. USGS Quad Jacumba 7½' X 15' ___ Year 1959
4. UTM Coordinates 11 575600 3622980
5. Twp. 16S Range 8E ; SW ¼ of SE ¼ of Sec 30
6. Location On the west side of Carrizo Creek on an elevated sandy bench approximately 25 meters west of stream bottom approximately 1400 meters downstream from the junction of Goat Canyon and Carrizo Creek. 210° to VABM Groan (Peak 2732) 3000 meters.
7. Contour 1520 ft.
8. Owner & Address Dept. of Parks and Recreation
9. Prehistoric X Ethnographic ___ Historic ___
10. Site Description Milling Station (1 mortar and 1 basin) associated with a light density lithic scatter
11. Area 10± x 5± meters, 50± square meters.
12. Depth of Midden unknown
13. Site Vegetation Prosopis & Encelia Surrounding Vegetation Fouquieria, Ferrocactus
14. Location & Proximity of Water Carrizo Creek, 25 meters
15. Site Soil Light Brown Sandy Loam Surrounding Soil same
16. Previous Excavation none
17. Site Disturbance none
18. Destruction Possibility slight
19. Features Bedrock Milling (1 mortar & 1 slight basin)
20. Burials none
21. Artifacts 1 granite pestle in situ on top of milling boulder; 5+ porphyritic basalt flakes
22. Faunal Remains none noted
23. Comments Ground cover extreme, more cultural material may be present.
24. Accession No. ___
25. Sketch Map yes by MSS where reverse
26. Date Recorded 13 April 1981
27. Recorded By M. S. Shackley
28. Photo Roll No. ___ Frame No. ___ Film Type(s) Fujichrome Taken By MSS

SITE STATUS:

% Destroyed 0 How ______ Test Excavated ______ %, if known.

National Register Status: Listed ______ Potential ______ No Determination ______ Nominated ______ Ineligible X

State Historical Landmark (No.) ______ Point of Historical Interest ______

SPECIAL ATTRIBUTES (Place an X in only those spaces which pertain to the site)

Midden/Habitation Debris ______ Lithic and/or Ceramic Scatter X

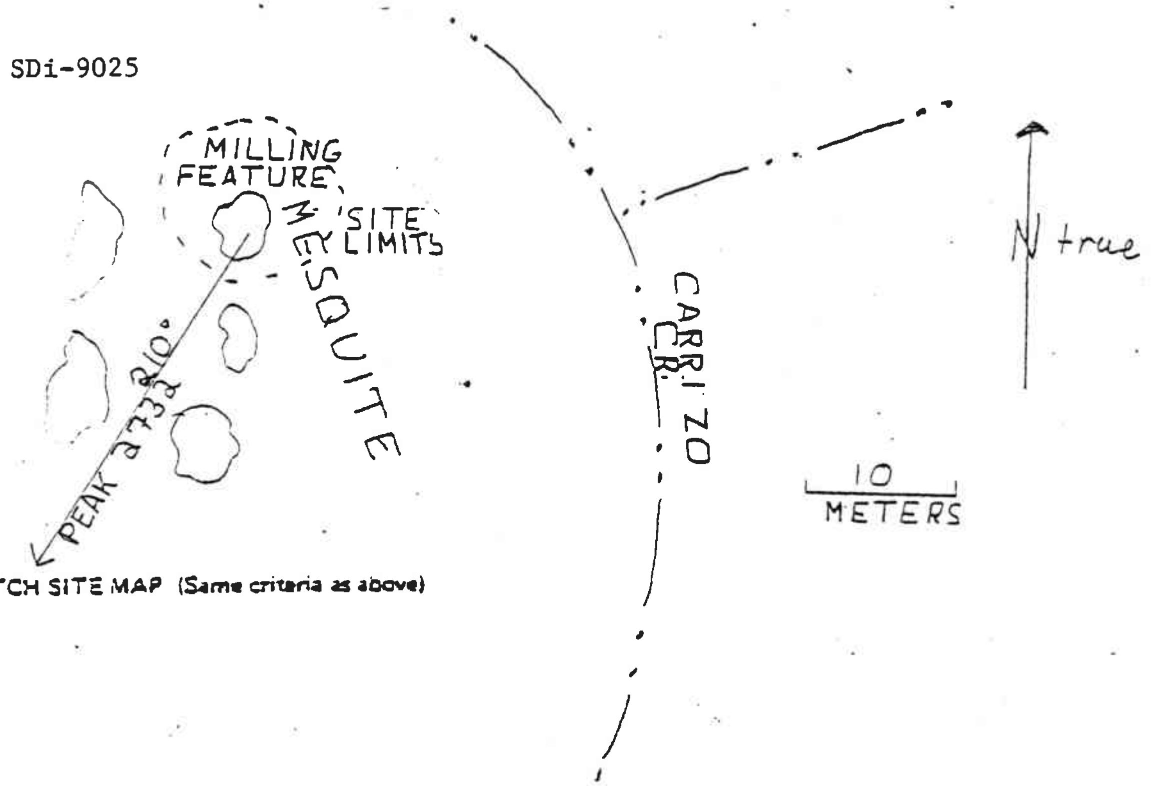
Bedrock Mortars/Milling Surfaces X Petroglyphs/Pictographs ______ Stone Features ______

Burials ______ Caches ______ Hearths/Roasting Pits ______ Housepits ______ Structure Remains ______

Underwater ______ Open Air ______ Rockshelter ______ Cave ______ Quarry ______ Trails ______

REMARKS ______

SKETCH LOCATION MAP (Include permanent reference markers, North Arrow, and Scale) See Attachment



SKETCH SITE MAP (Same criteria as above)

State of California — The Resources Agency
DEPARTMENT OF PARKS AND RECREATION
ARCHEOLOGICAL SITE SURVEY RECORD

SITE No. SDi-9026

1. Previous Site Designation N/A 2. Temporary Field No. CG-5
3. USGS Quad Sweeney Pass 7½' X 15' ____ Year 1959
4. UTM Coordinates 11 574260 3623750
5. Twp. 16S Range 8E ; NE ¼ of NE ¼ of Sec. 25
6. Location On northeast side of Carrizo Creek 10 meters on eroded bench 45° and 425 meters to Peak 2190 in Section 30
7. Contour 1280 ft. 8. Owner & Address Department of Parks and Recreation
9. Prehistoric X Ethnographic ____ Historic ____ 10. Site Description Widely scattered milling site with 10 slicks and 1 possible basin, all highly exfoliated. No associated artifacts.
11. Area 50 x 75 meters, 3750 square meters. 12. Depth of Midden none
13. Site Vegetation Encelia Surrounding Vegetation Prosopis, Ferrocactus
14. Location & Proximity of Water Carrizo Creek, 10 meters
15. Site Soil Sandy Alluvium Surrounding Soil same
16. Previous Excavation none
17. Site Disturbance Erosion
18. Destruction Possibility Erosion
19. Features Series of milling stations (see #9 above)
20. Burials none
21. Artifacts none
22. Faunal Remains none
23. Comments
24. Accession No. ____ 25. Sketch Map no by ____ where ____
26. Date Recorded 13 April 1981 27. Recorded By M. S. Shackley
28. Photo Roll No. none Frame No. ____ Film Type(s) ____ Taken By ____

SITE STATUS:

% Destroyed 0 How ______ Test Excavated ______ %, if known.

National Register Status: Listed ______ Potential ______ No Determination ______ Nominated ______ Ineligible X

State Historical Landmark (No.) ______ Point of Historical Interest ______

SPECIAL ATTRIBUTES (Place an X in only those spaces which pertain to the site)

Midden/Habitation Debris ______ Lithic and/or Ceramic Scatter ______

Bedrock Mortars/Milling Surfaces X Petroglyphs/Pictographs ______ Stone Features ______

Burials ______ Caches ______ Hearths/Roasting Pits ______ Housepits ______ Structure Remains ______

Underwater ______ Open Air ______ Rockshelter ______ Cave ______ Quarry ______ Trails ______

REMARKS ______

SKETCH LOCATION MAP (Include permanent reference markers, North Arrow, and Scale) See Attachment

SDi-9026

SKETCH SITE MAP (Same criteria as above) none

State of California — The Resources Agency
DEPARTMENT OF PARKS AND RECREATION
ARCHEOLOGICAL SITE SURVEY RECORD

SITE No. SDi-9027

1. Previous Site Designation: N/A
2. Temporary Field No.: CG-6
3. USGS Quad: Sweeney Pass 7½' X 15' ____ Year: 1959
4. UTM Coordinates: 11 573720 3623910
5. Twp. 16S Range 7E ; NE ¼ of NW ¼ of Sec. 25
6. Location: west bank of Carrizo Creek on elevated bench approximately 600 meters upstream from SDi-8918, 14° and 780 meters to Peak 1436 in Section 24
7. Contour: 1200 ft.
8. Owner & Address: Department of Parks and Recreation
9. Prehistoric X Ethnographic ____ Historic ____
10. Site Description: Widely scattered milling station, lithic / ceramic scatter. Bedrock milling widely scattered and artifact scatter very low density.
11. Area 75 x 75 meters, 5625 square meters.
12. Depth of Midden: none observed
13. Site Vegetation: Prosopis, Encelia Surrounding Vegetation: Fouquieria, Ferrocactus
14. Location & Proximity of Water: Carrizo Creek, 40 meters
15. Site Soil: Light Brown Sandy Loam Surrounding Soil: same
16. Previous Excavation: none
17. Site Disturbance: none observed
18. Destruction Possibility: slight
19. Features: Milling Features: 37 slicks, 1 rub and 1 basin
20. Burials: none
21. Artifacts: Porphyritic basalt hammer-chopper, Tizon Brown ware, porphyritic basalt and quartz flakes.
22. Faunal Remains: none observed
23. Comments: This site may be temporally and spatially associated with SDi-8919, 1262, and 8919. Probably mesquite gathering camp.
24. Accession No. ____
25. Sketch Map: yes by MSS where reverse
26. Date Recorded: 14 April 1981
27. Recorded By: M. S. Shackley
28. Photo Roll No. ____ Frame No. ____ Film Type(s): Fujichrome Taken By: M. S. Shackley

SITE STATUS:

% Destroyed 0 How ______ Test Excavated ______ %, if known.

National Register Status: Listed ____ Potential X No Determination ____ Nominated ____ Ineligible ____

State Historical Landmark (No.) ______ Point of Historical Interest ______

SPECIAL ATTRIBUTES (Place an X in only those spaces which pertain to the site)

Midden/Habitation Debris ____ Lithic and/or Ceramic Scatter X

Bedrock Mortars/Milling Surfaces X Petroglyphs/Pictographs ____ Stone Features ____

Burials ____ Caches ____ Hearths/Roasting Pits ____ Housepits ____ Structure Remains ____

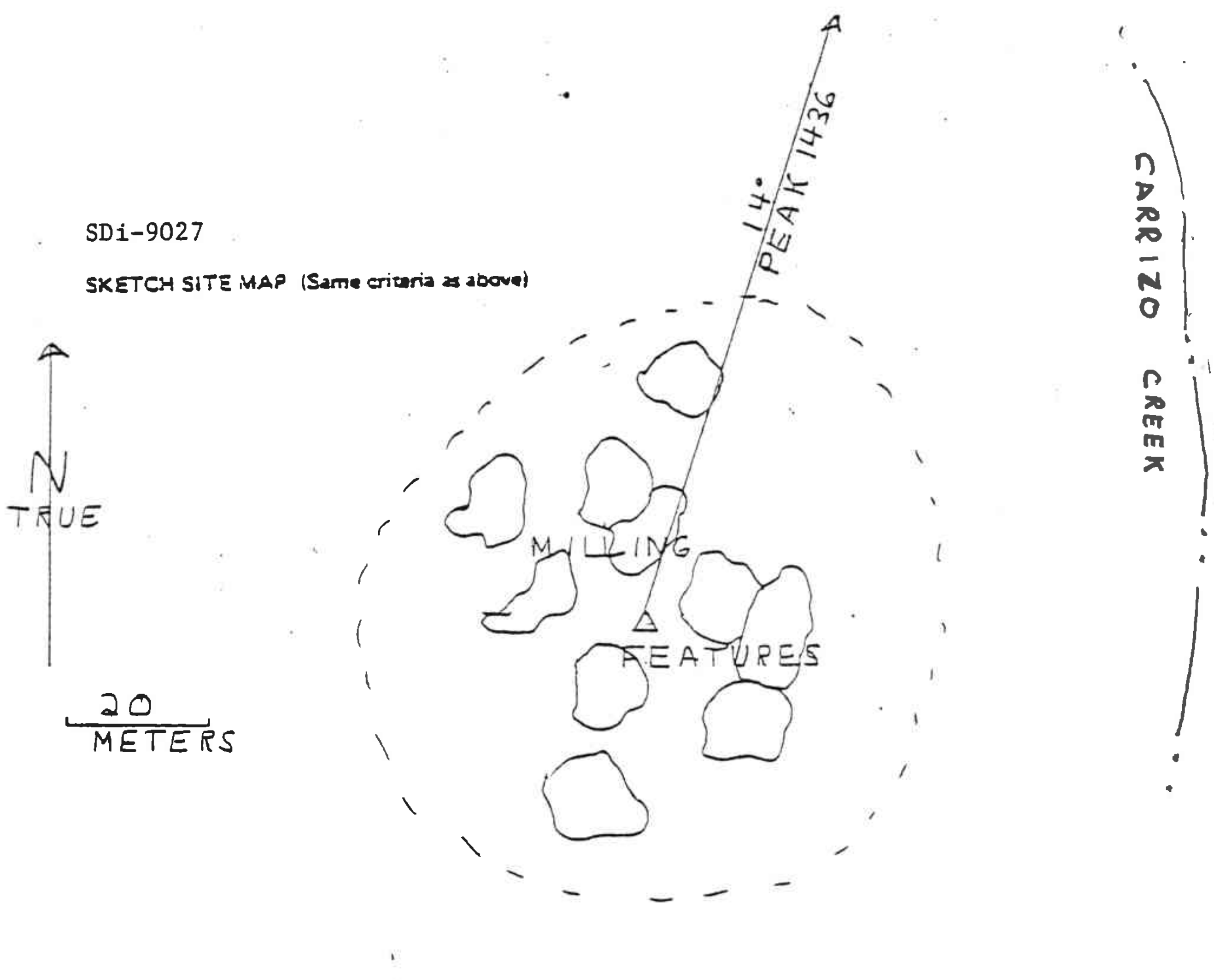
Underwater ____ Open Air ____ Rockshelter ____ Cave ____ Quarry ____ Trails ____

REMARKS No midden observed

SKETCH LOCATION MAP (Include permanent reference markers, North Arrow, and Scale) See Attachment

SDi-9027

SKETCH SITE MAP (Same criteria as above)



ABSTRACT

ABSTRACT

Research and documentation of late prehistoric exchange in the Far Southwest has received very little attention in the archaeological literature. Using a balanced program of ethnographic/ethnohistoric, and archaeological data, a preliminary assessment is made of the exchange network complexity in the region now known as San Diego County, Imperial County, and northern Baja California.

Archaeological research was formulated and instituted for the Carrizo Gorge area of Anza-Borrego Desert State Park for the express purpose of testing the proposition of a late prehistoric communication route descending through the gorge. The probability of Carrizo Gorge being a portion of the communication network was alluded to in the ethnographic literature.

Using current archaeological economic theory applicable to regional prehistoric exchange, data gathered from SDi-161 in Carrizo Gorge is compared with two other sites in similar cultural and natural environments in the local area. A correlation matrix based on Pearson's product-moment correlation coefficient is used to compare the sites. Interpretation of the statistical results suggests that Carrizo Gorge is very likely a portion of a late prehistoric communication network.

Ten sites selected within San Diego County were subjected to a regression analysis using obsidian frequencies within the sites as dependent variables (Y) and distance from the regional Obsidian Butte source as independent variables (X). Interpretation of this preliminary analysis suggests the probability that the exchange system was directional and does not conform to the gravity model of monotonic decrement.

The ethnographic/ethnohistoric data suggest that exchanged material moved throughout the late prehistoric region under discussion by four general mechanisms:

1. Seasonal Transhumance
   A. with possible pooling in the Peninsular Ranges
2. Direct Access
3. Premediated Exchange Journeys
4. Incidental Traders

The network was characterized by: (1) a large diversity of lithic, subsistence, and ideological exchange; (2) directional symmetry focused on the Cuyamaca/Laguna Mountains and the San Diego River System; and consequently (3) a complex network serving to link diverse lineages from the Sand Hills in Imperial Valley to the Pacific Coast, and south into Baja California.

A research program for further investigation of the late prehistoric exchange system in the Far Southwest is presented as part of the discussion.