# Background to Prehistory of the Yuha Desert Region

by
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edited by
Philip J. Wilke

Prepared for the

UNITED STATES DEPARTMENT OF INTERIOR
BUREAU OF LAND MANAGEMENT
California Desert Planning Program
1695 Spruce Street
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## INTRODUCTION

The Yuha inventory area as defined by the Bureau of Land Management (Fig. 1) includes two subareas. To the north it is dominated by San Felipe Creek draining out of the Lower Borrego Valley into the Salton Sink. The broad San Felipe drainage is flanked on the north by the San Felipe Hills, and on the south by the Fish Creek Mountains, the Superstition Hills and Superstition Mountain. The southern portion centers on Yuha Wash and the Yuha Basin, but includes the Coyote Mountains and the southeastern flanks of the Peninsular Range.

The inventory area is almost cut in two by the boundaries of the Naval Reservation surrounding Superstition Mountain. The status of the reservation is presently uncertain and it remains to be determined if it will be treated as part of the inventory area. For the purposes of this report we have included it. However, Raytheon overlays of vegetation and soil were not made, so we have not been able to begin stratification of it for sampling purposes.

The Yuha Basin intaglios and the preliminary dating of Yuha Man have served to focus concern for the archaeological features of this area. But the inventory area also includes more than 80 linear miles of beachline dating from the final high stand of Lake Cahuilla. This final stand is remembered in the legends of the Cahuilla Indians (Wilke and Lawton 1974) and the beachline is marked by the intermittent remains of camps where shellfish, birds and fish were cleaned and cooked, in stark contrast to the barren appearance it projects today. After the final retreat of Lake Cahuilla the presence of marshes and dependable water in the area now known as Harper's Well and surrounded by the great San Felipe mesquite forest must have become an important locale. It was occupied until the 1830s when it was known as San Sebastian.

In compiling the present report, we have found the area to be characterized by little systematic knowledge of either its prehistory or its archaeological inventory. Significant work in the area was undertaken by Malcolm Rogers of the San Diego Museum of Man and Benjamin McCown of the Archaeological Survey Association of Southern California, but each died before completing reports. Current research in the area includes projects by the University of California, Davis, San Diego State University and Imperial Valley College Museum, results of which are largely unreported.

In the Salton Sink area, even more than in other areas of the desert west, the archaeology demands an interdisciplinary approach. No realistic picture of the prehistory will be recovered until the history of the lake and the terrestrial surfaces adjoining it are worked out. Geologic work to date has focused on structure, faults, and more recently, on the area as a zone of subduction related to plate tectonics. The Pleistocene and Holocene geology of the area remains virtually unknown.

We begin with a section treating the environmental history of the area as a backdrop

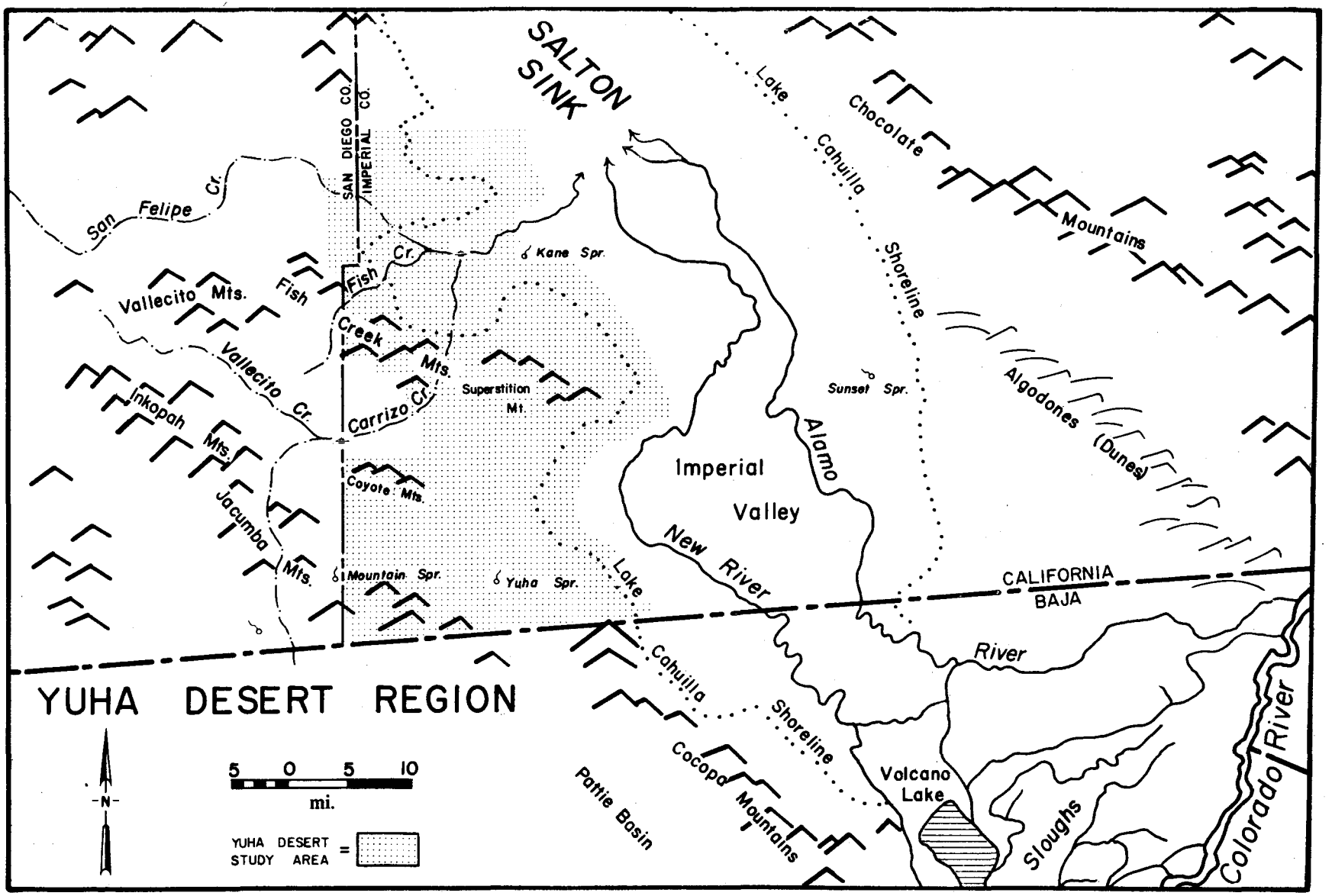


Fig. 1. The Yuha Desert and adjacent regions.

for its history and prehistory, pointing out the questions that need be answered if we are to understand man's interaction with his environment in the Yuha area. We travel back through the ethnographic and ethnohistoric periods, searching for clues to the prehistoric period. We have pieced together the outlines of a prehistoric sequence for the area. We then discuss the future of Yuha archaeology, the threats to it as a resource, its potential for science and for the public. We introduce a model for the subsistence-settlement system of the hunters and collectors living in the area of such a rich but fickle resource as Lake Cahuilla. When fully expanded, this model could comprise an encompassing research design to guide regional archaeological inventory and research. And finally, we discuss the quality of our present knowledge of archaeological site locations in the Yuha inventory area.

# REGIONAL ENVIRONMENTAL HISTORY OF THE YUHA DESERT REGION

David L. Weide

## INTRODUCTION

Three aspects of the regional environmental history of the Yuha Desert are of special interest to archaeologists. These include: (1) ages and evolutionary sequences of the various surfaces in the region such as shorelines, terraces, alluvial fans, and the composite surface of West Mesa; (2) changes in climate during the Holocene including an estimated date for the onset of the modern climate and the hydrologic history of Lake Cahuilla (Blake Sea, Lake LeConte) as it reflects paleoclimatic conditions during the past six or seven thousand years; and (3) the history of regional vegetation with respect to the succession of dominant communities and the influx of exotic species of potential usefulness to man.

This portion of the Yuha Desert report presents a sketch of the regional surficial geology intended as a framework on which to build a subsequent geomorphological chronology. Secondly, paleoclimates and the problems of change versus stability are approached through a model of the paleohydrology of Lake Cahuilla. The results of this study suggest that (1) radical departures from the present hydrologic regime are not required to account for apparent gaps in the archaeological record of lacustrine adaptations on the part of prehistoric occupants, and (2) that during the past six or seven thousand years, climate of the region may have been characterized by present values of precipitation, runoff, and evaporation. Finally, despite a lack of palynological data, some comments may be offered dealing with the significance of local flora for aboriginal populations.

## GEOLOGIC SETTING OF THE YUHA DESERT AREA

The surface geology of the Yuha Desert area is dominated by Quaternary alluvial and lacustrine deposits, isolated outcrops of Pliocene marine and non-marine sediments, and one small exposure of Mesozoic granitic rock. Although detailed geologic mapping in the area remains to be published, a good overall geologic sequence may be obtained from the Salton Sea and El Centro sheets of the Geologic Atlas of California (Jennings 1967; Strand 1962).

### Stratigraphy

Briefly, the area consists of four topographic subdivisions, each characterized by a distinctive stratigraphic sequence. From north to south these include the Superstition Hills, West Mesa, Superstition Mountain, and the Yuha Buttes.

The Superstition Hills are comprised of older alluvium and the dissected remains of alluvial fans that formerly covered broad areas of the southwest margin of the Salton basin. Evidence of at least a relative antiquity of these deposits lies in extensive well-developed desert pavements containing pebbles heavily patinated with desert varnish. These deposits form part of the Brawley Formation and probably represent lacustrine and fluvial

deposition during the late Pleistocene (Dibblee 1954; Tarbet and Holman 1944:1782). The sediments of the Brawley Formation consist of interfingering units of clay, siltstone, and pebble gravel, lacustrine and terrestrial in origin, that represent minor vertical but widespread horizontal transgressive/regressive movement of the Lake Cahuilla shoreline.

West Mesa, a partially dissected, horizontal surface, forms an extensive apron of lacustrine silts interfingering with coarse boulder fanglomerates and alluvial sands and gravels capped by a veneer of Lake Cahuilla deposits including gravel beach ridges, sand fields, and pockets of fine clay. Toward the southwest, the West Mesa surface rises slightly and channels of ephemeral streams have cut deeply into lacustrine and fluvial sediments that are probably correlative with the Borrego Formation as described by Babcock (1974:325). Interfluves between these channels are commonly capped by isolated patches of an apparently older alluvium.

Superstition Mountain and the Yuha Buttes form upland areas lying south and southwest of West Mesa. Superstition Mountain, now extensively eroded, contains a core of Mesozoic granite flanked by terrestrial sediments of probable Pliocene age. The Yuha Buttes contain a core of middle-to-lower Pliocene marine sediments of the Imperial Formation surrounded by extensive deposits of Pliocene non-marine sands and outwash gravels (Durham 1950:23-33). Along the southern margin of the Yuha area Pliocene non-marine sediments are covered by widespread Quaternary non-marine terrace deposits corresponding to the Linda Vista, Bay Point, and Sweitzer Formations (Milow and Ennis 1961:28).

It is important to note at this point that geological and geomorphic mapping of the Yuha Desert area and, in fact, the entire perimeter of the Salton Basin, has not been done in a manner that truly benefits an archaeological understanding of the region's development throughout the Holocene. The confusion arises from the fact that most geologists have been content to combine all unconsolidated deposits under the headings of "Quaternary Alluvium," "Pleistocene Alluvium," or "Quaternary and/or Pleistocene non-marine deposits" without concern for absolute age, sequence of formation, or mode of origin. One of the fundamental requirements in evaluating the archaeological resources of the Yuha Desert area must be to (1) map the region at a scale where genetic differences in unconsolidated materials may be recognized; (2) develop a classification of unconsolidated deposits on the basis of internal structure, composition, and particle morphology that accurately describes their mode of origin; and (3) establish an absolute chronology, preferably on the basis of radiometric dates, not only for the Yuha Desert area, but also for the Salton Basin *and* the entire channel network of the lower Colorado River system. Until this is done, correlation and meaningful age determinations of such deposits as the Borrego and Brawley Formations and their associated terrace, fan, and channel surfaces can, at best, be only speculative.

**Structural and Tectonic Relationships**

The Yuha Desert area, forming the southwestern part of the Salton Sink, is dominated structurally by both right lateral and vertical movement along the margins of the Salton

trough (the landward continuation of the Gulf of California rift). Although the major component of movement has been concentrated on the east side of the Salton Sink (Babcock 1974:321), the geomorphic and depositional environments of the Yuha area do reflect discontinuous movement along the San Andreas fault zone and structurally controlled inputs of sediment from the Colorado River.

In terms of rates of deformation due to faulting during the past seven thousand years, stream channels and paleosurfaces within the Yuha may have suffered up to 154 meters of right lateral displacement based on a rate of recent slip of 2.2 cm. per year (Wyss and Brune 1968:4692). With respect to deposition, the Borrego Formation of the northeastern Salton trough (and its probable southwestern analog in the Yuha area) represents a depositional environment similar to that of the last few hundred years. In general, the stratigraphy of the Borrego Formation (exceeding 1,400 meters in thickness) indicates the entire Salton trough underwent repeated periods of desiccation as shown by thin evaporite beds of considerable lateral extent (Babcock 1974:324). Between periods of desiccation numerous freshwater lakes occupied the basin. These are represented by thick beds of clayey and silty sediment largely derived from the Colorado River (Merriam and Bandy 1965:912). This cycle of inundation-deposition followed by desiccation has continued for a considerable length of time (sufficient, at least, to result in approximately 1,500 meters of sediment) with the last period of deposition ending 450±200 years ago at the close of the last high-stand stage of Lake Cahuilla (Hubbs, *et al.* 1965).

With respect to the age of surfaces it can be shown that surfaces developed on the Brawley and Borrego Formations were intensively warped at the end of late Pleistocene (Wisconsin?) time (Babcock 1974:329). Furthermore, younger, Holocene surfaces developed above the highest Lake Cahuilla shoreline, while not yet deformed, have existed for a time interval sufficient to develop extensive desert pavements and varnish. Since it is questionable whether conditions during the last 2,000 years could promote the formation of desert varnish, and since the varnish itself appears to require two to three thousand years to form (Hunt 1966:90-92), the Holocene surfaces are tentatively estimated to be 5,000 years old.

## HYDROLOGIC HISTORY OF LAKE CAHUILLA AND PALEOCLIMATES

Reconstruction of paleoclimates for anthropological purposes involves as main parameters values of precipitation and evaporation. These climatological factors directly influence the types and distribution of regional vegetation and, indirectly, provide a measure of biomass in terms of plants and animals available to the prehistoric inhabitants of a region. Perhaps the single most effective procedure for reconstructing past climates is palynology, the reconstruction of vegetation communities (and hence climates) through the study of fossil pollen. To date, suitable pollen records for the Yuha Desert area have not been obtained.

In basins of interior drainage that contained lakes, however, another method of

estimating precipitation/evaporation values has been used successfully at various areas throughout the western United States (Snyder and Langbein 1962; Leopold 1951; Weide 1974). Basically the technique involves the hydrologic budget of a closed basin lake in equilibrium with precipitation, runoff, and evaporation. The simple model for this annual water budget is:

$$\Delta V = I_s + I_g + P - E$$

where: $\Delta V$ = annual change in volume of the lake; a factor that may be expressed in terms of surface area.

$I_s$ = inflow from surface channels

$I_g$ = ground water seepage to the lake

$P$ = direct precipitation to the lake

$E$ = evaporation from the lake surface

In the case of Lake Cahuilla, the water budget equation is predicated on the following:

(1) The Salton Basin containing Lake Cahuilla is, in essence, a closed basin without significant loss of water via outflow to the Gulf of California. Although specific data are lacking on the subsurface geology at the south end of the basin, geophysical evidence indicates that a thick section of Tertiary marine and non-marine sediments has been gradually warped upward to form the sill lying at ca. 40 feet above sea level that now closes the basin. Were Lake Cahuilla reconstituted to its maximum depth (and therefore maximum area), evaporation from its surface, as is shown in the following sections, would account for almost all water lost. Runoff to the Gulf of California through outflow channels leading south would have been at best intermittent and of such low velocity, given the present gradient, that meandering and/or braided channels would have developed without significant cutting of the sedimentary barrier at the south end of the basin.

(2) The maximum equilibrium stand of Lake Cahuilla is represented by the ca. 40 foot shoreline. Under annual equilibrium conditions the lake area represented by this perimeter would evaporate in one year a volume of water equal to the inflow plus precipitation direct to the surface.

(3) Essentially all inflow to the basin from surface channels was derived from temporary diversions of the Colorado River as it alternated between channels on its extensive delta, sometimes discharging all of its flow into the Gulf of California, sometimes routing all flow to the Salton Sink, perhaps sometimes splitting some percentage of annual discharge between the two outlets (Sykes 1914:16).

(4) All water loss from the Salton Sink occurred as evaporation from the surface of Lake Cahuilla.

(5) Input to the lake from ground water seepage was negligible prior to the development of irrigation systems (Hely, *et al.* 1966:8).

(6) Precipitation to the surface of the lake averages approximately 6.4 cm. (0.22 ft.) per year (Hely, *et al.* 1966:9; Hely and Peck 1964:Plate 3) and, as a first approximation, may be

assumed to have remained constant throughout the past several centuries if not millenia.

**Surface Area of Lake Cahuilla**

A relatively accurate estimate may be made of the surface area of Lake Cahuilla at its maximum "equilibrium" stage since this highest shoreline is plotted continuously on the 1:250,000 sheets of the Geologic Atlas of California (Imperial, Salton Sea, and Santa Ana sheets) and, for the extension into Mexico, can be determined from contours on the American Geographical Society 1:1,000,000 sheet of northern Baja California. Using a compensating polar planimeter, the maximum area of Lake Cahuilla was computed to be 507,646 hectares (1,256,550 acres). This also represents the area available for evaporation and is considered accurate to within five percent of the actual lake surface.

**Evaporation from the Surface of Lake Cahuilla**

Three recent studies have been done on evaporation from the Salton Sea. A minimum, short-term value of 1.77 m. (5.78 feet) per year is reported by Hely, *et al.* (1966:1) for the period 1961-1962. This value is supported from the open water surface of Salton Sea (as compared with the more common Class A Pan evaporation method). Hughes' study of techniques and subsequent methods of converting pan evaporation to lake surface evaporation not only support Hely's values for the 1961-1962 interval but also earlier reports of evaporation equal to 1.77 m. (5.8 feet) and 1.83 m. (6.0 feet) (LaRue 1916:142; Blaney 1955). In an earlier paper (Hely and Peck 1964:Plate 6), a somewhat higher annual evaporation value of 2.34 m. (6.83 feet) is derived from U.S. Weather Bureau data for the period 1946-1955. In the following evaluation of Lake Cahuilla equilibrium, both values will be considered although both produce essentially the same results when applied to long term studies.

**Surface Discharge to Lake Cahuilla**

Surface discharge to Lake Cahuilla from small tributary drainage basins is considered to be relatively minor when compared with input from the Colorado River during periods when all (or even a small percentage) of its flow was directed to the Salton Sink. Of all marginal streams only Whitewater Wash is fed by a drainage basin large enough to make an appreciable difference in the annual hydrologic budget as dominated by the Colorado. Sediments exposed in the channel of this wash system, however, indicate that high volume discharge was a rare and sporadic event, occurring perhaps once in several centuries. For the purposes of this model it seems safe to assign the entire input to discharge from the Colorado plus direct precipitation.

It can be shown from the geologic record that input from the Colorado was not constant and that brief periods of filling and still-stand were inevitably followed by a rapid fall in stage and, usually, by complete desiccation of the basin. To evaluate the hydrologic cycle as a system, however, it is necessary to estimate what volumes of input were characteristic of

the periods when discharge from the Colorado poured into the closed basin. The first approximation of potential discharge is based on data for the lower Colorado at Yuma, Arizona. The discharge figures presented here represent more or less "normal" flow prior to the advent of even minor irrigation development on the river. The years chosen to represent this type of input to the Salton Sink are 1902-1916. During this interval mean annual discharge was 16.96 million acre feet (Hely 1969:50).

This type of discharge represents only one aspect of postglacial conditions, where precipitation, runoff, and discharge throughout the entire drainage basin of the Colorado were consistent with present values. The other common condition has been when values of precipitation have been considerably lower than "normal" for extended periods of time. This condition of reduced moisture (the Altithermal of Antevs 1954:183) prevailed from ca. 6000 B.C. to ca. 3000 B.C.

Discharge of the Colorado simulating this extended period of low runoff was determined by using the interval 1931-1940 as a model. These nine years were marked by severe drought in the western United States that, in turn, was reflected in sharply reduced discharge in all rivers. During this period, for instance, the flow of the Colorado at Yuma averaged 5.71 million acre feet per year, roughly one third of "normal." It must be noted, however, that by 1931 numerous water diversion systems had been built on the Colorado above Yuma. This requires a correction factor of 1.58 million acre feet to be added to Yuma discharge making a total potential discharge of 7.29 million acre feet, a 57 percent reduction from normal conditions.

We thus have two classes of annual input ($I_s$ of Eq. 1) to consider: 16.96 million acre feet under normal conditions; 7.29 million acre feet under extended drought conditions. It is important to note at this point that since no direct equivalent of "acre foot" exists in the metric system, Eq. 1 demands that input parameters be in English units.

**Equilibrium Conditions of Lake Cahuilla**

Using evaporation model 1 (evaporation = 5.78 ft/yr) equilibrium at the ca. 40 foot shoreline is defined as follows:

(area of lake) (annual evaporation in feet) = annual volume lost as term E in Eq. 1

or

$$(1{,}256{,}550)\ (5.78) = 7{,}262{,}859 \text{ AF} = E$$

and

(area of lake) (annual precipitation in feet) = annual input exclusive of surface runoff or P in Eq. 1

or

$$(1{,}256{,}550)\ (0.22) = 276{,}441 \text{ AF} = P$$

Assuming ground water input and output to be negligible:

$$E - P = 6{,}986{,}418 \text{ AF} = \text{annual water loss}$$

This is the volume that must have been supplied by the Colorado River to maintain Lake Cahuilla at its ca. 40 foot shoreline. Using evaporation model 2 (evaporation = 6.83 ft/yr) the final volume is equated to be 8,305,795 AF/yr. Comparison of these two volumes reveals the following: (1) Under conditions of normal flow (16.96 million AF/yr) Lake Cahuilla would have risen to the highest shoreline and then overflowed if input into a completely desiccated basin were continuous for a period of more than four or five years (assuming that annual evaporation loss equals ten percent of the total basin storage capacity, a conservative estimate in view of the extremely shallow nature of Lake Cahuilla over most of its basin). (2) Under conditions of low flow (7.3 million acre feet per year) a well balanced equilibrium between input and evaporation could have been attained (i.e., 7.3 million AF input vs. 7 to 8 million AF evaporation).

**Reconstruction of Holocene Depositional Environments and Their Relation to Climate vs. Discharge**

The sequence of Colorado River sediments in the late Pleistocene (?) and Holocene (?) upper portion of the Borrego Formation argues for cycles of flooding and evaporation controlled not by climate, but by alternation in the flow regime of the Colorado River. As summarized by Babcock:

> The widespread distribution of the lacsutrine sediments (and) the presence of thin evaporite layers interbedded with clay and silt . . . indicates repeated desiccation of the lacustrine basin during Borrego deposition . . . Desiccation was interspersed with influxes of mostly clayey and silty sediments largely derived from the Colorado River [Babcock 1974:324].

At this point it is interesting to speculate, on the basis of the equilibrium conditions presented above, what might have been the optimum time period for this type of deposition and what this time period would imply in terms of human occupation of the basin. First it must be pointed out that we are faced with two unknowns in terms of *cause* of fluctuation between depositional periods (implying the presence of a lake) and evaporation periods (implying retreat of the lake margins and even total desiccation of the basin). These are (1) the cycle may have resulted from variation in flow of the Colorado River assuming all flow was directed to the basin, *or* (2) the cycle may have resulted from periodic movement of the Colorado between its channel to the Gulf of California and its channel to the Salton Basin. It is important to note that the latter does not require any marked change in Colorado discharge. If the former were the case, an interval from 6,000 to 3,000 B.C. seems to be the optimum period. This is simply because during that time equilibrium between Colorado flow and surface evaporation would have been in delicate balance (i.e., 7 to 8 million AF/yr. input vs. 7 to 8 million AF/yr. evaporation), and the normal annual variation in flow could account for rapid changes in the lake stage. Were the Colorado, however, directed more or less continuously to the basin prior to a period of low flow (i.e., before about 6,000 B.C.), the larger flow volumes (on the order of 17 million AF/yr.) would have caused the lake to remain at a more or less constant level where the elevation of the uppermost shoreline was governed by outflow to the south across the 40 foot sill.

If, on the other hand, condition two is the case and flooding-evaporation cycles are controlled entirely by periodic changes of the Colorado channel, it becomes essentially impossible, given our present level of knowledge, to assign any chronology to the Lake Cahuilla system beyond the fact that the close of the last high stand may be dated at 450±200 years B.P. and that archaeological evidence may indicate a more or less continuous use of lacustrine resources during the interval A.D. 1,000 to 1,400. In any case, it may be noted that neither of these conditions requires radical departures from present values of precipitation or evaporation since the observed behavior of Lake Cahuilla can be explained solely in terms of variation, either spatially or temporally or both.

The picture that emerges then is one in which climatic conditions throughout the Yuha Desert area, and concomitantly the regional biomass, have remained more or less constant during the past six or seven thousand years, the principal variables being the presence or absence and, if present, the periodicity and amount of fluctuation in the level of Lake Cahuilla. Such fluctuation could have been extreme even in periods when all flow was directed to the Salton Sink since recorded values during the measured test interval of low flow (1931-1940) ranged from 3 to 10 million acre feet per year. Fluctuation in volume of this magnitude into a shallow basin has a radical effect on the geographic position (altitude) of the shoreline at any given instant in time. Rapid lateral transgressive/regressive movement of the shoreline, in turn, prohibits the formation of any viable shore-zone vegetation community that is continuous and composed of large numbers of perennial species. This alone would serve to sharply reduce the usefulness of the lake margin to any group of aboriginal occupants during an interval of lake fluctuation. Since archaeological evidence points to more or less continuous occupation of the high shoreline of Lake Cahuilla during the interval 1,000 to 1,300 A.D. the lake stand during this interval may have marked the close of a period of Holocene fluctuation that operated for several thousand years previously. Such a rise in lake level to the maximum possible elevation would have had a severe effect on earlier archaeological material situated below the ca. 40 foot shoreline. First, the encroaching surf zone would have physically disrupted any spatial context of artifact assemblages. Second, sediments deposited during the high stand would have effectively buried what remained beneath a blanket of silt and sand. Finally, as the lake level fell for the last time (ca. A.D. 1,400) the regressing surf zone would have further clouded the archaeological picture through the deposition of recessive beach deposits. In more recent times, during what would have constituted a "normal" low stand or a phase of complete desiccation (from A.D. 1,400 to the time when man controlled the channel of the Colorado) inflow to the basin was generally sufficient only to penetrate to the Salton Sink playa and the lower courses of the Alamo and New Rivers wherein a nucleus of prehistoric agriculturalists became established. At the present time there is reason to think that had control of the Colorado never taken place, subsequent future flooding of the Salton Sink and the periodic return of Lake Cahuilla would occur. Technology has merely introduced a temporary hiatus in the normal course of events.

## RADIOMETRIC DATA ON THE YUHA DESERT AREA

Pleistocene and recent radiometric dates pertaining to the Yuha Desert area may be subdivided into two categories[1]: (1) dates yielding information on one or more high (and old) shorelines of Lake Cahuilla, and (2) a single archaeological site at Split Mountain sand dune.

Dates on the highest shoreline, while only two in number, agree closely and argue for a stand of the lake some 30 meters higher than the last well-developed major stand. A date (LJ-505) on freshwater snail (*Physa* sp.) indicates that at 37,100±2000 B.P. the elevation of the lake surface was 30 m. above the present sill at Volcano Lake, Baja California, and hence 30 m. above any possible extant structural dam separating Lake Cahuilla from the Gulf of California. Stanley (1962) attributes this anomaly to continuing diastrophic development of the basin involving active sinking of the Colorado delta within the southern end of the Salton Trough. A second early date (LJ-959) replicates the former. Derived from a tufa deposit at an elevation of 43.05 m., far above the ca. 40 foot shoreline, this date at 37,400±2000 B.P. also supports rapid tectonic subsidence of the trough.

The second set of $C_{14}$ dates applies to a single archaeological site at the Split Mountain sand dune. The site, on a shoreline at an elevation of 14.5 m., is apparently stratified, with surface deposits of charcoal dated to 420±100 B.P. (LJ-GAP-58), an occupation layer 60 cm. below surface at 470±100 (LJ-GAP-59), and a basal deposit 1.5 m. below surface (LJ-GAP-57) at 720±100 B.P.

A review of published radiocarbon dates for the Salton Basin in general (Appendix 1), and the Yuha area specifically, indicate a correlation between a high stand or series of stands of Lake Cahuilla and a prehistoric reliance on lacustrine food resources. This period of mutual association between man and lake, at least on the basis of $C_{14}$ dates shown in Appendix 1, appears to have existed either continuously or intermittently from ca. 1580 B.P. (A.D. 370) to ca. 270 B.P. (A.D. 1680), a span of 1300 years. It is important to note that the summary $C_{14}$ data are, however, inconclusive for the following reasons: (1) dated samples do not represent any consistent pattern of sampling, being simply the product of a fortuitous find and the interest or funds to secure the date; (2) the questionable accuracy of many of the dates given radical changes in methodology and even basic chronometric theory since dating was begun; (3) the questionable collecting accuracy of many key samples with respect to stratigraphic relationships and inter-strata mixing on the part of the collector; and (4) the overall lack of a regional geomorphic study that governed the collection of data within a consistent structural framework.

In spite of the foregoing problems, the dates taken as a group suggest a lacustrine environment existed in the Salton Basin for approximately 1300 years. It is highly probable, however, that this interval was marked by many rapid fluctuations in lake level; perhaps even two or three periods of total desiccation as the primary water source, the Colorado River, sought various distributary channels between the Salton Basin and the Gulf of

California, and/or as the volume of Colorado River flow fluctuated.

## ARIDITY OF THE YUHA DESERT AS AN INDEX TO BIOTIC RESOURCES

The Yuha Desert is one of the most arid regions of the United States. This hyper-aridity is reflected by a notable lack of vegetation and surface runoff. In order to directly compare Yuha aridity with other regions of the western United States, a precipitation/evaporation ratio was constructed based on mean annual precipitation and mean annual Class A pan evaporation. Data for this ratio are from published graphic data summaries (U.S. Department of Interior 1973:Plate 96). The numerical value of the P/E ratio is less than 1.00 whenever evaporation exceeds precipitation. As aridity increases in severity the ratio approaches zero. A numerical value of 1.00 or greater indicates average annual precipitation equals or exceeds average annual evaporation. The areas chosen for comparison include (1) Death Valley, California, numerically the most arid region of the United States; (2) northeast Arizona/northwest New Mexico, one of the major focal points of north American prehistoric Indian occupation; and (3 and 4) the west-central Great Basin and southeastern Oregon, both typical desert regions occupied more or less continuously by prehistoric hunters and gatherers. The relative degree of aridity (and hence an approximation of the floristic and faunal biomass available) between these localities is shown in Table 1.

It is apparent from these values that the Yuha Desert environment ranks with that of Death Valley in terms of aridity. Furthermore, these conditions have existed for the past several thousand years during which time the single major hydrologic resource of the area, Lake Cahuilla, has exhibited a generally ephemeral nature and, when present, has suffered extreme variation in stage.

## POSTGLACIAL AND RECENT VEGETATION CHANGES IN THE YUHA DESERT AREA

Categorical descriptions of the vegetation native to the Yuha Desert area have been published by MacDougal (1908) and the vegetative history of the past hundred years has been discussed in some detail by Kniffen (1932). Two points of interest to archaeologists are worth restating, however, since they are directly related to the hyper-aridity and hydrologic instability that has affected the area for the past several thousand years. First, essentially all plant communities that show any appreciable amount of density and diversity are now, and have been, restricted to riverine water courses. These riparian communities, dominated by willow, cottonwood, arrowweed, and mesquite, have been widely distributed across the Colorado Delta and southern Salton Sink for at least the last several thousand years. Mesquite, for instance, is known to have been part of the natural Southern California riparian community, and hence available as an aboriginal food resource, for at least the last five to ten thousand years (P. Mehringer, personal communication 1974). The recent rapid spread of mesquite (often reaching infestation proportions) is, on the other hand, primarily due to increased destruction of grass cover through overgrazing during the past 100 years (see Hastings and Turner [1965] for an excellent general description of changes in the

**TABLE 1**

Precipitation/Evaporation Ratio as an Index of Aridity and Available Biomass, Selected Areas of Western U.S.

| REGION | $\overline{X}$ Ann. Evap. (inches) | $\overline{X}$ Ann. Precip. (inches) | Precip. / Evap. |
|---|---|---|---|
| Death Valley, California | 140 | 2.0 | 0.014 |
| Yuha Desert, California | 128 | 2.5 | 0.019 |
| W Central Great Basin | 72 | 8.0 | 0.111 |
| NE Arizona / NW New Mexico | 72 | 12.0 | 0.167 |
| SE Oregon | 58 | 14.0 | 0.244 |

floristic landscape of the American southwestern deserts).

Prior to the recent agricultural and hydrologic development of the Colorado delta, both in Mexico and the United States, riparian shrub and tree vegetation alternated with open grasslands both in time and space. The relative positions of the two communities depended, in large part, upon the immediate hydrologic geography of the Colorado outflow. Recently this pattern has been changed by a gradual reduction of the grassland area. Agricultural development, containment of the Colorado channel, increased upstream withdrawal of water for irrigation, and increasing salinity of the used irrigation water that has been returned to natural outflow channels are probably the dominant causes of this major floristic change. In any case, a regional vegetation dominated by riparian communities has marked the southern margin of the Salton trough for the past several thousand years.

The second major point concerns shoreline vegetation on the fluctuating margins of the lake itself. Several points argue that during much of recent Lake Cahuilla time an impoverished flora dominated by tules occupied the lake shore. First, numerous recessional and processional shorelines coupled with a complexly interstratified shore-lake sedimentary record argue for numerous fluctuations in lake level. Secondly, over most of the perimeter of Lake Cahuilla, surface gradients are extremely shallow; thus even minor changes in the elevation of the surface would displace the immediate shoreline over a considerable horizontal distance. This, in turn, would alternately drown or strand any less mobile form of shore vegetation. Finally, at several localities, the charred remains of tules have been recovered from sedimentary deposits marking the changing shoreline position during the last 700 years (see Appendix 1). In terms of a broad spectrum of plants useful as food resources, one must turn to more or less perennial water sources, predominantly spring-fed streams inland from the lake, and to the major inflow channels that carried some runoff to the Salton Sink during periods when most of the Colorado River discharge was directed to the Gulf of California.

**NOTE**

1. For a complete listing of published dates pertaining to the entire Salton Basin see Appendix 1.

# ETHNOGRAPHIC SKETCH OF THE YUHA DESERT REGION

## INTRODUCTION

In ethnographic times, the Yuha inventory area was located between two well-defined California Indian groups (Kroeber 1925:725). The region of the New and Alamo Rivers (Imperial Valley) to the east of the study area, was occupied at least intermittently by the Kamia, semi-sedentary agricultural Yuman speakers (Gifford 1931:1). The mountains to the west of the study area were occupied by the Southern Diegueño, also semi-sedentary Yuman speakers, but who pursued a hunting and gathering existence (Spier 1923:297). In the ethnographic literature the Yuha Desert is therefore seen as a region of trade and travel but not a primary region of resource exploitation or habitation (Fig. 2). If this is an accurate abstraction, historic and proto-historic archaeological remains should be concentrated around water sources and on the trails which connect these sources with the Kamia and Southern Diegueño settlement areas.

The most complete ethnographic source for the Kamia is E. W. Gifford's *The Kamia of Imperial Valley*, published as Bulletin 97 of the Bureau of American Ethnology. The only general summary of the Southern Diegueño is Leslie Spier's *Southern Diegueño Customs* (Spier 1923). These ethnographic works can be supplemented to some extent by ethnohistoric documents dating from the first half of the nineteenth century (presented elsewhere in this report), and by the following ethnographic papers: Almstedt (1974), Banks (1972), Chace (1967), Davis and Allen (1967), Forbes (1965), Harner (1953), and Shipek (1961).

The data for Spier's ethnography were collected in 1920 from a single informant, while Gifford's data were derived from six informants in 1928-1929. All of these informants were born too late to have participated in their respective ancestral native lifeways. Therefore, an ethnographic reconstruction based on these testimonies is a record of two different cultural situations. On the one hand, the informants were trying to recall what they were told life had been like "in the old days" before white contact, and on the other hand they were describing changes in their culture brought about by white contact. In the first case the ethnographic record for the Yuha is a record of "memory culture," which is an idealized version of how the informant's parents or grandparents had lived. In the second case the record is one of the destruction of native lifeway and the addition of an acculturative veneer. It is often difficult to evaluate certain aspects of the ethnographic record as to whether they are truly native or whether they were derived after white contact.

It has been argued that for archaeological purposes ethnographic information should be used as a theoretical model of a localized social system to be tested against archaeological data (Thomas 1973:157). Therefore, this summary of the ethnographic record for the Yuha Desert is intended to provide a basis for such model testing. In addition, the data presented here will provide insights into the nature of aboriginal land use in the Yuha area.

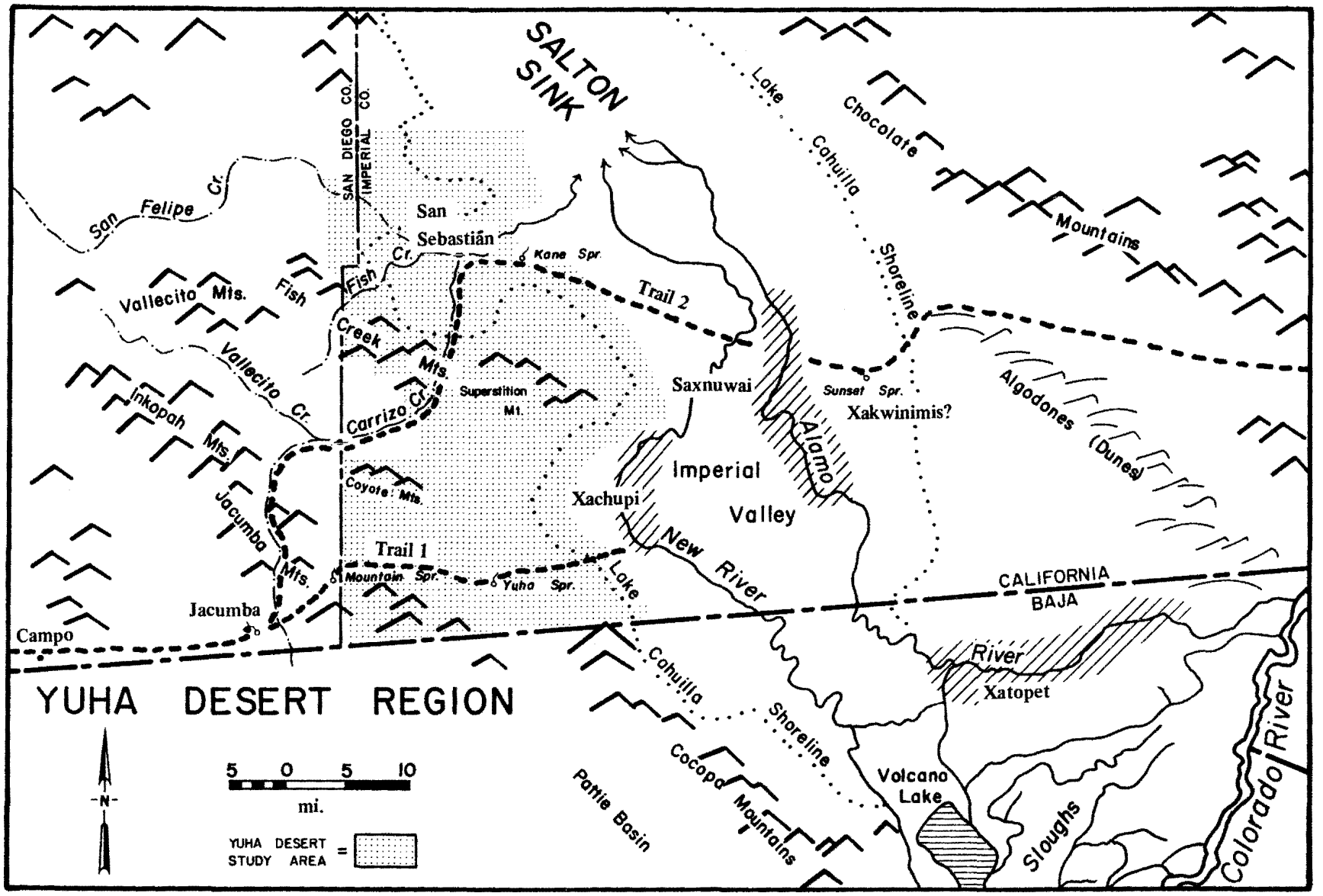


Fig. 2. Ethnogeographic locations in the Yuha Desert region.

The Yuha inventory area is included in a larger environment that was jointly exploited by the Kamia and Southern Diegueño. However, in this paper it will be more fruitful to think in terms of adaptation to different sets of environmental conditions than to think of different cultures. An undecided issue among students of ethnography in this region is that of the relationship of the Kamia as a separate entity with a defined territory, to the Southern Diegueño as a separate entity with a defined territory. The ethnographic literature clearly shows that there was sufficient interaction between the two groups that there is no real value in keeping them conceptually separate in a long-term sense (Gifford 1931:1-3; Spier 1923:300-306). In addition, it will become clear that the material culture of the two groups largely reflects distinct adaptation to their respective environments. *Kamia* will therefore be a term to indicate the people who occupied the riverine environment of Imperial Valley, and the term *Southern Diegueño* will denote the people who occupied the peninsular mountains to the west of the study area. It is difficult to tell at present how sharply the Kamia should be viewed as a separate entity along with the River Yuman (Cuchan) and the Southern Diegueño. Recent linguistic studies indicate that the dialect of the Kamia was quite distinct from that of the Southern Diegueño, in spite of the fact that the two groups have sometimes been considered the same (Margaret Langdon, personal communication to Frederic Hicks 1974). Other evidence, such as the fact that Pablo Coclum, "grand chief of the Cuchans," was actually born on New River about 1800, and was a Kamia (Gifford 1931:1), suggests strong relationships between the Kamia and Cuchan. The problem may never be solved.

## POPULATION

Information on actual Kamia population size and distribution in pre-contact times is almost lacking. Gifford estimates that there could not have been more than a few hundred people living in the vicinity of the New and Alamo Rivers in the Imperial and Mexicali Valleys. It is probable that most or all of these lived along New River, since it is the stream which seems to figure most prominently in the early historic records as a channel of the Colorado River distributary system. Gifford's estimate (1931:16) is based on that of Heintzelman (1857:53), whose census of the New River totaled 254, including 118 men, 82 women, and 54 children in 1849. This may be only a partial Kamia census, however, since elsewhere in his report Heintzelman indicates that the Kamia (or Yum, as he termed them) occupied the entire length of both the New and Alamo Rivers (1857:40). This would seem to indicate that even after long contact with Westerners there were more than "a few hundred" Kamia still surviving in the area.

The population for all Diegueño (Northern, Southern, and Kamia) has been estimated at 3000 (Kroeber 1925:712). Spier (1923:306), on extrapolation from 1920 figures, estimated the population at 3500-5000.

## AGRICULTURE

Kamia agriculture, like that of the Mohave, Yuma, and Cocopa, depended on the annual

flood of the Colorado River to provide soil nutrients and irrigation waters (Gifford 1931:21). During the flood of the Colorado it was not uncommon for waters in the delta to drain to the northward down the New River, and probably the Alamo (Salton) River, both distributaries of the Colorado. It was along these sloughs that the Kamia planted when flood water was available. The flood crested in May and June and this peak defined the beginning of planting activities (Gifford 1931:21; Castetter and Bell 1951:144-151). There was no need for artificial irrigation in inundated areas, therefore the Kamia did not build irrigation networks in areas close to the river. They did maintain a dam at Xatopet (Table 2) to provide an agricultural area during periods of low water (Gifford 1931:7). An irrigation network was maintained in Jacumba Valley in the mountains to the west (Gifford 1931:22).

The Kamia cultivated maize (*Zea mays*), cowpeas (*Vigna sinensis*), tepary beans (*Phaseolus acutifolius* var. *latifolius*), gourds (*Cucumis* spp.), watermelons (*Citrullus vulgaris*), and pumpkins (*Cucurbita pepo*) (Gifford 1931:21). Of these cultigens, cowpeas are of Oriental origin and were introduced by the Spanish (Gifford 1931:22; Castetter and Bell 1951:129). They were introduced at such an early date that Gifford's informants considered them to be as ancient as other cultigens (1931:22).

After the flood receded it was possible to begin planting. The Kamia planted by pushing a digging stick into wet ground to a depth of about six inches, dropping about five seeds into each hole, and filling the hole with fine uncompacted soil (Gifford 1931:22). Soil was not compacted because the Kamia believed that plants would not grow through hard soil. Planting activities could last up to one month depending on the speed with which water receded and on the number of interruptions caused by other subsistence activities (Castetter and Bell 1951:148).

Although the Kamia did not maintain irrigation networks, this did not mean that they were totally free to leave agricultural localities to accomplish tasks in other areas. At the start of the growing season, gardens were weeded with a mesquite slat and soil was heaped around plant bases to prevent wind damage (Gifford 1931:22). Gifford's informants said that there was no division of labor over these tasks, and other activities had to be scheduled around garden work (Gifford 1931:22).

The Kamia planted at three primary locations: (1) Xachupi, located on the west side of Imperial Valley from Indian Wells north along the New River; (2) Saxnuwai, located on the east side of Imperial Valley from the latitude of Brawley south along the Alamo River; and (3) Xatopet, located at Huerta, Baja California on a slough that was probably the east/west portion of the Alamo River before it turns north (Gifford 1931:5-7). Secondary planting locations were at Blue Lake near Xachupi and in Jacumba Valley, San Diego County (Gifford 1931:5-7).

Agricultural areas away from the river were irrigated. At one such area, Jacumba Valley on the international boundary in the mountains to the west of Imperial Valley, watermelons, pumpkins, corn, beans, and cowpeas were planted (Gifford 1931:22). This

## Table 2

## List of Ethnogeographic Terms

The ethnogeographic terms in this list have been compiled from the works of Gifford (1931) and Spier (1923). They should aid in understanding this report by indicating as fully as possible the locations of the places indicated.

| Name | Description |
|---|---|
| Saxnuwai | On the east side of Imperial Valley from the latitude of Brawley south along the slough called Alamo River. It extends south at least to the Holtville area. Spier places this locality north of Brawley and east of Imperial, California. This was an important Kamia agricultural area. |
| Xachupi | On the west side of Imperial Valley at Indian Wells, California. Located at about longitude 115° 30' W and latitude 32° 43' N. This on the west bank of the New River about six miles north of the Mexican border. Wells for drinking were dug at this location and it was an important trade and agriculture location. |
| Xakwinimis | This is a spring, possibly Sunset Spring on the trail which ran from Campo through San Felipe and Kane Spring to Xakwinimis and on to the Colorado River. The sand hills lie to the northeast of this location and Brawley lies to the southwest. It is east of modern Salton Sea and Mount San Jacinto appears across the length of the Salton Sea. Black Butte, Baja California, Mexico is visible to the south of this spring. |
| Xatopet | This name applies to the east/west stretch of land fringing the slough called Alamo River. The sand hills were visible from this location and were about ten miles to the north. The Colorado River was about ten miles to the east. This name does not refer to any particular spot or settlement but to the entire segment of the slough. This location probably includes all of the Alamo River before it turns north. All Kamia lineages maintained houses at this location and a dam was maintained there to allow farming in dry years. |

means that non-riverine areas were fully integrated into the agricultural complex. Irrigation was accomplished with a network of ditches which conducted water from a dammed spring to the fields (Gifford 1931:22). The spring and dam were said to be located on the Mexican side of the border. According to Gifford, the Jacumba region was also farmed by a Southern Diegueño lineage (1931:22). Spier also indicates that there was a Southern Diegueño lineage in the area, however he does not mention agriculture (Spier 1923:302, 304). It would appear that both the Kamia and Southern Diegueño practiced agriculture in Jacumba Valley.

Gifford (1931:22-23) argues that irrigation, with its associated agriculture, was the result of mission contact and would not have been possible in precontact times. However, more recent work (Bean and Lawton 1973; Lawton and Bean 1968; Lawton 1968) suggests that irrigation was in fact aboriginal. This difference of opinion could be resolved with more archaeological and ethnohistorical investigations (see Archaeological Potential of the Yuha Area, this report).

## GATHERING

Both the Kamia and the Southern Diegueño gathered wild plant foods. The latter probably relied more heavily on the gathering of plant foods than the former. Mesquite (*Prosopis juliflora*) and screwbean (*Prosopis pubscens*) were the most important wild plants gathered by the Kamia (Gifford 1931:23). Both types of beans were gathered during July by shaking the tree with a hooked stick and collecting the fallen beans from the ground. Other wild plants exploited by the Kamia were tule (*Scirpus* spp.), sowthistle (*Sonchus oleraceus*), yerba mansa (*Anemopsis californica*), saltbush (*Atriplex torreyi*), and a grass (*Cyperus erythrorrhizos*) (Gifford 1931:23-24). Of these wild plant resources, sowthistle was introduced after contact and must be viewed as an addition to the native flora.

The Kamia gathered mesquite and screwbean from an area located between Blue Lake and Xachupi and at two locations on the Colorado River about eight miles south of Xatopet (Gifford 1931:3-9, 23). Seven Wells was a favorite area for the Kamia to gather tule roots and pollen (Gifford 1931:23). There were undoubtedly other gathering areas exploited by the Kamia, however these are the only ones specifically named by Gifford's informants. All of these named gathering areas are closely associated with named Kamia agricultural areas. The lack of named gathering areas separate from planting areas seems to support Gifford's implicit contention that the Yuha inventory area was used primarily for trade and travel. This probably indicates that at no time were the Kamia strictly agricultural, a fact that has been clearly pointed out for the River Yumans by Castetter and Bell (1951). It would seem that all of these groups, including all of the River Yumans (Mojave, Cuchan, Cocopa, Halchidhoma, etc.) and the Kamia subsisted by farming when water was available and always relying to a heavy degree on gathering and to a lesser degree hunting and fishing. The implication of this is that when there was insufficient overflow in the Colorado Delta to charge the New River, the Kamia subsisted on stored agricultural foods and relied on gathering until the river flowed again and thereby made agriculture possible. If there was a

prolonged period of low discharge from the Colorado, and therefore low flow or no flow at all in New River, the Kamia abandoned their attempts at agriculture in Imperial Valley and often left the desert (Heintzelman 1857:40). At these times they moved away, but just where they went is not specified. There is reason to believe that some of them probably went to the Colorado. It has been shown, however, by White (1974) that warfare along the lower Colorado River is intimately related to low water flow, and hence crop failure and the food shortages which resulted. At these times the River Yumans resorted to raiding and poaching on neighboring hunting and gathering territories. The situation was one into which it would have been maladaptive for the Kamia to go. It therefore seems more reasonable to assume that they may have resorted to outmigration from Imperial Valley into the mountains to the west. At these times such places as San Sebastián, at the San Sebastián Marsh at the confluence of the Carrizo and San Felipe Creeks, the Carrizo Marsh on the middle Carrizo Creek, and Jacumba Valley, which constitutes the headwaters of the Carrizo itself, would have been the logical places to go. Perhaps mention in ethnohistorical documents of Kamia living at the village of San Felipe in the San Felipe Valley refer to Kamia who sought refuge there when New River failed to provide the necessary water for their crops. Perhaps the farming in Jacumba Valley is best viewed as another aspect of this restructured settlement system when New River failed. Such times would have seen increased collecting in the Yuha, and increased use of water sources such as Yuha Spring.

The relative importance of gathering for the Southern Diegueño over gathering for the Kamia can be estimated by the lists of plant foods mentioned by informants. From six informants, Gifford elicited a list of seven wild plants that were exploited by the Kamia, while from one Southern Diegueño informant, Spier was able to elicit a list of twelve wild plants (Gifford 1931:23-24; Spier 1923:334-336). While these lists are not conclusive, they do indicate that gathering was primary for the Southern Diegueño and secondary for the Kamia.

The major wild plant resource for the Southern Diegueño was acorns (*Quercus* spp.). These become ripe in September and fall to the ground in October (Spier 1923:334). Acorns were gathered from the ground by Southern Diegueño women and stored in baskets until February, at which time they were dry enough to be processed (Spier 1923:334). After drying, acorns were cracked by women and old men, stored in clay pots, and cached in rock outcrops (Spier 1923:334). Bedrock mortars and heavy stone pestles were used to grind acorns into meal. Acorn meal was then leached to remove tannic acid by lining a shallow twined basket with meal and pouring cold water, followed by warm water, over it (Spier 1923:335). In comparative terms, acorns for the Southern Diegueño are analogous to cultigens and mesquite for the Kamia as major dietary components.

Other Southern Diegueño wild plant resources included pigweed (*Amaranthus finubriatus*), goosefoot (*Chenopodium* spp.), white sage (*Salvia apiana*), nettle (*Urtica holoserica*), wild flax (*Apocynum cannabinum*), wild plum (*Condalia parryi*), barrel cactus (*Echinocactus acanthodes*), prickly pear (*Opuntia occidentalis*), cholla (*Opuntia* spp.), mescal (*Agave deserti*), juniper (*Juniperus californica*), and piñon (*Pinus monophylla* or *quadrifolia*)

(Spier 1923:334-346). The collection of some of these plants might have taken Southern Diegueño into the western portion of the study area.

## HUNTING

The Kamia are said to have lacked snares, driving nets, or decoys and relied on the bow and arrow or mesquite throwing stick (boomerang) for hunting (Gifford 1931:26). Cottontail rabbits (*Sylvilagus auduboni*) were called by a squealing sound and killed with a bow and arrow. Jackrabbits (*Lepus californicus*) were hunted by a group of about ten men who would set fire to the brush along a waterway and kill fleeing jackrabbits with a boomerang. The Kamia had no special rabbit-hunt chief, and the timing of a hunt was controlled by the regular chief. Although the kill was not pooled, an unsuccessful hunter usually received a gift of some rabbits from those who had been successful.

Deer (*Odocoileus hemionus*) were hunted by individual Kamia in the willow thickets along water courses. These animals were killed with a bow and arrow. No deer call was used and no special sanctions were imposed on deer hunters. Mountain sheep (*Ovis* sp.) were hunted in the mountains west of Calexico. While no specific hunting practices are recorded, it can be inferred that mountain sheep were hunted in a manner similar to deer. Beavers (*Castor* sp.) were dug out of their houses and killed with a digging stick (Gifford 1931:27).

Hunting practices among the Southern Diegueño were similar to those of the Kamia. Rabbits were hunted by a group of men who would surround a patch of brush, set fire to it, and kill fleeing rabbits with bow and arrow or throwing sticks. One major difference was the use of carrying nets as an alternate rabbit hunting technique. To trap rabbits, several nets would be stretched across a runway and rabbits would be driven into them. According to Spier, the choice of rabbit hunting technique was determined by the number of available hunters with large groups using nets and small groups using fire. Deer and mountain sheep were hunted by individuals and the only difference between Kamia and Southern Diegueño seems to be that the Southern Diegueño reportedly used a throwing stick as well as a bow and arrow for mountain sheep. The Southern Diegueño did not use snares. They did use a deadfall trap, consisting of a rock supported by a stick which rested on an acorn for killing small rodents, squirrels, rats, and mice (Spier 1923:337-338).

## FISHING

Fish were taken by the Kamia with a hook, seine net, basket scoop, bow and arrow, or by hand (Gifford 1931:25). Spier mentions that the Southern Diegueño took "Colorado salmon" with a bow and arrow from the sloughs around New River (1923:338). The Kamia did not use fishing platforms or poisons. Kamia fishhooks, made from unmodified barrel cactus spines, were attached to a cowpea fiber line and baited with grasshoppers. In precontact times, fishing line was apparently made from a different material, possibly agave fiber. The Kamia used a basketry scoop in lakes, occasionally in sloughs, but never in the Colorado River. Seine nets—used in lakes, large sloughs, and the Colorado River—were

waded into the water by a group of about six men. The bottom of the net was held down by their feet and the net was spread by spacing arrowweed sticks along its length (Gifford 1931:25-26).

The Kamia utilized at least four species of fish. These were a Cyprinid (*Ptychocheilus lucius*) called "salmon" and probably the same salmon mentioned by Spier, a sucker (*Xyrauchen cypho*) called "humpback," a minnow (*Gila elegans*) called "small white fish," and catfish (*Amiurus nebulosus*) which was introduced (Gifford 1931:26). Of these species, only humpback was regularly killed with a bow and arrow. In addition, it was usually killed in sloughs during high water, thus providing an early spring food source (Gifford 1931:26).

## TRADE

The Kamia traded their agricultural products to the Southern Diegueño in return for acorns, mescal, and tobacco (*Nicotiana* spp.). Xachupi, the agricultural locality near Indian Wells, was said to be the best Kamia locality for this trade (Gifford 1931:23). If this is true, then it is probable that the Southern Diegueño settlements located on the western edge of Imperial Valley would be the best Southern Diegueño localities for receiving Kamia cultigens. The localities noted by Spier (1923:300-306) were at or near the following areas: Jacumba, Coyote Wells, Warner's Hot Springs, Campo, and at the junction of San Felipe and Carrizo creeks. The latter is the site of the village of San Sebastián, at the San Sebastián Marsh. Both Kamia localities and Southern Diegueño localities were occupied seasonally, and the relationship of these two seasonal occupation cycles would affect the scheduling, frequency, and density of trade across the Yuha inventory area. In addition, if the Yuha area was used mainly as a trade corridor, then the location of known trails becomes highly significant.

From Gifford (1931:8-9, 17) two trails between the Kamia and the Southern Diegueño can be identified. The first of these ran from Jacumba Valley through In-Ko-Pah Gorge and Mountain Spring (the present site of Interstate 8) to Yuha Spring and from Yuha Spring to Xachupi (Indian Wells). The trip along this trail was said to take three to four days. It was necessary to have a dry camp at the end of the first day out of Xachupi, and this camp was probably located about half way between there and Yuha Spring. Camps on the second, third, and fourth nights were probably at Yuha Spring, Mountain Spring, and Jacumba respectively. The second trail mentioned by Gifford ran from Campo east and then north in the mountains until it emerged to run east through the desert, across to Sunset Spring, and on to the Colorado River. This route would take the trail across Saxnuwai, the Kamia agricultural locality in the vicinity of Brawley. In addition, 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 Sebastián, from San Sebastián to Kane Springs, and from Kane Springs through the Brawley area to Sunset Springs and beyond to the Colorado River. While Gifford only mentions that the second trail branches from the Yuha trail somewhere in the mountains, there is ethnohistoric evidence—derived from accounts of Pedro Fages' Colorado River campaign (1781-82) and Fages' travels in 1772—which indicates a major

Indian trail which follows the proposed route from west of San Sebastián through present day Harpers Well, Kane Springs, and into the desert (Rensch 1955:193-208). One of the major contributions that an archaeological inventory of the Yuha area could make would be to identify these trails and verify the density of use for the area in Late Horizon times (see Archaeologic Potential of the Yuha Area, this report).

## FOOD PREPARATION

The Kamia skinned and gutted rabbits and then cooked them by either boiling or baking in hot coals. Rabbit bones were not used for tools or cracked for marrow. However, sometimes the Kamia ground rabbit bones and mixed them with rabbit meat to make food for old persons. The Kamia ate fish fresh and did not dry them for later use. Fish could be broiled, but were generally stewed without cleaning in a ceramic pot (Gifford 1931:27).

The main contrast between Kamia and Southern Diegueño food preparation techniques was in plant food preparation. The Kamia ground mesquite, screw bean, and acorns in a cottonwood mortar with a stone or wood pestle and other plant foods on a granite metate with a stone mano (Gifford 1931:23, 41). The Southern Diegueño ground acorns in a bedrock mortar with stone or wood pestle and other plant foods, such as wild plum, were processed on a slab metate with a stone mano (Spier 1923:335). This difference is probably related to the abundance of granite bedrock suitable for mortars in the mountains relative to the scarcity of suitable bedrock in desert areas. This trait in association with others can be used as a marker between the mountain adaption of the Southern Diegueño and the desert or riverine adaption of the Kamia.

## SOCIAL ORGANIZATION

Kamia society was made up of three social groupings: the "tribe," the lineage, and the extended family. They can be considered as tribal because the Kamia recognized one man as a civil and ceremonial leader (Gifford 1931:50). His primary duties were to aid in the mourning ceremony and to talk at funerals (Gifford 1931:51). In addition, the chief would set the time for group rabbit hunting, lead the Kamia in war, and act as speaker in negotiations with outsiders (Gifford 1931:50-51, 26-27, 31). Chieftainship was not hereditary, but by consensus of the male population. If the men were unsatisfied with a chief, this feeling would reach him through informal channels and cause him to resign. In the same informal manner, it would become known that a man was considered capable of being chief and would be acceptable to the male community. If this man was agreeable he became chief and remained in office until the men became dissatisfied with him and started the process over again. A man was considered capable of being chief if he were well liked, thought of as a "good talker," and considered to be in possession of "good qualities" (Gifford 1931:50). Old age was said to be the principal cause of a Kamia chief's resignation. The last Kamia chief died in 1905 and was not replaced because the Kamia were too scattered. This indicates that population decimation in the face of Western contact and the restrictions of reservation life had effectively destroyed the Kamia social system by 1905,

even though there were still living individuals who considered themselves to be Kamia.

The Kamia were further organized into ten, or possibly eleven lineages (Gifford 1931:11). These lineages were patrilineal in that descent was traced through the male, and exogamous in that marriage was restricted to persons outside of the lineage. Post-marital residence was ambilocal in that the couple would live with the husband's parents for a few months, then move to live with the wife's parents for a few years, and finally move to a separate residence (Gifford 1931:55). Kamia lineages were not definitely localized, although a given lineage would divide their agricultural activities between several but not all named localities (Gifford 1931:11-12). The identification of lineages with named locations is probably more a function of the preferences of individual families, moving as sub-lineage segments, for particular localities than it is of a concept of lineage property rights to land.

Among the Kamia, the normal day-to-day living unit was an extended family consisting of a man and his wife or wives, their children, and any surviving grandparents (Gifford 1931:19-20, 55-56). This family unit served as the basic work unit in that it would be an extended family that worked, lived, and moved together at particular resource areas.

There were considerable differences in social organization between the Southern Diegueño and the Kamia. For example, Spier argued that the concept of a tribal chief was a recent innovation among the Kamia, possibly as a result of their contact with the Yuma, and that there was no "tribal chief" among the Southern Diegueño. If this is true, then the largest social group among the Southern Diegueño was the patrilineal exogamous lineage (Spier 1923:309).

Each Southern Diegueño lineage was led by a ceremonial chief whose principal duties were to make images for and lead the mourning ceremony, admonish the members of the lineage, and lead the lineage in war. In distinction from the Kamia, Southern Diegueño lineage chieftainship was generally hereditary although there were informal processes which allowed men to oppose the appointment of a given individual to the chieftainship. However, if a problem of succession arose and the heir apparent could or would not serve, then a replacement was chosen from his blood relatives. In addition, Southern Diegueño lineages were much more localized than were Kamia lineages. Each lineage had a summer camping area that it returned to and had rights of relatively exclusive occupancy. Finally, the Southern Diegueño were primarily patrilocal as opposed to ambilocal (Spier 1923:299, 309-310).

While there are significant differences between Kamia and Southern Diegueño social organization, this does not limit the closeness of the social connection between these groups. This close connection can be illustrated by connections between Kamia and Southern Diegueño lineage systems. Each Kamia lineage is also found among Southern Diegueño (Gifford 1931:2). Also, among the Kamia, exogamy and kinship terms are extended to be applicable to the appropriate Southern Diegueño lineages (Gifford 1931:12). These social connections were so close that Spier argued that the groups living along the

New and Alamo Rivers, which Gifford designates as Kamia, should be included under the designation Southern Diegueño (1923:301). This type of confusion is why it is better to think in terms of different adaptions rather than different linguistic and tribal groups.

## SETTLEMENT PATTERN

The Kamia lived in large square or rectangular earth-covered houses. These extended family houses were scattered, at about 100 yard intervals, along a low rise of ground beside a waterway. House locations were chosen so as to be near running drinking water. This desire meant attempting to place a house as close to waterway as possible without having it inundated by flood waters. Inevitably a house would be built too close to water, and it would be flooded. If this occurred, the old house was abandoned and a new house built on higher ground. In addition to flooding, a house or general area would be abandoned after either a series of dry years or a death in the house (Gifford 1931:18-20). Unfortunately, it is almost certain that the combination of the downcutting of the New and Alamo Rivers in 1905-1907 and disturbance by modern agriculture have destroyed the remains of all Kamia settlements in Imperial Valley.

The Kamia should have maintained some type of temporary living arrangements at seasonal exploitation localities such as gathering localities, trail or well sites, and trading locations. There is no record of the nature of Kamia temporary camps. However, it can be assumed that these sites are represented in the archaeological record as at least some of the Late Horizon sites which are designated as temporary use localities.

The data on Southern Diegueño settlement patterns are much more limited than the data for the Kamia, but suggest that the pattern is different. Southern Diegueño settlement patterns are dominated by the interplay between summer and winter camps. Winter camps, located in the foothills on the western edge of the Colorado Desert, had substantial earth-covered gable houses which were occupied by the largest Southern Diegueño group, probably the lineage. These houses were not placed in tight clusters but would be scattered over a given valley or locality so that the people in each house would have easier access to resources. Summer camps, located in interior mountain valleys, were occupied by the smallest Southern Diegueño group, probably a nuclear or extended family and had minimal housing units. Spier argues that these camps had no structures, but were placed in the open under a convenient tree (Spier 1923).

## MATERIAL CULTURE (Fig. 3)

A curved throwing stick (boomerang) was used by the Kamia for killing cottontail rabbits. It was made from hardwood, either mesquite or screwbean, and each man usually carried one (Gifford 1931:28). The boomerang was thrown with a side-arm motion from an oblique angle (45° from horizontal).

The Kamia used a simple bow, made from mesquite, screwbean, or willow, which was

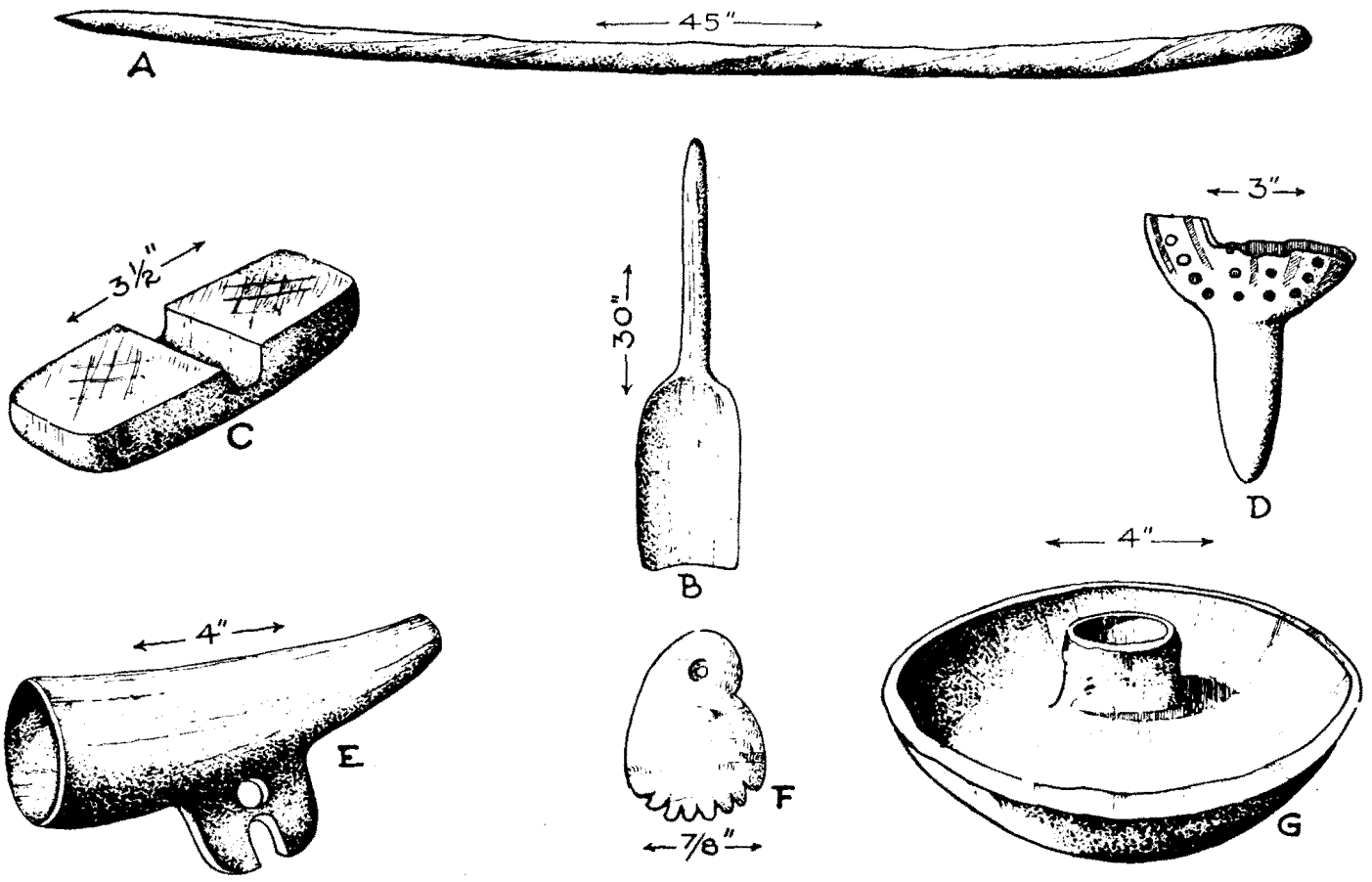


Fig. 3 Miscellaneous artifacts from the Late Horizon, Yuha Desert Region. A, mescal chisel; B, mescal shovel; C, arrow straightener; D, fragment of painted pottery rattle; E, clay pipe; F, shell ornament; and G, clay pottery anvil. (After Treganza 1942).

strung with a deer sinew cord. A Kamia bow was made from green wood by tying the wood in position and allowing it to sun dry. Bows were shot by primary release with a deer-hide wrist guard worn for protection from the string (Gifford 1931:28).

War arrows were of two types, a straight arrowweed shaft or a cane arrow with an arrowweed foreshaft. Both types were tipped with a stone arrow point. Two or three half feathers from a large hawk were lashed with deer sinew and glued with arrowweed gum to the base of Kamia war arrows. Small bird arrows were made of arrowweed and tipped with four small sticks placed in pairs at right angles and tied transversely across the distal end of the arrow (Gifford 1931:28-29). Presumably, arrows for hunting large game were similar to war arrows while small game arrows were similar to bird arrows.

The Kamia obtained lithic materials from the mountains to the west in the area assigned to the Southern Diegueño. According to Gifford (1931:28) the Kamia made lithic tools by primary stone-on-stone percussion flaking. If this is true then pressure flaking tools such as antler tine flakers were not used. The Kamia made small triangular or side-notched points which have been classified by archaeologists as Cottonwood Triangular and Desert Side-notched respectively. However, in the archaeological literature, these point types are seen as being made by pressure flaking and not, as indicated by Gifford, by percussion flaking. Stone knives were made by the Kamia with the same materials and techniques used for arrow points and were not hafted (Gifford 1931:29). Instead one end of the knife was shaped and dulled into a handle.

Metates and manos were of stone and used to grind seeds and other plant materials into meal. The mano was used with a forward/backward motion, similar to that of Pueblo peoples, and not in a circular motion. This use pattern produced metates that were flat-faced slabs with a convex base. The metates seen by Gifford were about 2 feet long, by 1 foot wide, by 3 inches thick, and manos were as long as a metate was wide with a rough cylindrical shape (Gifford 1931:42). Granite for these implements was said to come from an area near Jacumba (Gifford 1931:41-42).

The Kamia ground beans, corn, pumpkin seeds, watermelon seeds, and acorns in a cottonwood mortar with a stone or wood pestle. Kamia mortars were made by burning the trunk of a large cottonwood to length and hollowing one end by fire. The mortars seen by Gifford were about 14 inches in diameter and 2 feet long with a hole in the end about 12 inches deep by 10 inches in diameter. The Kamia would set these mortars a few inches into the ground and build a sun shade over them. Pestles were long, slender, smooth cylinders of granitic stone or occasionally of mesquite wood. The pestles seen by Gifford were about 12 inches long by about 2½ inches in diameter. The Kamia used the pestle with both hands in an up and down pounding motion (Gifford 1931:40-41).

Kamia arrow shaft straighteners were ungrooved globular pieces of steatite (Gifford 1931:29). In use, the straightener was heated and a cane arrow was bent over it until it was straight. Arrowweed shafts did not need to be straightened.

The Kamia ceramic assemblage includes water ollas, food storage ollas, canteens, jars, cooking bowls, parchers, plates, scoops, cups, and rattles. Both painting and rim notching were used by the Kamia as decorations on non-culinary ceramics. Surface color in Kamia wares varies from ocherous pink through buff to oyster white, and paint colors are reds derived from hematite and red ochre or black derived from rendered mesquite (Rogers 1936:25-26). In the archaeological literature, Kamia ceramics are assigned to the Lower Colorado Buff Ware or Tizon Brown Ware classifications (Dobyns and Euler 1958; Schroeder 1958).

The Southern Diegueño did not use a cottonwood mortar, but used instead a bedrock mortar and a heavy stone pestle. Southern Diegueño metates were granite slabs with a slight oval depression in one face and manos were ovoid stones. Manos were pushed back and forth with a rolling motion and not rocked from side to side (Spier 1923:335). This difference in use motions could account for the apparent differences between Kamia and Southern Diegueño manos and metates.

Southern Diegueño bows were made from mountain ash, willow, mesquite, or screwbean with mountain ash as the preferred material. These bows are made by drying green wood, then burying it in wet ground to soften it, and then stringing it to shape and allowing it to dry. As with the Kamia, Southern Diegueño arrows were of two types, either a cane shaft or a cane shaft with an arrowweed foreshaft. Arrow points were small triangular or side-notched and, as with the Kamia, have been assigned to the Cottonwood triangular or Desert Side-notched types respectively. Arrow shaft straighteners are described as grooved, made from soap stone (steatite) or clay, and used in the same manner as the Kamia (Spier 1923:351-352).

The Southern Diegueño ceramic assemblage includes water ollas, cooking bowls, cooking pots, rattles, anvils, pipes and large storage ollas. Large storage ollas are the most impressive vessels in this assemblage. They were built to a height of 33 inches and could hold as much as 27 gallons. Large ollas were filled with acorn meats and cached in caves and shelters for storage. Southern Diegueño ceramics were sometimes decorated by incising and painting, with incising being the older of the two techniques (Rogers 1936:18-20).

## ARCHITECTURE

The main Kamia house was a square or rectangle frame building that was thatched and covered with sand. Each family maintained its own house, and it was generally smaller than a chief's house. A chief's house could be as large as 40 feet by 40 feet with a 7 to 8 foot ceiling. The main posts and heavy timbers were made of cottonwood, and smaller roof members were of willow. Arrowweed was used as thatch; the roof and sides were covered with sand. If a very old person were living with a Kamia family, a small shelter would be constructed outside of the main house. This shelter was also a sand-covered square or rectangle which was about 12 feet by 12 feet in outline with a south-facing door. A sun shade was built in front of the main Kamia house. It was a square arrowweed roof supported

on poles which was left open in summer but surrounded by arrowweed walls in winter. This shade covered the primary work area outside of the house, and such tasks as food processing or cooking would be done under it to take advantage of its shade (Gifford 1931:18-21).

There is some question if the Kamia used a sweathouse. Those of Gifford's informants who said that they did described it as being conical, about six feet high, with the lower two feet dug into the ground. Sweathouses were said to accommodate four men and were used for curing (Gifford 1931:21).

The Kamia mourning ceremony was conducted under a semi-circular shade that was specially erected for each occasion. It was roofed and walled (along the arc) with arrowweed, and the straight side was oriented to the east and left open. These shades were said to be about 22 to 24 feet wide on the straight side by about 30 feet long (from front to back) with a 7 foot ceiling. The lower two feet of the walls were heaped with sand to hold the arrowweed thatch in place. Two fires, one inside and one outside of the structures were kept burning throughout the ceremony (Gifford 1931:58-59).

A granary was constructed by the Kamia for storing mesquite pods, beans, and corn. It was made, in a "bird's nest" weave, of willow and arrowweed with the leaves left on. If the Kamia built a granary away from the house it was placed on a high platform to protect it from coyotes, but it if was close to the house it could be built on the roof or on the ground near the house. In all cases, the granary was covered with loose arrowweed and dirt while being surrounded with thorny mesquite branches to protect it from small pests (Gifford 1931:40).

The main Southern Diegueño house, used only in winter, was a simple gable (2 meters long by 1.5 meters high at the ridge) which was set directly on the ground. Two forked posts, set up at the ends, supported a ridge pole which supported slanting poles placed at ¼ meter intervals along each side. Long branches of chamessa bush and dry tanglefoot grass covered with damp earth would be used as a wall covering. There was no sun shade built in association with these houses and Spier (1923:38-40) does not mention a separate residence for old people. Spier (1923:324-326) mentions a ceremonial house but does not give any details which could yield a description of it.

## CALENDAR ROUND

In historic time, the Kamia economic system involved moving between agricultural localities, trade areas, and gathering localities. The baseline of this movement in historic times was Xatopet, an agricultural locality near the junction of the Alamo and Colorado Rivers (Gifford 1931:7). Here, all Kamia lineages maintained residences, and it can be seen as the starting point for each annual round of exploitative movements.

Kamia agriculture was dependent on annual Colorado River flooding. This flood peaked in May and June, at which time the Kamia were centralized at Xatopet. This location was

ideal for monitoring the strength of the flood and based on an assessment of its strength, the Kamia would decide on which other agricultural localities had received enough water to allow planting. If the flood failed, a dam at Xatopet held back enough water to allow some farming.

If the other localities had been inundated, then the Kamia would separate into family groups and move to various agricultural localities to begin farming. Planting took place as flood waters receded, therefore family groups did not leave Xatopet until just prior to the recession. On arrival at a given locality, the Kamia would plant crops and then remain in the area until after harvest. Corn in this region has a growing season of from 90 to 120 days (Castetter and Bell 1951:100-106). This means that the Kamia would have spent from about the end of May until possibly mid-October away from Xatopet.

The relationship of cultigens to wild plant resources is the major factor which allowed the Kamia calendar round to be successful. Cultigens are mainly surface water dependent, while staple wild plant foods, such as mesquite and screwbean, are ground water dependent (Bean and Saubel 1963:52). In the Imperial Valley, surface water comes from the Colorado River. Little of this water would become ground water because of the high evaporation rate in the area. On the other hand, ground water in this area is derived from local sources such as Carrizo Creek and San Felipe Creek. The separation of surface and ground water places the two major Kamia food-procuring systems on separate environmental systems and allows them to vary more or less independently. There is enough variation in ripening periods so that cultivated and wild resources are exploitable in sequence. Mesquite and screwbean ripen in June-July-August, at just the time when cultigens have been planted but have not started producing, and become the staple during this period. Then, in September and October cultigens are ready for harvest, and they replace mesquite and screwbean as the staple foods.

In the limited ethno-geography given by Gifford (1931:3-9) each named agricultural locality is associated with a named gathering locality. This close association illustrates the connection between gathering and planting activities. In addition to the requirement that an agricultural locality be regularly flooded, it seems that it must also have been located in or near a locality which yielded sufficient quantities of mesquite and screwbean.

After harvest, the Kamia returned to Xatopet and subsisted on stored foods, fish, occasional hunting, and limited local gathering. This period, from about mid-October to about June was one of relative inactivity. The main house was repaired, tools were made and repaired, and major ceremonies were performed. In June the whole cycle would start again with the recession of the annual Colorado River flood.

The annual cycle of Southern Diegueño movements was dependent on a totally different set of environmental variables. In this system the Southern Diegueño moved from winter camps in the foothills on the western edge of the Colorado Desert up into the mountains to occupy summer camps in high mountain valleys. In their winter camps, the Southern Diegueño were in the best location to trade for cultigens with the Kamia. Gifford

(1931:17-23) reports that most of the trade between these groups took place in the winter with the Southern Diegueño usually moving to meet the Kamia. This means that winter, the time when acorns were not available except as stored food, found the Southern Diegueño in a position to obtain cultigens as a supplemental food.

In the spring, probably at the same time as the Kamia dispersed, the Southern Diegueño would move out of their winter houses and begin ascending the mountains, staying in temporary camps and subsisting on locally available resources (Spier 1923:306). The pace of this move was governed by the ripening of plant foods. In vertically stratified environments, such as from the foothills to the mountain valleys, the ripening time of plants is directly related to elevation with lower plants ripening earlier. Therefore, an exploitation strategy, such as used by the Southern Diegueño, which capitalized on this pattern of seasonal progression, would derive maximum use of various plant resources.

In the summer, the Southern Diegueño would occupy their summer camps, located in high mountain valleys, such as Campo Valley or Pine Valley. From these camps, they would exploit acorns as their major winter staple. Acorns were abundant above 3500 feet and they came ripe in late summer, from about mid-September through November (Bean and Saubel 1961:238, 242). It is easy to underestimate the productivity of acorns. And while there are no data on yields for the Southern Diegueño, there are for the Cahuilla directly to the north which indicate that in a single gathering trip of a few weeks a family of six to eight could gather and process five or six hundred pounds of acorns, or enough to last them a whole year (Bean and Saubel 1961:243). This immense productivity allowed hunting and gathering groups, such as the Southern Diegueño, to acquire enough acorns for both subsistence and trade.

In the fall, immediately after the acorn harvest, the Southern Diegueño would return to their winter camps, thus completing their calendar round. As with the Kamia, winter was a period of relative inactivity, with the Southern Diegueño subsisting on stored resources, engaging in limited hunting and local gathering, repairing and making equipment, and conducting trade and ritual activities.

## RELIGION

The Kamia had three ceremonies which are of archaeological significance. These were the eagle sacrifice, mourning ceremony, and funeral. In the eagle sacrifice, an eagle was ritually suffocated to obtain its feathers for the mourning ceremony (Gifford 1931:49-50). After the sacrifice, the skinned body of the eagle was wrapped in clothing and buried without cremation. In a dry location, the remains of a sacrificed eagle could be recovered. At the end of a mourning ceremony the special shade along with grass images of the deceased and offerings of blankets and clothing would be burned (Gifford 1931:58-61). The burned remains of this structure and its contents could be represented in the archaeological record. On the death of a Kamia, the house in which the death occurred, with all its contents, would be burned. In addition, the body of the deceased, along with all of the dead

person's possessions, would be burned on a pyre built over a pit (Gifford 1931:56-58). After the corpse and pyre had completely burned, the hole was filled with earth which was solidly packed by pouring water over it (Gifford 1931:58). Cremations would appear in the archaeological record and in fact are well represented.

The Southern Diegueño had the same three ceremonies and also the toloache (jimsonweed) initiation ceremony. Spier does not give enough detail for these to be described for their archaeological significance. It can be assumed that the physical remains from the mourning ceremony and the eagle sacrifice would be similar to those from the Kamia. However, at the end of a Southern Diegueño funeral the ashes of the deceased would be gathered together, put in a ceramic pot, and either hidden in remote rocks or buried (Kroeber 1925:176). This difference, along with bedrock mortars, could be used as a marker for the boundary between Kamia and Southern Diegueño.

## SUMMARY

The Kamia were a group of Yuman speakers who were localized in the area of the New and Alamo Rivers; at the same time, they maintained close contact with the Colorado River tribes to the east and the Southern Diegueño to the west. There are no clear figures on the size of Kamia population, however it can be assumed that there were more than 254, the figure given in Heintzelman's census.

Kamia economics involved a combination of agriculture, hunting, gathering, and trade. Agriculturally, the Kamia were closely associated with the Colorado River tribes and undoubtedly derived their techniques from that source. Kamia agriculture depended on the annual May-June recession of the Colorado River flood stage, for this inundation made desert cultivation of corn, beans, squash, pumpkins, gourds, and watermelon possible. In addition, Kamia agriculture depended on the association of mesquite and screwbean thickets with flooded areas because these resources were used as staples during the growing season. Meat was derived from group and individual hunting of deer, mountain sheep, beavers, rabbits, and birds and from fishing.

The trade network maintained by the Kamia with the Southern Diegueño is the most significant portion of the economic system for the Yuha inventory area. In this trade, Kamia agricultural products were exchanged for acorns, mescal, and tobacco. There were two main trade routes: one in the south from Jacumba through Yuha Spring to Xachupi (Indian Wells), and the other in the north from Campo through San Felipe, Kane Springs, and Sunset Springs to the Colorado River. It was along these routes that connections between the two groups were maintained, and in the ethnographic literature the primary use for the Yuha inventory area is as a setting for this trade and travel.

Kamia sociopolitical organization can be considered on three levels. All Kamia recognized one man as chief. His main duties were to lead mourning ceremonies, set the time for rabbit hunting, lead the Kamia to war, and act as spokesman for the tribe in

dealings with outsiders. Chieftainship among the Kamia was not hereditary. A man was chief at the suffrage of the male population who through informal processes could depose or appoint chiefs. The last Kamia chief died in 1905, and his death marked the end of the Kamia as a viable social entity.

On the second level, the Kamia were organized into a number of patrilineal exogamous lineages whose primary function was to regulate marriage and structure social relationships. These lineages did not function as property controlling entities except through individual extended family preferences for particular localities. The extension of Kamia lineage rules to appropriate Southern Diegueño lineages illustrates the close social connection between these groups.

The basic level of Kamia sociopolitical organization was the extended family. These constituted the basic work unit in the system and the day-to-day group for individuals. It would be the extended family that moved as a unit between various resource areas.

The Kamia manipulated their environment through a rich and varied complex of material items and structures. However, in archaeological contexts, the bulk of this material culture would not be preserved. Of the entire complex only stone tools such as arrowpoints, knives, shaft straighteners, metates and manos, and ceramics are likely to be preserved. An historic accident, the flood of 1905-1907, and present land use in the area have probably destroyed all hope of recovering the remains of the major architectural feature of the Kamia adaptation.

The most useful way to conceptualize the Kamia adaption is a system of environmentally and culturally controlled movements through space and time. These movements begin in the spring at the junction of the Alamo and Colorado Rivers with the Kamia living in large groups. Depending on the strength of the annual flood, the Kamia would disperse in smaller groups to various agricultural localities and remain there throughout the summer, planting, tending, and harvesting their crops. Mesquite and screwbean were the staples of Kamia diet during this period. After the fall harvest, the Kamia would return to the Colorado River and remain there during the winter. Winter was the time of major ritual activity, trade, maintenance, and of minor food gathering activities. In the spring this cycle would be repeated.

The Southern Diegueño were a group of Yuman speakers who occupied the area from the foothills on the western edge of the Colorado Desert up to the crest of the Pennunsular Ranges in the vicinity of Campo and Warner's Hot Springs. They maintained close connections with the Northern Diegueño on the coast and with the Kamia. Their population has been estimated at between three and five thousand.

Southern Diegueño economics involved a combination of hunting, gathering, and trade. Meat staples were derived from individual and group hunting of deer, mountain sheep, and rabbits. Vegetal staples were derived from the exploitation of a wide range of seasonally available wild plants. The primary wild plant food was acorns which are abundant enough

above 3500 feet to provide for both subsistence and trade. The relevant aspects of Southern Diegueño/Kamia trade have already been summarized.

Southern Diegueño social organization functioned on two levels. On the first level, the Southern Diegueño were organized into several patrilineal exogamous lineages. Each lineage was headed by a chief who acted as ceremonial and civic leader. His duties were to lead mourning ceremonies, provide social control through admonition, and lead the lineage in war. The position was hereditary except that community feelings were considered through informal processes. The primary functions of Southern Diegueño lineages were marriage regulation and the structuring of social relations. In addition, the lineage assumed all of the functions that were held at the tribal level in the Kamia social system. The major difference between Kamia and Southern Diegueño lineages was that Southern Diegueño lineages had control over summer territories. As in the Kamia, the basic unit of daily association was the extended family. In the Southern Diegueño, this was the second level of social organization.

The Southern Diegueño had a complex material cultural assemblage, but as with the Kamia the bulk of this assemblage would not be preserved in archaeological contexts. It would be represented in the archaeological record as stone tools, bedrock mortars, ceramics, and a few other non-perishable items. The main archaeological difference would be that the remains of major Southern Diegueño camps should still be recoverable.

In terms of seasonal movements the Southern Diegueño can be viewed essentially in the same manner as the Kamia. The Southern Diegueño moved in space and time from foothill winter camps to mountain valley summer camps. Spring was spent moving from foothills to mountains, exploiting serially available plant resources. These plants ripened in sequence as elevation increased, and the Southern Diegueño capitalized on this to pace their movement from winter to summer camps. Summer would be spent gathering, processing, and storing acorns and other resources available in high mountain valleys. Fall was spent in moving back to winter camps and transporting stored resources to these camps. Winter was a period of major ceremonies, equipment maintenance and manufacture, and trade with the Kamia. In the spring this cycle would be repeated.

This summary essentially portrays the Kamia as they were recalled by very old informants after 150 years of Spanish, Mexican, and American influence. The settlement pattern which the informants described involved a general base of operations at Xatopet, near the point where Alamo Slough leaves the Colorado River, south of the Algodones and near the Mexican boundary. This location, Xatopet, is precisely on the interface between the Cuchan (River Yuman) and Cocopa territories, two groups which were constantly at war in aboriginal times. This conflict pattern could have made living at Xatopet something less than desirable, at least in terms of security. It seems reasonable that occupation at Xatopet might have become a regular aspect of Kamia settlement patterns only after the subjugation of warfare between the Cuchan and the Cocopa. If this is actually the case, then the Kamia occupation of New River and adjacent regions in Imperial Valley may have involved more permanent settlements at some locations that were occupied the year round for as long as

the overflow from the Colorado Delta provided sufficient water for irrigation of crops. In either event, the Yuha study area would have been immediately to the west of the regularly occupied territory of the Kamia, and would have seen more intensive land use by Kamia in the course of gathering and trading activities.

# AN ETHNOHISTORY OF THE YUHA DESERT (1769-1865)

**Harry W. Lawton**

The Yuha Desert historically formed an inhospitable barrier—dry, bleak, and forbidding—between the Colorado River and the Pacific Coast. Nevertheless, this barren region of the lower Imperial Valley served as a hazardous gateway for thousands of missionaries, travelers, explorers, and settlers who after crossing the Colorado River were forced to traverse its sandy wastes to reach one of three main overland routes to coastal southern California (Fig. 4).

The best known and most traveled of these routes, particularly during the Mexican and early American period, was the Southern Emigrant Trail, sometimes also referred to as the Sonora Road, the Gila Trail, Cooke's Road, and the Butterfield Road. This route led across the Yuha Desert through the Carrizo Corridor to San Felipe Valley, where it then forked, one branch leading to San Diego and the other to Temecula, San Gabriel, and Los Angeles.

The second major overland route to the coast—the Anza Trail—led across the Yuha Desert, between the Fish Creek and Santa Rosa Mountains, through Borrego Valley, up Coyote Canyon between the San Ysidro and Santa Rosa Mountains, down into the San Jacinto Valley, and from there to San Gabriel. This earliest route of Spanish explorers, missionaries, and settlers appears to have been abandoned around 1785, although a number of unsuccessful efforts were made to reopen it.

The third remaining overland route was a trail pioneered in 1782 by Pedro Fages from San Diego across the Cuyamaca Mountains by way of Oriflamme Canyon and Mason Valley through the Carrizo Corridor and over the Yuha Desert.

In addition, there were a number of lesser used alternates of the three primary routes and a southernmost route that went by way of Devil's Canyon along old Indian trails to Jacumba and thence to San Diego. Much of this latter route today is followed by Interstate Highway 8. The southernmost route appears to have been used only intermittently by the Spanish and briefly as a stage route in the American period.

All of the routes from the lower Colorado River necessitated crossing the Yuha Desert. Although few emigrants appear to have perished in the desert crossing, the trail across the Yuha Desert was well marked by carcasses of animals, abandoned wagons, and other cast-off possessions throughout much of its history (Edwards 1961:12). While there were several watering places regularly utilized by travelers during the hundred-mile march from the Colorado River crossing, none of these were certain sources of a large water supply until one reached the mouth of Carrizo Wash. As a result, most emigrants plunged into the desert on a rapid forced march, which was not conducive to a leisurely observation of the region or its scattered inhabitants.

For this reason, even studied collectively, the surviving journals and diaries of travelers across the Yuha Desert provide only the most fragmentary picture of the Indians of the

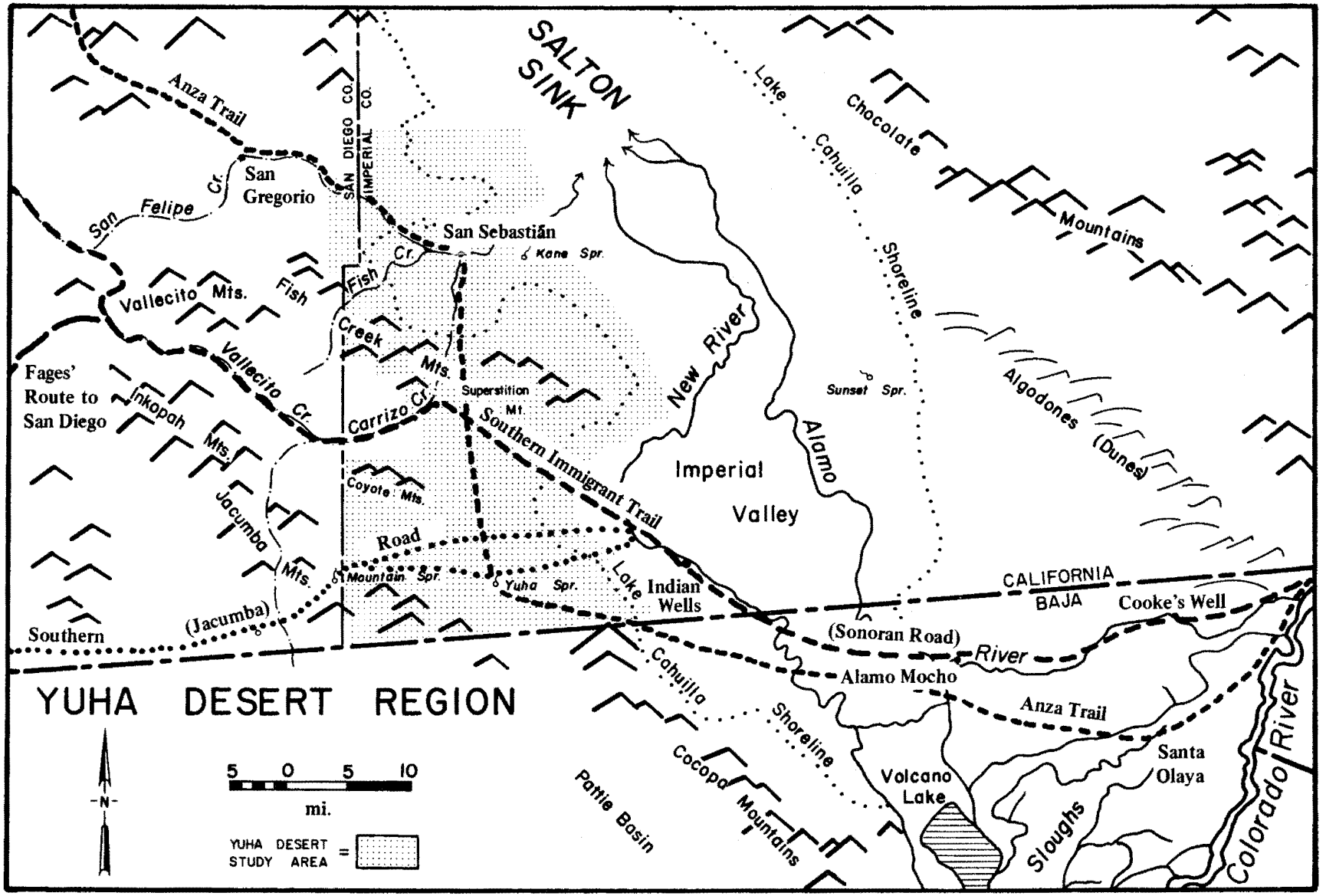


Fig. 4. Major historic routes across the Yuha Desert Region.

region and their movements. Not until late in the historic period was there any interest in turning away from the most direct routes across the Imperial Valley sink to explore adjacent areas, such as the breadth of the New River, where aboriginal settlement concentrations may have been heaviest.

No definitive account of all known crossings of the Yuha Desert has yet been attempted, although Edwards (1961) provides a relatively thorough study of travel along the Southern Emigrant Trail, accompanied by an excellent bibliography, which includes material relating to other routes as well. Weight (1948) presents a fairly comprehensive account of early crossings of the Colorado Desert. Significant commentaries on the desert crossings are also provided in introductory material and footnotes by Ralph P. Bieber in his *Southern Trails to California* (1937) and *Exploring Southwest Trails* (1938). Parker (1957:80-84) presented a brief chronology of the Anza-Borrego Desert, much of which relates to crossings of the Yuha Desert inventory area. Lindsay (1973) provided a detailed general history of the Anza-Borrego Desert, including a survey of the more important crossings of the Yuha Desert. Two significant ethnohistorical works on Indian groups of the Colorado River and adjacent regions are Castetter and Bell's *Yuman Indian Agriculture* (1951) and Jack D. Forbes' *Warriors of the Colorado* (1965).

The chronological ethnohistory presented here concentrates only on major crossings of the Yuha Desert region and those accounts by explorers, missionaries, soldiers, and emigrants which contain observations illuminating the culture or movements of Indian inhabitants of the region from Spanish contact to the middle of the nineteenth century.

## THE SPANISH PERIOD (1769-1821)

Between 1540, when Hernando de Alarcón reached the mouth of the Colorado River as part of the Coronado expedition to the north, and 1769 when Mission San Diego was established, a number of Spanish explorers and missionaries made contact with Yuman groups of the Colorado River, although none appears to have entered the Yuha Desert inventory area.

Alarcón reported sailing an estimated 85 leagues up the Colorado River in August, 1540, encountering a large Indian population engaged in farming along the river (Hammond and Rey 1940:124-155). Aschmann (1966:247) placed Alarcón's terminal point well above the Colorado-Gila junction and the head of the delta. Forbes (1965:88) identified it more specifically as the Pilot-Knob-Yuma area. Among about ten native groups along the river mentioned by Alarcón, Aschmann (1966:247) believed that the Quiquima may have been the Halyikwamai and the Coana possibly the Kohuana of later reports. Forbes (1965:96) made the same identifications and also speculated that the Cumanas of Alarcón may have been a small group of Kamia, then settled upon the river.

In September, 1540, Melchior Díaz, attempting to make contact with Alarcón's expedition, marched overland from Corazones in Sonora with a small party of soldiers and

some Indian guides (Hammond and Rey 1940:210-212). Reaching the Colorado River, Díaz traveled upstream, possibly as far as Pilot Knob or Yuma, where he found a message from a departed Alarcón, who had returned to New Spain after recording his expedition's discoveries. En route back to Sonora, Díaz accidentally ran into his own lance. He died about three weeks later and was buried in the wilderness by his soldiers.

Sixty-three years elapsed before the next Spanish expedition, led by Juan de Oñate, first governor of New Mexico, reached the Colorado River by way of Bill Williams Fork (Bolton 1948a:268-280). Traveling downstream, the Oñate party reached the mouth of the Colorado on January 25, 1605, and took formal possession of the region for the King of Spain. The large number of Indians and tribes encountered by Oñate–six villages of the Halyikwamais alone were said to include about 5,000 persons–stirred some interest in Mexico. In October, 1605, the Mexican viceroy recommended a presidio at the mouth of the Colorado, but his proposal was not followed up (Hammond and Rey 1953:1011).

Almost a century passed before the Spanish again returned to the lower Colorado River, although an occasional pearl-fishing expedition in the Gulf of California may have reached the river's mouth. By then the Spanish frontier had extended considerably in the north, and Spanish missionaries were active among the Pimas, Papagos, and other groups in Arizona. In 1701 and 1702, Father Eusebio Kino of the Jesuits made two missionary visits to the Colorado River region (Bolton 1948b). These expeditions convinced Kino that California was not an island, but a peninsula, and that a land route was possible between Sonora and Baja California.

With the establishment of Mission San Diego in 1769 and the beginning of a mission chain up the Pacific Coast, such a land route from Sonora became of vital importance. In 1771, Father Francisco Garcés, missionary at San Xavier del Bac near present-day Tucson, Arizona, followed Kino's old trail to the Yuma junction, and crossed the Colorado River near its mouth, believing it to be the Gila. Entering the delta country of Baja California, Garcés skirted the Cocopa Range to its terminus with Signal Mountain, below the international border near Calexico (Bolton 1930, I:31-32; Pourade 1971:12-13).

Looking northwest from the lower Imperial Valley into a blue haze, Garcés became the first white man to glimpse the Yuha Desert and two gaps in the distant sierras, which he believed might provide a land passage to New California. One of the openings Garcés sighted was the entrance to Borrego Valley, and the other may have been Sweeney Pass or even the more distant Carrizo Corridor (Pourade 1971:13-14). Garcés was already aware that Juan Bautista de Anza, captain of the presidio at Tubac on the Sonoran frontier, was interested in developing a land route to California (Bolton 1930, I:32). Upon his return to Arizona, he immediately contacted Anza, who on May 2, 1772 wrote to the Mexican viceroy requesting permission to open a road from Sonora to the Pacific Coast (Bolton 1930, I:33). Approval for the expedition was granted by Carlos of Spain on March 8, 1774 (Bolton 1930, I:41).

Credit for being the first European to enter the Yuha Desert, however, goes not to Anza,

but to Pedro Fages, captain commander at Mission San Diego, who had already reached the Imperial Valley plain from the west two years earlier in 1772 (Bolton 1931:209-219). Fages left no observations of the Yuha Desert or its inhabitants. His account of his discovery is confined to a few sentences in a note appended to his 1772 diary, which was written on November 27, 1773. The relevant sentences in the note are as follows:

> Last year coming from San Diego in pursuit of deserters, I went and struck the plain fifty leagues toward the east. Lack of water forced us into the sierra, but, when we were parallel with the mission of San Gabriel, we went about fifteen leagues to strike the plain again; and we went along the plain toward the north, keeping close to the sierra, on account of the water, travelling for about twenty-five leagues, until we reached the pass of Buena Vista . . . [Bolton 1931:219].

Bolton assumed that in turning back from the Yuha Desert into the sierra, Fages entered Borrego Valley, crossed the San Jacinto Mountains through Coyote Canyon, and struck the San Jacinto Valley. He noted that in 1774 Anza found signs of horses in Borrego Valley and Coyote Canyon, which may have been left by either Fages or the deserters (Bolton 1931:214). Although Bolton's interpretation of Fages' route after leaving the plain poses some unresolved geographical problems, there is no doubt that the Spanish soldier was the first white man to enter the Yuha Desert.

Meanwhile, between the first glimpse of the Yuha Desert by Garcés and approval of Anza's expedition, the first Christian—although not a European—had already pioneered the land route that Anza would take and crossed the Yuha Desert. He was an Indian runaway from Mission San Gabriel, and according to Father Francisco Palou he was a native of Santa Gertrudis Mission in Baja California, who had been taken north with the Portolá expedition (Bolton 1926, III:136-137). Weary of mission life, Sebastian Taraval had fled with his wife and another Indian in August of 1773. The three had crossed the mountains near Coyote Canyon, descended the Borrego Valley, and made their way as far as the Indian village of San Sebastián at the San Sebastián Marsh (near Harper's Well). They then tried to reach the Colorado River over the Yuma Sand Hills (the Algodones). Taraval's wife died of thirst in the dunes, and Taraval and his male companion staggered on to the Yuman villages on the Colorado. In December, 1773, Taraval was taken by Captain Salvador Palma, a Yuman leader, to Altar, where Anza was in the midst of outfitting his expedition. The Indian runaway was pressed into service as a guide (Bolton 1930, III:65; Forbes 1965:149-150).

The first Anza expedition (1774-75), made up of thirty-three members, including Father Garcés, set out from Tubac on January 9, 1774, arriving at the Colorado River a month later, where friendship was established with the Yumans, who swore fealty to the Spanish crown (Bolton 1930, I:65).

A direct route from Yuma to the northwest was ruled out by the sand dunes in which Taraval's wife had perished. As a result, Anza was forced to descend the Colorado River into Baja California to the Laguna de Merced, turn west to the well of San Jacome (already visited by Garcés), cross the Cocopa Mountains, and then travel along the dry Laguna Salada

to reenter Imperial Valley west of Signal Peak. Anza's route then lay north to the wells of Santa Rosa de las Lajas (near Yuha Well), on to the village of San Sebastián at the confluence of San Felipe and Carrizo Creeks, west six leagues to the village of San Gregorio (Borrego Springs) and on up the Borrego Valley another six leagues to the village of Santa Catarina (the lower willows of Coyote Canyon). The expedition then ascended Coyote Canyon to the Pass of San Carlos, descended to the San Jacinto Valley, and continued on to Mission San Gabriel, arriving on March 22, 1775 (Bolton 1930, I:67-101).

Anza's diary makes no mention of any Indians encountered between the vicinity of Yuha Well and the village of San Sebastián, although a number of Indians were encountered south of the present international border. At San Sebastián, the expedition found a large marsh with much pasturage, and a fair-sized running spring. Anza described the village and its inhabitants as follows:

> Here we found a small village of mountain Indians, who took flight, abandoning all their little possessions, which I did not permit anyone to touch. I had the native of California [Taraval], our guide from here foreward, go to overtake someone. He went after them and brought a woman to my presence, and I gave her beads and tobacco, telling her that she should call her friends, with assurance that no harm would be done to them and that it would be good for them to accept our gifts. She did so, and at three o'clock in the afternoon seven men came, although with much perturbation, and I gave them the usual presents. Among them was the chief of this village, which the native Californian [Taraval] says consists of more than four hundred persons when they are all together, as he observed when he made his journey through this place, where he was given good hospitality by the ruler mentioned, whom we shall call "Captain," and who celebrated seeing the Californian with special demonstration [Bolton 1930, II:82].

After nightfall more of the Indians returned, and Anza made them embrace two Yumans who had accompanied him "and with whom they are continually at war" and agree to cease all hostile relationships (Bolton 1930, II:82). The San Sebastián Indians, whom Anza termed "Serranos," broke their "few arrows" as a sign of peace toward the Yumans. A further description of the San Sebastián people followed:

> These mountain Indians are called by those of the Colorado River Jahueches and also Caguenches and Ajagueches. They say that they are as numerous as the Yumas. They live ordinarily in the mountains, subsisting on the mescal which abounds, and on seeds, supplemented by some deer hunting. They have no crops and no opportunity to plant them, for lack of water and lands. They are a naked people. They are of ordinary height, like those farther back, but less robust. With regard to the rest of their bodies they are like the people of the Colorado River. They are superior to these in the greater abundance of bows and arrows, although of the worst kind of construction, whereby they are seen to be equal. In spirit they appear to be more cowardly than the Yumas. They possess no horses, and they are so afraid of the Yumas that they are terrified even when they hear a horse whinny. They wear

> their hair short without adornment. In color they are very black and their features are very ugly.
>
> Their language is related somewhat to the Yuma tongue; indeed, I noticed that they understand each other to some extent, although the language of these people of whom I am speaking is very rapid and extremely explosive. Their settlements extend from the mountains which begin at the place where the Colorado River empties into the Gulf of California and run from south to north beyond the place where we are. Their women wear, to cover themselves from the waist down, a skirt like those of the Yumas, with the difference that those which these wear are of thread, which they get from the leaves of the mescal, like that which is called in the kingdom *de arria*. They have the ugliness which is usual with all the rest of the Indians [Bolton 1930, II:83-84].

Garcés in his diary noted that in addition to a well (Anza said "spring") at San Sebastián, there was also a little lake. He reported that the greater part of the Indians at the village recognized him, and that they were the same Indians he had observed at San Jacome in Baja California three years before. They had abandoned that village for lack of water (Bolton 1930, I:96; II:334). Garcés adds a few details of description not given by Anza:

> The Cajuen Indians who live away from the river are ordinarily small of body and weak. They make some guaraches, or sandals of mescal fiber, and some nets with which they bind now the head, and now the stomach. Some wear their wigs, while on the river many go bald. They also carry a macana of the shape of a sickle [rabbit sticks]. These Indians inhabit the whole sierra which runs from here to the mouth of the river and extends, as I have said, as far as the Gulf [Bolton 1930, II:341].

In a third diary, Father Juan Díaz of Caborca Mission, noted that the San Sebastián people "live on mesquite beans, together with the mescal which they bring from the sierra, and the rabbits which they hunt, which for them is very easy [Bolton 1930, II:280]."

On March 11, the Anza party headed west toward the mountains, and the following day after going up San Felipe Creek entered Borrego Valley from the southeast. East of the Borrego Sink and near the foot of the badlands, they camped at Borrego Springs, which they named San Gregorio. Here they encountered "sixty heathen," who were hunting (Bolton 1930, II:86). Taraval observed that these Indians spoke the language of San Diego. Of the three diarists, Garcés provided the only description of the people of San Gregorio:

> Going west-northwest and through small hills we came to a valley, and after passing a red hill we halted, having traveled five leagues, at some wells and salty marshes called San Gregorio, a place which has much pasturage and is in a very narrow valley between two ranges. To this point came many Cajuenches, and here we saw another tribe. These Cajuanches do not paint themselves as much as the Yumas. With their macanas they are accustomed to kill many rabbits and some deer, with whose skins the women cover themselves behind, but in front they wear aprons of the fiber of *arria*, made of the inner bark of trees. These multitudes of fibers some wear like a net and others loose, but all cover

> themselves well, and even the little girls three years old or even infants are never seen naked. In these regions the women use the nets to carry wood, herbs and the ollas in which they carry water, and also to carry their little children. The men build corrals with the nets, stakes and flat rocks, and, driving the game from long distance toward a corral, they kill it in abundance. Since these mountain Indians eat much mescal and in some parts the roots of the tule, their teeth are very badly decayed and damaged. Some carry a lance with a good point, which appears to be a weapon for war, and even the women carry poles that are shorter and thicker. They eat a great quantity of wild onions, which abound in these parts. Although these Cajuenches are not such people as the Yumas they are friendly and more timid [Bolton 1930, II:341-342].

Northwest of San Gregorio five leagues, the Spaniards came to the place they called Santa Catarina, which was at the Lower Willows, just at the lower end of Collins Valley. At this point they had entered Cahuilla territory, and Garcés noted that although they saw a few "Cajuenches" these people spoke a distinctly different language. Beyond this point the march up Coyote Canyon would begin, and we are well outside the Yuha Desert inventory area and adjoining regions relevant to this ethnohistory.

Because of a limited supply of food at Mission San Gabriel, Father Garcés and a number of soldiers returned to the Colorado River, leaving early in April, while Anza and an escort proceeded to Monterey. On their return journey, Indians killed one of their horses for meat. Garcés carved a warning note to Anza on a willow tree in the Canyon. From San Sebastián, Garcés made a shortcut across Imperial Valley, stopped at Kane Springs, which he named San Anselmo, and reached Santa Olaya on April 24, having managed to cut nineteen leagues off the journey (Bolton 1930, II:356-357).

On May 3, 1775, Anza left San Gabriel on his return trip. Near Santa Catarina, Indians fired upon his riding animals and three were slightly wounded by arrows (Bolton 1930, II:227). Anza's men captured four of the Indians, and administered a beating to "the most guilty one." At the Lower Willows, Anza found Garcés' warning. Anza's continued journey across the Yuha Desert was uneventful, and no new information on Indians of the region was recorded.

Anza's opening of a land route to California was received with great enthusiasm in Mexico City, and plans were quickly developed for strengthening New California by sending colonists over the Yuma route (Bolton 1930, I:133-154). On October 23, 1775, a second Anza expedition, consisting of 240 persons and over one thousand animals, began its march from Tubac. In the party were Father Garcés, Father Tomás Eixarch, Father Pedro Font, Sebastian Taraval, and three other Indian interpreters. The crossing of the Colorado River was completed on November 30, and Fathers Garcés and Eixarch, Taraval, and several servants and muleteers were left under Captain Palma's protection at the Yuma village, where the priests planned to begin missionary labors (Bolton 1930, I:187).

The expedition then continued on to Santa Olaya, where it was split into three divisions.

On December 9, the first division, which was led by Anza, began its march toward the Yuha Desert, followed by a second division led by Sergeant Juan Pablo Grijalva, and the third division led by Lt. José Joaquín Moraga. The march north was made under unusual weather conditions for Imperial Valley through storms with heavy snowfall even on the desert. On December 11, the Spanish opened six wells at Santa Rosa de las Laxas (the arroyo at Yuha Well). After leaving the rich farming lands at the Yuman village of Santa Olaya, the Spanish encountered no Indians in their march northwestward across the heart of Imperial Valley until they reached the village of San Sebastián at the junction of San Felipe and Carrizo Creeks. Here, Father Font noted that there was a spring with rather "hot or warm" water and nearby a "ditch which is very miry, with the worst kind of water and very injurious." His own description of the Indians of San Sebastián follows:

> Here live a few mountain Indians called Jecuiches, who, I should judge from what I saw, must be about twenty or thirty souls. They are very miserable, hungry, weak, emaciated, and of degenerate bodies. They came out to see us when we arrived, although when they saw the soldier who went ahead of us as guide they started to run; but they stopped when they saw that the soldier was calling them. With the cold which is experienced here, it is a surprising thing to see these Indians naked, and so hardy that in the morning the first thing they do is go and bathe at the spring, as we have seen. They use bow and arrows, although the latter are few and inferior. They have another weapon, a sort of *macana*, which is made of hard wood, thin, about three inches wide, shaped like a crescent or a sickle, and about two-thirds of a vara long. With this stick they hunt hares and rabbits, throwing it in a certain way and breaking the animals' legs. They are accustomed to hunt them also with nets which they have, made of a thread very well spun and so soft that it appears like hemp; but I was not able to learn or understand how they make it, for lack of an interpreter, for their language is different from that of the Yumas, although somewhat similar to that of the Cajuenches, as it seems to me.
>
> For food they have now and then a jack rabbit, when they catch one, for they are not plentiful, and sometimes mescal, which they go to hunt far away in the sierra; but regularly they live on the beans of the mesquite, and the tule which grows in the lagoon of the spring, for which reason their teeth are very black and rotten. They are so hungry that, with the dirt and everything, they gathered up in a hurry some grains of maize which remained on the ground from that which was given to some mules. These Indians, who I think must be of the Quemeya tribe, according to what Father Garcés said, and those which I afterward saw at the Pass of San Carlos, appeared to me the most unhappy and unfortunate of all people that I have seen [Bolton 1930, IV:130-132].

Considerable confusion obviously exists as to the identity of the Indians at San Sebastián and the size of the village. Anza had understood from the chief of the village on his first expedition that it consisted of "four hundred persons when they are all together" (Bolton 1930, II:82). The diarists on the first expedition had considered these Indians to be "Cajuenches" (various spellings), which is a Spanish corruption of K'win, the Maricopa term

for Kohuana (Forbes 1965:345; Kroeber 1925:798). Font refers here to them as Jecuiches, now known as Cahuillas (Kroeber 1925:692-708), but also suggests they may have been of the "Quemaya tribe," which indicates they were Kamia or Southern Diegueño.

On December 15, some Indians from the Santa Rosa Mountains came to San Sebastián and visited with the Spanish, managing to steal three horses. Sergeant Grijalva and four soldiers pursued them to two villages about four leagues away on the eastern slopes of the Santa Rosas, where two horses were found hobbled and one tied to a mesquite tree. The Indians of the villages denied any thievery, insisting the horses had come there alone (Bolton 1930, IV:134-136).

On December 18, the Anza expedition set out from San Sebastián, and after going about two leagues came to an abandoned Indian village, apparently on a flat just west of the marsh of San Sebastián (Bolton 1930, IV:140). Neither the Anza nor Font diaries mention encountering any Indians at the well of San Gregorio or at the spring of Santa Catarina during the next two days of march, before the expedition began the ascent of Coyote Canyon and on to Mission San Gabriel. The return journals of Anza and Font also provide no additional details of ethnohistoric interest.

Anza in delivering his colonists safely had almost doubled the population of Alta California and pioneered a land route which would be used by at least 300 colonists in the next five years (Pourade 1971:197). Although they left no record of their crossing of the Yuha Desert, a second contingent of settlers from Sonora, made up of 30 families and 35 soldiers led by Lt. Diego Gonzales and sub-lieutenants Cayetano Limón and José Darío Argüello, arrived at Mission San Gabriel on July 14, 1781 (Bancroft 1886, I:341-343; Beilharz 1971:114). Limón, with his nine soldiers, immediately turned back for Sonora by way of the Yuma crossing. On August 18, 1781, another group of settlers from Sonora arrived at Mission San Gabriel, where they were quarantined for some time, some of the children having recently recovered from smallpox (Bancroft 1886, I:343). A Spanish census taken in 1790 showed that up to 50 percent of colonists up to that time had reached California by the Anza Trail (Lindsay 1973:51).

To assure that the Anza Trail would remain open, two mission outposts were established along the Colorado River. The pueblo of La Purisma Concepción was begun late in 1780 on the west bank of the Colorado River near the Gila junction, followed soon after by a second pueblo, San Pedro y San Pablo de Bicuñer, about five leagues down river (Bancroft 1886, I:358-359).

Cruelty towards the Indians by the settlers and damage done to their native food supply appears to have precipitated a rebellion of the Yumans on July 17, 1781 (Forbes 1965:199). The Yumans destroyed the missions, killing settlers and soldiers, and four priests, including Fathers Garcés and Díaz (Bancroft 1886, I:361-365). Limón and his nine soldiers, returning from San Gabriel across the Yuha Desert, stumbled upon the blackened ruins of Concepción. His own party was attacked on August 21, and two men were killed

and Limón and his son wounded. Limón and the survivors then made their way back over the Anza Trail to San Gabriel with news of the disaster (Bancroft 1886, I:365; Beilharz 1971:115; Forbes 1965:205-206). On their journey back, they found the Indian village of San Sebastián deserted, which led Governor Felipe de Neve of California to the apparently unfounded speculation that the San Sebastián Indians had joined the Yumans in the uprising (Forbes 1965:205-206).

On September 9, 1781, a council of war was held by the Spanish at Arizpe, Mexico, and it was decided to send a punitive force of 100 soldiers under Lt. Col. Pedro Fages and Captain Pedro Tueros against the Yumans (Priestly 1913:135; Rensch 1955:195). At the Colorado River, Fages succeeded in two separate trips in ransoming women and children captured by the Yumans and in recovering the bodies of the priests. He was then ordered to go to Mission San Gabriel to discuss future military actions with Governor Neve. In January, 1782, Fages and 40 soldiers set out for San Gabriel by way of the Anza Trail (Rensch 1955:195).

Fages' diary records no encounters with Indians on the Yuha Desert until he arrived at the village of San Sebastián on March 15 (Priestly 1913:73). At the village, the native captain, named Pachula, came to visit Fages with a few Indians, and presented the expedition with some mescal. Fages writes:

> I gave them some beads, and distinguished the captain and his son, a boy, by giving them baize with which to clothe themselves; and they offered to accompany us with several natives as far as the mission of San Gabriel. To this I would not consent unless Pachula and his son should join us with two other natives who said they wanted to go with us as far as that mission [Priestly 1913:73].

Fages' entry suggests that by 1782 there was considerable awareness of mission activities on the Pacific Coast among Indians of the interior, and indicates that the existence of Mission San Gabriel was well known to the Indians at San Sebastián. Accompanied by Pachula and three natives, Fages continued on uneventfully over the Anza Trail to Mission San Gabriel, arriving on April 2, 1782 (Priestly 1913:79).

Governor Neve after conferring with Fages determined that summer rains and high floodwater on the Colorado would make a campaign against the Yumans impossible until September. Once again, Fages followed the Anza Trail to the Colorado River, where he delivered this message to Captain Tuero, who had remained on the defensive there with 40 men (Beilharz 1971:126). No mention of encounters with Indians on the Yuha Desert occur in Fages' account of this journey (Priestly 1913:79-87). Lindsay (1973:51) is of the opinion that this may have been the last time in the Spanish era when the Anza Trail was used.

On April 14, 1782, Fages started back for Mission San Gabriel from the ruined village of Concepción. This time, however, through a sudden change in plans, he was to discover the Carrizo Corridor—and thereby a new route that would eventually replace the Anza Trail. On

April 17, Fages arrived at San Sebastián after an uneventful crossing of sixty waterless miles of the Yuha Desert. His decision to turn off at this point from the Anza Trail came about as follows:

> Hearing that the Indians in the mountains about San Diego were in a state of semi-insurrection, I thought I might observe their movements and make them feel some respect if I should change my route and pass through their territory on my way [Priestly 1913:91].

Accordingly, Fages' party left the village of San Sebastián and turned south along the wash of Carrizo Creek for five leagues. At the mouth of a dry canyon with some pasturage, Pachula, captain of the village of San Sebastián, and 30 of his followers, joined Fages and asked to accompany him to Mission San Gabriel. The natives were all armed and Fages was reluctant to have them join him:

> . . . . I therefore had the interpreter persuade Pachula that it was not convenient to have him go farther, because on his return, the Camillares Indians of the mountains would kill him and all his people, since they were enemies. I also represented to him that we were not going to the mission, but to embark at San Diego. This displeased them all, especially Pachula, who threw down his cane as if offended, saying he no longer wanted to be captain. I again began to persuade him affectionately through the interpreter, that all I had said was for his good and because I loved him very much; but as he insisted that it was only to keep them going in our company (which was true), I told him that he might go by the other road, which he knew from having gone over it with me before. By these words, I was able to convince him, and he went back from there to his village with his natives. For this reason, since I had left three soldiers behind with some horses, it became necessary to leave here four more to watch the movements of the Indians, to join the three first, and later to follow our trail into camp with the latter [Priestly 1913:92-93].

Anza on the basis of an inquiry by Taraval had fixed the population of San Sebastián at about 400 in 1774. Font in 1775 placed it at about 30 persons. Fages said Pachula was accompanied by 30 "of his warriors," suggesting there may have been more. Allowing for women, children, and old people, the village of San Sebastián in 1782—simply on the basis of 30 warriors and quite possibly the "of" signifies more—would appear to have had a population of at least 150 to 200 persons.

The passage quoted above also suggests Pachula and his men had never been to Mission San Gabriel, except for the ones who made the March trip with Fages, and who learned the route on that journey. At the same time, the passage hints that Spanish authority may already have superficially extended onto the Yuha Desert. Pachula throws down his cane (ceremonial staff?), and threatens to resign his captaincy—which implies that particular office was confirmed upon him by the Spanish. Why otherwise should Fages be threatened? One can only conclude that presently available Spanish records provide only a sketchy picture of relationships with the Indians of the interior.

After a two hour rest, Fages and his men marched six leagues west through the Carrizo Corridor, where he discovered the first palm tree oasis (*Washingtonia filifera*) yet found in California. This oasis, which Fages named Three Palms has since vanished, and its exact location has become a subject of considerable controversy (Rensch 1955:197-198; Edwards 1961:47-49). On April 18, Fages continued the march from Three Palms up Carrizo Corridor, where he found a second oasis with three or four palms. Edwards (1961:49) identified this as the present Palm Springs. A few miles beyond, Fages found another spring, which appears to have been the present Agua Caliente (Edwards 1961:49). Fages then continued on six leagues to the place he named "San Felipe" (later known as Vallecito), where a halt was made for the night. This site was to become an important stopping-place on the San Diego road through Cuyamaca and on the Sonora Road from Los Angeles. Much later it was a station for the San Antonio-San Diego mail route (1857-1861) and the Butterfield Stage (1858-1861).

The next day Fages and his men set out through a region of maguey plants (*Agave deserti*), which have thrived in this area for hundreds of years as a food and vegetable fiber used by Indians (Rensch 1955:199), and after one league rounded a small rock pass (La Puerte Grade), which leads into Mason Valley. At the north end of Mason Valley, Fages' party finished their journey through the Carrizo Corridor, turning west at what was to become the junction of two major roads after 1826, the Sonora Road to Los Angeles, which turned east into Box Canyon, and the San Diego route, which went west by an Indian trail over the Cuyamaca Mountains to San Diego (Rensch 1955:199). About a league before entering Oriflamme Canyon and beginning the ascent through the Cuyamaca Mountains, however, Fages passed a "large village of Camillares Indians" situated on a plain with numerous springs (Priestly 1913:95). The term "Camillares" was applied by the Spanish to Kamia or Southern Diegueño groups.

In the face of continuing hostility from the Yuman Indians, the Spanish made a number of efforts to open a safer route to the Colorado River (Bancroft 1886, I:454). In May, 1783, Second Lt. José Velásquez made a reconnaissance eastward from San Diego to the summit of the coast mountains, where he found the route impracticable, and returned after an absence of four days (Bancroft 1885, I:454). Then in April, 1775, Fages, accompanied by Velásquez, made a similar reconnaissance seeking a more southerly route to the Colorado River that might pass below the territory of the Yuman Indians (Bancroft 1886, I:454; Pourade 1961, II:60-62; Forbes 1965:222-225). This journey took them into the Jacumba Valley and then southward a considerable distance into Baja California before they picked up the Anza Trail near the U.S.-Mexican border in Imperial Valley. They returned to San Diego by way of the Carrizo Corridor route, which Fages had pioneered three years earlier.

A translation of the diary of this expedition, kept by Velásquez, has yet to be published. The best summary of the Velásquez diary is presented by Forbes (1965:222-225), but it offers few details of ethnohistoric interest about the return trip across the Yuha Desert. Forbes does note, however, that when the Spaniards reached the San Felipe rancheria, Fages dispatched Velásquez and 12 soldiers back to the rancheria of La Palma (four leagues west

of San Sebastián), where they skirmished with a group of Indians and exacted retribution from them for allegedly killing a Spanish deserter (Forbes 1965:224-225). The deserter, José Hermenegildo Flores, later reached the Colorado River safely in 1779 (Forbes 1965:225).

One entry in the Velásquez diary, translated by William Mason, may add to our knowledge of aboriginal agriculture west of the Colorado River (Bean and Lawton 1973:xvi). About 20 miles south of Jacumba in northern Baja, Velásquez climbed a hill to observe the desert plain and noted smoke in the distance at the base of some mountains. He was told by his Indian guide that this was a village where the natives planted wheat. Although wheat is a European introduction, it had reached the Colorado River and was being grown by Yuman Indian groups there about three-quarters of a century before the establishment of Mission San Diego (Castetter and Bell 1951:123).

Efforts to reopen overland connections with Sonora ceased in August of 1786, when the Spanish government decided too many hazards were posed by continuing warfare with the Yumans along the Colorado River and Apaches in Arizona and Sonora (Forbes 1965:225-226). Instructions were issued to the provinces specifying that "without very urgent motive" no further communication was to be made by land between Sonora and California (Gálvez 1951:58).

In 1795, Captain Juan Pablo Grijalva and Father Juan Mariner, exploring the interior northeast of San Diego in search of new mission sites, penetrated the Valle de San José (Warner's Valley), where a number of Cupeño and Southern Diegueño villages were visited (Hill 1927:27-33). The explorers stopped short of discovering the valley of San Felipe to the east, which was all that was needed to link the Corrizo Corridor with Warner's Pass.

The next crossing of the Yuha Desert occurred in October, 1796, when José Joaquin Arrillaga after exploring northern Baja California continued north from the Laguna Salada basin across the Yuha Desert to the vicinity of San Sebastián. From there he went on to Vallecito (Fages' "San Felipe") and then crossed the Cuyamaca Mountains to San Diego (Arrillaga 1969).

Arrillaga's journal provides no information about the rancheria at San Sebastián. Instead of visiting the village, he turned up Carrizo Creek, where after a five hour march he left the arroyo and "stopped in a nook where there was a rancheria of from six to eight small houses [Arrillaga 1969:95]." The Indians immediately took flight, although Arrillaga eventually persuaded an old man, two old women, and two young boys to come down from the hills and accept a meal and gifts. At five in the afternoon, Arrillaga's party reached Vallecito ("San Felipe"), which he described as follows:

> . . . . There are several small houses of gentiles in this place. Eight of the gentiles came this afternoon, and they remained until the first hours of the night when, after giving them pinole and cigarettes, they were sent away. San Felipe has a small spring, which can be sufficient

> only for a small vegetable garden. It forms a flat area about a half league in length and the same in width, all surrounded by high hills [Arrillaga 1969:96].

Between Vallecito and San Diego, Arrillaga encountered a number of other rancherias, but his account is too indefinite to pin down their exact locations. In general, his journal provides little material of ethnohistoric interest, although he did establish that there was extensive contact between the Yuman Indians of the Colorado River and Diegueño groups of northern Baja California (Forbes 1965:232).

From the Arrillaga expedition of 1796 until the end of Spanish rule in California in 1821, the overland route to the Colorado River across the Yuha Desert remained closed and only occasional contacts were made with Indians of the desert interior or the Yumans of the Colorado River. Forbes (1965:237-243) summarized those contacts which did occur, but none of them relates to the Yuha Desert inventory area or immediately adjacent regions.

Meanwhile, during the last years of Spanish rule, the missions began extending their influence into the interior valleys of southern California, moving outward to the edges of the Colorado Desert. Significant steps toward eventual reopening of a trail to the Colorado River were the establishment of a ranch at San José (Warner's Hot Springs) and the founding in 1818 of an assistencia or branch mission at Santa Ysabel, which also attracted converts from the rancheria of San Felipe in San Felipe Valley (Englehardt 1920:169-170).

## THE MEXICAN PERIOD (1821-1848)

In 1821, a Cocomaricopa chieftain, interested in trading for beads and cotton, arrived at Mission San Gabriel with a few companions, having traveled from a rancheria six days journey from Tucson (Bean and Mason 1962:8). His trip took him by a new route through the San Gorgonio Pass, which became known as the Cocomaricopa Trail. Although he brought with him a recommendation from the commandant at Tucson, he was sent back as quickly as possible after being questioned about conditions along the Colorado River and given to understand that such visits to California were not desired (Bancroft 1886, I:442). In Mexico, however, there was renewed interest in restoring the land route to California (Bean and Mason 1962:6-8). In May of 1822, when oaths of allegiance were submitted by California officials to the new Mexican administration, they were sent via the San Gorgonio Pass route by José Cocomaricopa, the Indian chieftain who had appeared at San Gabriel the year before (Bean and Mason 1962:9). This route missed the Yuha Desert inventory area entirely, skirting the basin of the present Salton Sea, turning eastward across the Colorado Desert through the mountains, and finally crossing the Colorado River near the site of the present bridge between Ehrenberg and Blythe (Beattie 1951:14).

In September, 1822, Lt. Col. Antonio Narbona, Civil Governor of Sonora, ordered Captain José Romero to set out with a force of 60 men to investigate the establishment of a mail route to Alta California (Bean and Mason 1962:8-9; Beattie 1951:18-20). Romero's first expedition of 1823-24 took him through the San Gorgonio Pass into the Coachella

Valley and far out on the Colorado Desert, where after six waterless days he was forced to turn back to Mission San Gabriel (Bean and Mason 1962:29-51). On a second expedition (1825-26) Romero succeeded in reaching the Colorado River, but events had already swung against the desirability of the Cocomaricopa Trail as an official mail road (Bean and Mason 1962:81-91).

Between Romero's first and second expeditions, Santiago Argüello, an officer of the San Diego presidio, discovered the San Felipe Valley—the final link between the Carrizo Corridor and San Jose Valley—while chasing Indian horse thieves to the Colorado River (Beattie 1951:19-20). This southern route was immediately recognized as the most practicable trail between Sonora and California. It involved following the Anza Trail from the Yuma crossing only as far as Carrizo Creek, then turning westward through the Carrizo Corridor to Vallecito. At the north end of Mason Valley, one could strike out over the Fages' route through the Cuyamaca Mountains for San Diego or turn north through Mason and Earthquake valleys into San Felipe Valley with its gradual ascent from the desert to San José (Warner's Hot Springs) and thence north to Temecula, finally once again returning to the Anza Trail to Mission San Gabriel (Lindsay 1973:54).

In November, 1825, when Romero's second expedition reached the Colorado River, his engineer, Lt. Romualdo Pacheco, was dispatched from Yuma to San Diego to reconnoiter the newly discovered Fages-Argüello route. Pacheco reported in favor of it, and the Sonora Road—as it came to be called by the Mexicans—was soon afterward established as the official mail route (Beattie 1951:20).

Intermittent Indian disturbances continued to present problems, however, although the Yuma Indians, fearing the Cocomaricopas to the north would benefit if a San Gorgonio Pass route were established, had announced they would welcome Mexican use of the Yuma crossing (Lindsay 1973:54). In December, 1825, Pacheco attempted to establish an outpost at Laguna Chapala (possibly on Fort Yuma Hill), which was abandoned after an Indian attack on April 1, 1826 (Bean and Mason 1962:83; Forbes 1965:248). The new route was also endangered by the outbreak of warfare between Indians of the desert and Indian groups of Santa Ysabel, San Felipe, and the Valle de San José, all of whom were Mexican allies (Forbes 1965:249-250). On April 5, Second Lt. Juan Maria Ibarra and a group of Indian allies attacked about a hundred of the desert Indians near San Felipe, killing 28 of them (Forbes 1965:249). In another of a number of skirmishes, a group of desert Indians from Vallecito went to San Felipe ostensibly to propose friendship and commerce (Bean and Mason 1962:83). Suspecting treachery, the captain of San Felipe and his warriors killed three of the desert captains and 15 of their men.

A number of researchers, including Bancroft (1886, II), Beattie (1951), Bean and Mason (1962), and Forbes (1965), have summarized the hostile state of affairs existing on the Colorado Desert in the 1820s, but the Mexican reports and documents covering this period have yet to be published. Undoubtedly, there is some fresh ethnohistorical data to be gleaned from these sources going beyond a broad rendition of Indian and Mexican hostilities and alliances.

Although the Sonora Road became an official mail route, it was badly marked, travel was often interrupted by Yuman hostilities, and it was scarcely known outside of California. In 1831, a trapping party from New Mexico led by David E. Jackson could find no one in Tucson or Altar who knew the exact route to California (Lindsay 1973:54). Most of the fur-trading expeditions, which began entering California in the 1830s, came by way of the Old Spanish Trail over Cajon Pass. The fragmentary reports which exist on travel over the Sonora Road up until the outbreak of war between the United States and Mexico in 1846 provide no new descriptions of the Yuha Desert inventory area.

The first American to reach the Pacific Coast by land—presumably after crossing the Yuha Desert en route—appears to have been Richard Campbell, who claimed to have made the journey from Santa Fe in 1827 (Maloney 1939:347-354). In 1831, a trapping company led by David E. Jackson, which included Jonathan Trumbull Warner, who was later to acquire the Valle de San José and profit from hordes of American emigrants to California, reached San Diego from Santa Fe via the Sonora Road (Warner 1907-1908:183-184; Hill 1927:93-111).

In 1832, a British botanist, Thomas Coulter, who had arrived in Monterey by sea, crossed the Yuha Desert by way of the Sonora Road to the Colorado River and returned. Coulter (1951) collected various plants in San Felipe Valley and noted "the rapid decrease and approaching annihilation of the Indians." In 1834, Rafael Amador made a record 48-day trip over the Sonora Road as a courier from Mexico City to Monterey, despite the fact that his horse and possessions were taken from him at Yuma by the Indians (Bancroft 1886, III:271).

Forbes (1965:268) reported that between 1835 and 1845 a number of groups of Sonorans reached California by the Yuma route, and speculated that their use of the Sonora Road was the result of an extension of Mexican settlement toward the Colorado River after the discovery of mineral wealth in the Papaguería in 1834-35. By 1835, he noted, a number of Sonorans were also living in the San Diego region and elsewhere in California. In addition, Forbes (1965:268-269), working from Mexican California archival sources, also recorded the use of the Sonora Road in this period by many Indians and Californios.

In 1837, during the midst of the civil rebellion in southern California against Governor Alvarado, a number of Indian uprisings occurred, probably spurred on by the knowledge on the part of the Yumans, Diegueños, and other groups that Mexican forces were split in dissension. In April, the rancho of Don Pío Pico, about 25 miles southeast of San Diego was attacked, five men were killed, and a woman and two girls taken prisoner (Ellison and Price 1953:64-68; Pourade 1963, III:29-31). In pursuit of the Indians, the Mexicans made their way into the mountains along the Indian trails that led to Jacumba (and eventually across the Yuha Desert to the Colorado River). The Mexican pursuers were ambushed in a narrow defile in the mountains, but fought their way free with the help of 200 friendly Indians who had learned of their situation from spies (Ellison and Price 1953:67). The woman and two girls who were captured were never rescued.

In February, 1839, a party of Mexicans, which included Antonio Coronel, made their way to Sonora, accompanied on part of their journey by an Indian interpreter, Captain José el Tuerto of San Felipe. Forbes (1965:269-270) summarized the events of this journey from several sources. In the Imperial Valley at Pozo de los Indios (Indian Wells), the travelers encountered 300 Indians, who had paint all over their bodies, wore feathers on their head, and were armed with bows and arrows. Among Indian leaders present at the gathering were Captain Charagüe of the Yumans; Guatabolote el Tuerto, captain of the Mohaves; Captain Coyote of the Kohuanas; Captains Martin Cartucho and Piedras Negras of the rancherias "de la Boca del río"; Captain Francisco of the rancherias of Baja California, and several others. Because Coronel, and another Mexican, Luís Arenas, were acquainted with the Indian leaders, they managed to avoid any hostilities by giving the Indians 30 mares for a feast. Coronel learned that a non-Indian woman was among the natives as the wife of one of the leaders, and he suspected she was the former Señora Cosima Peña, the Mexican woman who had been seized at Pío Pico's ranch in 1937. On the return journey from Sonora, the Mexicans were threatened by a party of Indians near Álamo Mocho (sometimes Álamo, Álamo Mucho, and Pozo del Álamo) below the U.S.-Mexican boundary in Imperial Valley, but they managed to escape.

Toward the end of the 1830s, the route from southern California across the desert to the Yuma crossing was by way of Valle de San José (Warner's Ranch), San Felipe, Los Vallecitos (Vallecito), Carricito (Carrizo), Pozo Hondo (west of El Centro), and Pozo del Álamo (Duflot de Mofras, 1937:112, 174). The village of San Sebastián is not mentioned in the 1840s. The last reference to this rancheria appears to be in an 1835 document which mentions three Indians from San Sebastián visiting Mission San Luis Rey (Forbes 1965:277).

In 1846, following the outbreak of the Mexican War, General Stephen M. Kearny set out from Fort Leavenworth to San Diego with the Advance Guard of the Army of the West, acquiring Kit Carson as a guide in New Mexico, and marching westward to the Pima villages along the Gila River. The crossing of the Yuha Desert inventory area was described by three diarists who were with Kearny's command: Lt. Col. William H. Emory (1848), Captain A. R. Johnston (1848), and Doctor John S. Griffin (1943).

Between the Colorado River, forded about 12 miles south of the Gila, and the well of Álamo Mocho about 35 miles to the west, Emory (1848:100-105) reported observing the ruins of a number of Indian settlements and the remains of irrigation ditches, although no Yuman Indians were encountered. At Álamo Mocho, Kearny's men captured some Mexicans, who told them they had found a running stream about a league to the west. Parties were sent out to search for the stream—which was probably a portion of New River—but were unable to find it. Emory (1848:101) noted that if there had ever been cottonwoods (*alamo*) at Álamo Mocho, they were now apparently buried under sand, which formed a vast bluff around the waterhole, making an arc of a great circle. After much effort, the waterhole was dug out to a depth of about 20 feet, and water was pulled to the surface in a champagne basket. Once the men had water, two buckets were allowed for each animal,

but at this point the animals had gone over 48 hours without water, and Emory observed that the night was filled with their piteous cries.

Two more days of travel brought the army command to a salt lake, which they had heard about from the captured Mexicans, but the stench of dead animals put to flight all hopes of using the water. The lake was probably a salt flat which had been filled by overflow from the Colorado River. On the fourth day, Kearny's forces reached Carrizo Creek after a grueling day in the Yuha Desert. Johnston (1848:611) noted that the Carrizo was a "place in the pass of the mountain where a stream rises, and sinks again immediately." He observed that the water was warm at its source, and flowed freely about a half mile in a "clear little stream towards the plains," and then became lost in the sand.

On November 29, the soldiers began their march up the Carrizo Corridor, where scores of animals dropped by the trail and fell prey to trailing packs of coyotes. Burned by the sun and their clothing in shreds, they reached Vallecito, where they rested for a day and General Kearny conducted a last inspection of his men. Captain Johnston wrote a description of the watering-spot:

> . . . . The camp is in a narrow valley, with abundance of grass; it is called Bayou Cita [sic]. The mules appear to like the dry grass on the hill sides better. We are near a corn patch of some California Indians. We may consider ourselves as partly in the country. It looks poorly here. It must be said the distance over the jornada is 91 miles or thereabouts; and to cross it properly one should come to it prepared with a little corn for each animal—say a peck—and then it could be passed without difficulty, by making three or four days of it over the plains. The constant seeing pieces of pottery shows that Indians have traversed it time out of mind . . . [Johnston 1848:612].

On December 1, the army reached the Indian rancheria of San Felipe, but found the village deserted. Not until the next day, as Kearny's men staggered wearily up San Felipe Valley toward Warner's Ranch, were any Indians encountered—a man and woman who passed them showing the utmost indifference to these ragged blue-coats emerging from the desert after one of the longest military marches in history. Four days later—at the end of their 1,500 mile journey—Kearny's forces engaged the lances of Andreas Pico in the Battle of San Pasqual, where Captain Johnston was one of 18 men lost in the American defeat (Woodward 1948).

Meanwhile, trailing several weeks behind Kearny's Army of the West was the Mormon Battalion, which had set out from Council Bluffs, Iowa under the non-Mormon command of Lt. Col. Philip St. George Cooke. Its primary objective en route was to open up a wagon road to California. The four most detailed accounts of the crossing of the Yuha Desert by diarists of the Mormon Battalion were provided by Cooke (1938), Tyler (1881), Brown (1900), and Standage (1928).

The Mormon Battalion reached the Colorado River crossing point made by Kearny on

January 10, 1847, and two days were spent in getting its 350 members across the river. On the evening of January 11, after marching 15 miles to the west, the battalion camped at an old well that Kearny had dug out, but it was again dry. Cooke had it cleaned out and also dug another well. Thenceforth, this waterhole was to become known as Cooke's Well—a major watering spot on the Southern Emigrant Trail as the wagon road built by the Mormon Battalion would come to be known. The march then continued on to Álamo Mocho, 22 miles away and still in Baja California. The battalion then turned northwest to Pozo Hondo (Deep Well), a short distance west of El Centro, arriving there on January 15. After a difficult journey across the Yuha Desert, the military force arrived at Carrizo Creek, many of the men so tired from thirst and fatigue they were unable to speak until water was brought to them. Between the Colorado River and Carrizo Creek, no Indians were encountered, although nine Mexicans who overtook Cooke and had been a day behind him reported having seen a "large war party of Indians" at the Colorado crossing (Cooke 1938:217).

On January 18, the battalion camped at Vallecito, where an Indian brought Cooke some intelligence on the progress of the war in California. The next day the Indian alcalde from San Felipe arrived at Vallecito with a message from the U.S. Naval Commander of the *Portsmouth* in San Diego, further describing progress of the war. Cooke wrote a short description of the alcalde:

> . . . . I presented the alcalde with a small looking-glass of my own, having nothing else to give him. He asked me not to let the other Indians know he had brought me the letter, etc. I told him he must look to the Americans hereafter as the rulers of this country and his friends; and that he should send me speedy information by bypaths of the vicinity or approach of any bodies of the Californians; that he should have them watched from the mountains, etc. He, and his interpreter also, a San Felipe Indian, are fine-looking men, nearly naked, hair long [and] face painted with red spots. Their language seemed bad, somewhat resembling that of the Apache . . . [Cooke 1938:221].

One of the roughest points of the journey came the following day, when the battalion struggled to get its wagons through the narrow Box Canyon. The men had to hack away the walls of the canyon with axes, having abandoned their picks and spades in the desert crossing, before they could get the wagons through. On January 20, they reached the village of San Felipe, which proved to be deserted. Nine days later the Mormon Battalion joined General Kearny's forces in San Diego—the first group ever to make a passage by wagon across the southern desert to California (Edwards 1961:20).

## THE AMERICAN PERIOD (1848-1865)

On February 8, 1848, the Treaty of Guadalupe Hidalgo was signed, and California was ceded with a vast amount of other territory to the United States. With the end of Mexican rule in California, the Sonora Road into Mexico fell into oblivion. Although still used by

large numbers of Mexican emigrants to California (Guinn 1909-1910:33), it was supereeded in the minds of Americans by the Southern Emigrant Trail—or the Gila Trail—with its new routing through Arizona and New Mexico. Gold had already been discovered in January at Sutter's Mill. By the following year, thousands of Forty-niners, both Mexican and Anglo-American, were pouring into California by way of the Yuma route.

Sometime in 1848, soon after the American conquest, a U.S. military mail service was initiated between San Diego and Yuma (Pourade 1963, III:123-124). The route proceeded from San Diego south to the Tia Juana River, turned east through valleys below the international border, returned to California near Campo, and then went east down Walker Canyon past Mountain Springs. The mail route then descended Long Canyon, joined the Southern Emigrant Trail east of Coyote Wells on the Yuha Desert, and continued along the latter route to Yuma.

In November, 1848, Graham's Battalion, a unit of the U.S. Army composed of two companies of dragoons and about 500 men, marched across the Yuha Desert along the Southern Emigrant Trail, encountering four inches of snow in upper San Felipe Pass (Couts 1961). In its march from Monterey in north central Mexico to Los Angeles, the battalion encountered numerous Sonorans, who passed them almost daily on their way to the California mines. The Sonorans were in the vanguard of the flood of gold-hungry emigrants who were to stream into California over the next few years.

Many of the gold-seekers were ill-equipped for the desert crossing and unknowledgeable about its hazards. The Southern Emigrant Trail from the Yuma crossing to the Carrizo Wash was littered with their abandoned wagons and possessions. John W. Audubon described the scene near Cooke's Well in October, 1849:

> We encamped at the wells [Cooke's Wells], and started out at two in the morning to go thirty-six miles to the next grass, having given our animals a good feed of mesquit beans, which we found in great abundance, about five miles below us. We went on well until we came to the lagoons, and truly *here* was a scene of desolation. Broken wagons, dead shrivelled-up cattle, horses and mules as well, lay baking in the sun, around the dried-up wells that had been opened, in the hopes of getting water. Not a blade of grass or green thing of any kind relieved the monotony of the parched, ash-colored earth, and the most melancholy scene presented itself that I have seen since I left the Rio Grande [Audubon 1906:166-167].

Among the many emigrants who abandoned their possessions in the desert was Charles Cardinell, who reached the Colorado River with an overland party on November 18, 1850. Cardinell described his experience as follows:

> On the 22nd we left the ferry, traveled sixteen miles, and encamped at another place on the Colorado. Next day we drove sixteen miles to some new wells. As a forty-five mile desert now lay before us, we started at 11 o'clock, but my horse broke his lariat and got away.

> The rest [of the party] left me. I searched for my horse till daylight in rain. So leaving behind me my saddle, sheepskins, and other things, I started on the Sandy Desert with a pack of eight pounds weight on my back. This pack soon became an enormous weight. The sand being knee-deep, I had to rest every fifteen minutes. So I continued on until noon, when, becoming so fatigued that I could not lift my pack to my shoulder, I was obliged to throw away half of my corn meal, half my beans, half of my meat, all my parched corn, and mesquite bread and a shirt. In the afternoon the wind blew up almost a hurricane, driving the sand in my eyes, and almost blinding me. At times I was obliged to lie down and cover myself with my blanket to keep from suffocating. The whole road on the desert seemed covered with the carcasses of dead animals, the stench from which was terrible. Late in the evening I came to a camp of soldiers, bound for the Colorado. They gave me supper and expressed astonishment at my pack. After resting two or three hours, I again started, and by morning arrived at another camp of soldiers, also bound for the Colorado. In a short time the rest of the company came in that had left me on the other side of the desert. I must have passed them in the night. The Captain gave each of us two days' rations of hard bread and pork, and also to me a letter to his family in San Diego [Cardinell 1922:70-71].

This account vividly illustrates why most early travelers in the region were preoccupied with staying alive rather than making accurate observations on the lifeway of the aborigines of the Yuha Desert.

Early in 1849, a party of New Yorkers and Mexicans, among whom was Job Dye, entered California with 300 mules, many of which were lost in the Yuma crossing (Dye 1951:66-67). In Imperial Valley, Dye noted that the New River, which he asserted he discovered and named, was carrying a large quantity of water from overflow of the Colorado River. Although Cooke and Kearny had both missed the New River, possibly because they came through in mid-winter after a dry season, most of the gold-seekers who followed them commented on the uniqueness of a river in the midst of the desert--among them Pancoast (1930), Harris (1960), Chamberlin (1945), Audubon (1906), Aldrich (1950), Eccleston (1950), Candee (1939), and the anonymous A.M.W. (1937). The flowing of the New River led to use of an alternate trail than Kearny's by emigrants, who beginning in 1849 followed the banks of the New River from Cooke's Well to Álamo Mocho. After 1853, when the New River went dry again, the emigrant route diverted back to Kearny's shorter trail between the two watering places (Edwards 1961:26).

Encounters with Indians in the northern part of the Yuha Desert inventory area are rarely mentioned in journals of travelers after 1848. Losses in population through European diseases over more than a half century and other factors resulting in disruption of the native economy and settlement patterns may have been responsible for abandonment of San Sebastián and other nearby rancherias mentioned in the earlier Spanish accounts and consolidation of these people into the native populations of Vallecito, San Felipe, and Agua Caliente. Since the first pasturage encountered after crossing the Yuha Desert was at Carrizo

Creek—near where the village of San Sebastián was located—increased usage of the Sonora Road in the late Mexican Period may have drained Indian plant food resources and led to abandonment of the village site.

The hordes of emigrants pouring into California during the gold rush were a continuous source of problems for the Indians along the Southern Emigrant Trail. The Spanish and Mexicans had tried to incorporate Indians into their economic systems, often employing coercive means, but many of the Americans who followed the westward trail had only genocidal attitudes toward Indians and no compunctions about stealing their food resources or appropriating their lands for pasturage, particularly the mesquite groves. Forbes (1965:297-340) presented numerous instances of friction between the Yuman Indians of the Colorado River and Forty-niners passing through their country. It can be assumed that the Southern Diegueño groups at Vallecito and San Felipe probably also had problems with some of the emigrants pouring through their territory, which may be one reason these villages were often deserted when travelers passed through.

One example of Indian harassment by Anglo-Americans along the Southern Emigrant Trail will be presented here. In 1850, Samuel Chamberlain reached the Yuma crossing with the notorious Glanton gang, who had hunted Indian scalps for bounty in Sonora. They seized a ferry being run by Indians, captured a number of the prettiest Yuman girls, and drove off the protesting Indians (Chamberlain 1956:288). According to Chamberlain, after a number of days in which the Indian girls were subjected to sexual attacks by the Glanton gang, the Yumans fell upon the outlaws with clubs, killing Glanton and most of his men. Chamberlain and two companions escaped, fleeing northwestward across the Yuha Desert, where they finally collapsed in the sands from thirst, only to be rescued and given water by two passing Indians from Vallecito (Chamberlain 1956:295-296). Foreman (1939:336) presented a slightly different version of this affair, and Forbes (1965:311-314) summarized several sources, but omitted Chamberlain's eyewitness account.

Between September and December of 1849, a U.S. military team under Lt. A. W. Whipple worked along the Colorado River as one of the units for the United States and Mexican Boundary Commission, surveying boundaries established under the Treaty of Guadalupe Hidalgo (Couts 1932; Whipple 1961; Emory 1857; Bartlett 1854). The two major members of this team were Whipple and Lt. Cave Johnston Couts, who were harassed continuously by Forty-niners demanding supplies or asking directions. Whipple was the first traveler along the route since Garcés to exhibit a strong ethnographic interest in Indians of the region. Accompanied by a Southern Diegueño guide, Tomaso, Whipple won the respect and confidence of all Indians he encountered.

Setting out from San Diego, the surveyors reached the rancheria of San Felipe on September 18, 1849, where they found several parties of emigrants, some destitute of provisions, complaining about hostilities committed by Indians at the mouth of the Gila River. Whipple (1961:31) was skeptical, noting: "One party pretended to have had a pitched battle with them, and showed an arrow with which one man had been wounded."

He described the rancheria of San Felipe as follows:

> The village at this place contains probably fifty Indians, part of whom are Diegeenos [sic], and acknowledge the authority of Tomaso; the rest belong to the tribe of the desert called Como-yéi, or Quemeya [Kamia], speaking a different language, and totally ignorant of Spanish. To my surprise the women were neatly dressed in calico frocks; and notwithstanding the streaks of tar with which they paint their faces, some were quite good looking. Their zandias [watermelons] were all "verdo," and they had nothing else to sell [Whipple 1961:31].

Whipple (1961:32-36) also provided a vocabulary list of 59 Diegueño words and phrases he recorded at San Felipe. His scholarship rapidly alienated him from Lt. Couts, a haughty West Pointer, who considered Whipple a dandy and bookish dilettante, and the survey was completed in an atmosphere of shared animosity.

On September 20, Whipple (1961:37) reached Vallecito, where he observed the "ruins of adobe huts, indicating the decline of the Indians" and a "few naked and miserable wretches, who have a garden of green melons, but nothing to eat except the roots of the wild maguey." The surveyors continued on across the Yuha Desert to the Colorado River. During the next few weeks, Whipple made friends with many Yumans and their leaders, including Pablo Coclum, their head chief. His report provided much ethnographic information on the Yumans, and he also obtained some information from Pablo Coclum about desert Indian groups west of the Colorado River:

> There are upon the desert west of the Colorado two tribes of Indians, called—one, Cah-wee-os [Cahuilla]; the other, Co mo yah or Co-mo-yei [Kamia]. The Co-mo-yahs occupy the banks of the New river near the Salt lake, and the Cah-wee-os live farther north upon the headwaters of the same stream. Pablo himself is Co-mo-yah. He was born upon the banks of New river (Hah-withl-high) of the desert, emigrated hither twenty years ago, and when I arrived he was captain general of the Cuchan [Quechan or River Yuman] tribe. Several Co-mo-yahs are here, and they can generally be distinguished from the Cuchans by an oval contour of the face.
>
> Pablo says that New river was formerly a running stream—rose north of the country of the Cah-wee-os, and flowed into the Colorado one day's journey below the lower crossing, at the village of Santjago. But for some twenty or thirty years the water in it was merely in pools until the past season, when abundant rains restored its former dimensions, and again water flowed from the Salt lakes to the Colorado [Whipple 1961:67].

Although Whipple is confused about the source of the New River, probably misunderstanding Pablo Coclum's attempts to explain its origin, he was the first writer to state that the Kamia had once inhabited the New River, and had been driven away by a lack of water in the New River slough early in the nineteenth century. As will be seen, his information coincides with a number of later sources.

William H. Emory (1857:97), who was also engaged with the boundary survey in 1850, interviewed another Yuman leader, chief of a village at the Gila-Colorado junction, and obtained further information about a shift in settlement patterns as a result of the drying of the New River.

> Pascual, the present chief of the Yuma Indians, when a child, lived at "Alamo Mocho," where at the time (he is now about 60 years of age) water was running constantly, as it did also at New River. The place of Pascual's childhood was called Hu-ta-pil, because plenty of tunas (the fruit of opuntion) grew there. Of all this, nothing seems to have been left but the name "Alamo Mocho," (stunted cotton-wood) as one tree of the kind marked this locality long after water had ceased to run here. If such changes really have taken place, and there is hardly room for doubt, we are inclined to ascribe the cause to an alteration of level—hyetographical [sic] changes being, perhaps, but the result [Emory 1857:97].

Late in 1850, a number of U.S. troops were stationed at Vallecito. Their presence was commented on by John Russell Bartlett, a U.S. boundary commissioner, who accompanied Lt. Whipple on a surveying trip to the Colorado River in June of 1852:

> . . . A depot of provisions is kept at this place, with a file of soldiers, for the supply of Fort Yuma, and of government trains passing and repassing. A few horses are also kept here, to facilitate the communications between Fort Yuma and San Diego [Bartlett 1854:124-125].

Where Whipple had been impressed by the Indians of San Felipe and shocked at the impoverished state of the Indians at Vallecito, Bartlett had just the opposite reaction. He described the San Felipe Indians as living in "twenty-three miserable old huts or wigwams built of straw and rushes," termed them "a filthy looking set, half clad and apparently half starved," and castigated their "improvidence" in failing to farm the surrounding land (Bartlett 1854:122-123). His impression of the Vallecito Indians was somewhat more approving:

> . . . . A band of Diegeno [sic] Indians live here, to whom the arrival of a train is an event of some importance. They made their appearance early this morning, dressed in their holiday clothes, and appeared more cleanly than any Indians we had seen. Nearly all wore clean white or fancy calico shirts, their only garment; pantaloons being regarded by all Indians as useless articles of dress. These people were formerly connected with the Missions, and hence call themselves Christians; but they now live in a most degraded state of indolence and poverty. They cultivate beans and pumpkins, and pick up an occasional mule, which serves them for food; though their main reliance is upon the acorns which they collect and store up in large baskets for winter use. The labor of preparing them for food is like almost all other labor, performed by women, who were to be seen in front of every hut wielding their heavy stone pestles. When the acorns are reduced to flour, it is washed to remove the bitter taste, and then cooked into a kind of gruel, or made into bread. These Indians were very attentive to

> us, bringing us wood (which is very scarce here) and water, and otherwise assisting about the camp. They seemed amply repaid with a few old clothes, or any fragments of food that remained from our tables. Our culinary department was always the great point of attraction to these poor creatures, who would often form a double circle around the camp-fires much to the annoyance of the cook . . . [Bartlett 1854:125-126].

Bartlett's report is the first of the period to give a rather thorough idea of the extent of acculturation at Vallecito at this time. He also noticed at San Felipe that there were "traces of former buildings in every direction" and "acequias or trenches for irrigating the lands [Bartlett 1854:123]," which suggests that Spanish mission influence in the 1820s may have extended beyond the assistencia of Santa Ysabel as far as San Felipe Valley. Many of the San Felipe Indians are known to have been converted to Christianity beginning in 1818 (Englehardt 1920:169), but none of the available sources refer to any substantial Spanish mission effort in San Felipe Valley.

In October, 1850, Major Samuel P. Heintzelman, who was in charge of the Vallecito army outpost, John L. LeConte, and a Mr. Matsell set out across the Yuha Desert for the mud volcanoes near the sink of the New River (LeConte 1855; Heintzelman 1857). They were accompanied by an interpreter from Santa Ysabel and the "head chief of the 'Lleguina' [Diegueño?] Indians living near the Salt Lake [LeConte 1855:1]." They followed Carrizo Creek toward the Salton Sink (Salt Lake), and finally reached an Indian village situated on New River near its termination point below the basin. According to Heintzelman (1857:41) the New River chieftain who accompanied them was named Gerónimo ("Heironimo"), and he had one wife at the river village and another at San Felipe. At Carrizo Creek, Gerónimo set off a smoke signal warning the village of their approach.

LeConte (1854:4) estimated the village was eight miles below the Salt Lake of the Salton Basin, and decided that in years of heavy overflow the New River ran into the basin. Apparently, the high floodwaters of the previous year had made it possible for the Kamia to reoccupy the New River. The Indian village contained about 50 inhabitants, who received the visitors in a friendly manner, offering them melons, pumpkins, and beans, which they were raising in abundance. The banks of the river were marked by a species of *Chenopodium*, which the natives called "Kelite" (Sp. *quelite*). The leaves of the plant were boiled as greens by the Indians, and the seeds prepared as cakes.

Seven or eight Indians accompanied the travelers north to the mud volcanoes. The Indians drew back from the steam, warning the Americans that devils in the shape of black birds rose from the ground and attacked anyone going too close (LeConte 1855:5). When the three men were not attacked, the Indians ran forward and danced around them exultantly. The next day on the return trip to Vallecito, the travelers took with them a supply of "musk-melons" from the village (LeConte 1855:6).

In November, 1850, Fort Yuma was established with three small companies of infantry

under the command of Major Heintzelman, who reported his first efforts were directed toward learning as much as possible about all Indian groups of the region. Forbes (1965:297-340) recorded many of the altercations between the Yuman Indians and the hordes of emigrants which led to building the fort. Heintzelman (1857:34-58) in his report on establishment of the fort presents a large amount of ethnographic data on the Yuman groups, and considerable data on groups of interest to the Yuha Desert inventory area.

Heintzelman's information on the New River indicated that in wet years it was normally occupied by Kamia along its entire length:

> The home of the Yum or New River Indians is on the New river. When the ponds and lagoons connected with it dry up, these Indians take shelter amongst their friends who live outside the desert. Two small bands are now with the Cucha-nos [Quechans or Yumans], under Jose Marie, or Chi-mi-a-ke, and Fernando or Haltow. These two frequently visit our camps, and have given different accounts of their numbers. Fernando had at one time one hundred and eighteen men, and at another, both together, but forty-seven men. The large number must have included but a small part of the tribe, as when New River is full of water they are scattered in a straight line over seventy miles in length, from north to south, or taking the windings of the river on the plat [sic] desert, near one hundred. I saw more than the latter number in the month of October, 1850, at Heironimos' rancheria, situated at the extreme northern limits of New river, near the mud volcano and Salt Lake. In the month of June of the next year, I met another considerable band (Antonios) on a fresh water lagoon, twenty miles south of the wagon road across the desert. When at the northern settlement, I was told Indians lived all along the course of New river; that they are frequently seen in numbers near the Big Lagoon, fifteen miles north of the Signal mountain. These latter, probably live on the borders of Lake Bechico, a considerable body of water, a few miles in a northeast by east course from the Big Lagoon.
>
> Luis or Sa-pan-na-co is the principal chief of these Indians, in place of Heironimo Cherow, or Burning Fire, uncle to Heironimo, who was a powerful chief, and had the control of all the Indians of the desert and neighboring sierras, after his victory over Huta-neal or Indigo Horse, a Mexican Indian chief of the Jacums [Jacumba Indians] many years ago. His authority fell upon Heironimo, whose power gradually decayed, until now it is nearly lost from the hands of his successor, and they are mingled among their more powerful neighbors. The Cu-cha-nos [Yumans] and Yums [Kamia] speak dialects of the same language [Heintzelman 1857:40].

Heintzelman (1957:4) also repeated Whipple's statement obtained from Chief Pascual that Kamia had once lived at Álamo Mocho prior to a drought near the beginning of the nineteenth century. He added that at that time the New River ran all year and there were "fine planting grounds" for crops. His report also presented material on the little-known Southern Diegueño Indians of the Jacumba Valley:

> The Yacum live in a fine valley in the mountains near their eastern slope, between the desert and the coast. Part of this valley lies in Lower California, and there are jealousies between the persons on the opposite sides of the line. They do not number 200; increased from the neighboring tribes in summer, when the means of subsistence are plenty, and decreased during the scarce season of the winter months.
>
> They are Dieguenos [sic], and were once formidable to the Spaniards and Mexicans, and still consider their mountain fastnesses impregnable. They are more warlike than their neighbors near the coast, and disposed to be troublesome, instigated by evil disposed persons near the line. The small force kept there as a stopping place for our express and proximity of troops on both sides, will no doubt curb their warlike propensities.
>
> They plant in the spring, and irrigate; raising corn, melons, pumpkins, chili, onions, beans, &c.; in summer, gather manzanitas and pinoñes; in the fall, acorns; in winter, live on hares, rabbits, rats, &c., and on their friends at the ranchos.
>
> Santiago, an old man, is the principal chief; Juan Pedro or Masty, another chief, speaks Spanish, and was guide during the war to Commodore Stockton [Heintzelman 1857:43].

In June, 1851, because of various problems, including keeping Fort Yuma supplied, Major Heintzelman and his troops fell back to Santa Ysabel. He left behind Lt. Thomas W. Sweeny and nine soldiers for the summer of 1851 (Sweeny 1956:51-58). In November, 1851, the Garra rebellion began, led by Antonio Garra, an Indian at Warner's Springs, who sought to unite the Indians of southern California from the Colorado River to the coast in a revolt against the white man (Pourade 1963, III:177-188). The revolt was finally put down with the attack of Major Heintzelman on the rancheria of Los Coyotes and the capture of Garra and the other Indian leaders, followed by their military trial and execution.

In November and December of 1853, Lt. R. S. Williamson, accompanied by William P. Blake, a geologist, and Lt. J. G. Parke, surveyed the Southern Emigrant Trail and adjacent areas of the Yuha Desert inventory area for a proposed Pacific railroad (Williamson 1853). Blake explored the San Gorgonio Pass and the northern end of the Yuha Desert, and Parke studied Jacumba Pass, which he found utterly impracticable for a railroad route (Williamson 1853:41). Blake (1857:105) reported "several Indian rancherias and small fields" along the borders of the creek at San Felipe, and noted that the Indian women were gathering mesquite beans and "carrying jars of water on their heads in true oriental style." No Indians were encountered during a march along the Southern Emigrant Trail between Carrizo Creek and the Colorado River.

In 1854, two retired Army men, Joseph Swycaffer and Sam Warnock, established a semi-weekly military mail service between San Diego and Yuma, sometimes going by way of Jacumba and sometimes by way of the Carrizo Corridor (Lindsay 1973:66).

On June 22, 1857, James E. Birch was awarded the contract by the U.S. Postmaster for the San Antonio to San Diego mail line, a route covering 1,476 miles (Conkling and

Conkling 1947:92-96). After crossing the Colorado River, the route ran south into Mexico for fifty miles and then northwest across the desert to Carrizo Creek, and through the Carrizo Corridor and over the Cuyamaca Mountains to San Diego. This service was superceded in 1858 by the inauguration of the Butterfield Overland Mail, which was designed to carry mail and passengers from Tipton, Missouri, to San Francisco. The Butterfield Overland Mail, which was operated until its suspension in 1861, also went through the Carrizo Corridor, but turned up into the San Felipe Valley, passing by way of Warner's Ranch and Temecula to Los Angeles (Conkling and Conkling 1947; Wright and Bynum 1954). Stations for the route were established at Fort Yuma, Álamo Mocho, Indian Wells, Hall's Well, Carrizo Creek, Vallecito, and San Felipe to mention only those within or adjacent to the Yuha Desert inventory area (Conkling and Conkling 1947, II:195-253). Hall's Well station was located on Coyote Wash about two and a half miles northwest of Plaster City, and corresponds closely to the location of Sackett's Wells, a watering place shown on old maps of the region (Conkling and Conkling 1943, II:226).

In July of 1857, Dr. John A. Veatch (1858), accompanied by two other white men and his son, set out from San Felipe to visit the mud volcanoes in the Salton Sink. They were guided by José Serrano, one of the captains of the rancheria at San Felipe. They found the New River abandoned by Indians, who had apparently reoccupied it only briefly in the years between 1849 and 1853 when it had been flowing again. Veatch recorded the following comments by José Serrano:

> Our guide states that this secluded spot was his early home. He was born here, and the tribe he now rules over here had their lodges, and lived in abundance on the maize, melons, and frijoles that he describes as growing with a luxuriousness unknown to any place away from the so-called desert. A succession of rainless summers drove them away, and they have not since returned. They planted with the early rains, say in July or August [Veatch 1858:294].

In 1857, a military expedition under Henry A. Crabb, consisting of more than a hundred men, marched along the Southern Emigrant Trail and across the Yuha Desert to Fort Yuma en route to Mexico to establish a colony (Beattie 1925:240; Lindsay 1973:65). The filibustering expedition ended with Crabb's men being executed by the Mexicans, and only one survivor, a boy named Evans, left to tell the story of the trek.

Throughout the Civil War from 1861 to 1865 there was steady military traffic on the Southern Emigrant Trail between Arizona and California (Lindsay 1973:70-71). In 1865, a new road over Mountain Springs and up through Jacumba and Campo was established by John G. Capron, which diverted traffic across the southern part of the Yuha Desert region from Fort Yuma to San Diego (Lindsay 1973:71). With the discontinuance early in 1868 or the last stage line over Warner's Pass, the Southern Emigrant Road sank into disuse (Beattie 1925:217). There is little of major historic or ethnohistoric interest beyond 1865 for the Yuha Desert inventory area. Accounts of homesteading in the Anza-Borrego Desert and adjoining areas beginning with the California land boom of the 1880s may be found in Lindsay (1973:73-83). Considerable information on this later period—including the status of

Indian groups of the Colorado Desert at the turn of the century—may also be found in George Wharton James' *Wonders of the Colorado Desert* (1906).

With the abandonment of the Southern Emigrant Trail as a major artery of travel to California, the route was swiftly forgotten. E. I. Edwards (1961:11) summed it up: "California was safely in the Union; the gold rush was ended; the Civil War and the coming of the railroad had sounded the death rattle in the throat of the Butterfield Mail. And this vital highway of the desert—the highway to conquest, to adventure, to riches, to national expansion—suddenly vanished into the limbo of forgotten glory. It became a *ghost trail*."

# HISTORY OF ARCHAEOLOGICAL RESEARCH IN THE YUHA AREA

## SAN DIEGO MUSEUM OF MAN: MALCOLM ROGERS

Systematic archaeology in the Yuha begins with Malcolm Rogers, who began his archaeological work as a volunteer with the Museum of Man in 1919 (Ezell 1961:533). In that year he found evidence of San Dieguito materials in San Diego county and soon recognized that they contrasted with the material remains of the mission Indians and the Indians responsible for the shell middens along the old coastal lagoons. Rogers continued his association with the Museum of Man, and became Curator of Anthropology in 1928, and Director in 1943 (Rogers 1966:19). During this long period Rogers engaged in field work over a wide geographical area, organizing a sequence for the archaeological remains in the coastal and desert portions of southern California. He traced remains of these long past lifeways north through the Mohave desert, into Nevada and to the Oregon line. Similarily, he followed them east across the Colorado Desert and Colorado River into Arizona.

Rogers' methodology was adapted to the nature of archaeological remains in the desert. They were almost never buried, either by natural deposition or habitation refuse of subsequent occupation. He made and studied surface collections, and derived his evidence for sequence from changing patterns of site location relative to a changing environment, a keen sense of differences in patination and other forms of weathering, and evolutionary assumptions based on tendencies for assemblages to become more complex and more specialized through time, the latter most clearly illustrated in this distinction between San Dieguito 1, II and III. The excavation of the C.W. Harris site in San Diego County (Rogers 1938) may be the only major excavation he undertook.

Within the Yuha study area Rogers found a large number of San Dieguito I sites, providing him with an excellent sample of sites he assigned to this phase, largely unmixed with later materials. In surveying the shore of Lake Cahuilla, he discovered an almost continuous line of sites that he called Yuman II which were contemporaneous with the most recent freshwater stand of the lake. He also found considerable evidence of use of the area during the last prehistoric period, Yuman III, in the form of sites associated with mesquite dunes and springs and/or wells. Rogers did not find materials that he associated with the periods between San Dieguito I and Yuman II in the Yuha study area, and he felt it was unoccupied.

In 1945 Rogers left the Museum of Man and apparently did little or no field work after that time. He had always been conservative in publication of his findings, feeling the need for great amounts of evidence, well studied, before publishing results. At the same time, when he did publish, (according to Ezell [1961:533] "only under pressure and always, as he felt, prematurely"), he did not present the detailed evidence, the description of his findings on which his results were based, so no adequate published record of his work exists.

In the intervening years Rogers changed some of his ideas about the relative importance of the periods in his earlier chronology, and while working with Emil Haury to relate the stratified findings from Ventana Cave to the Southern California sequence, had changed the naming of some of the periods. Haury's apparent misunderstanding of Rogers intention further confused the matter (Rogers 1966:27). Culture historians working with southern California sequences since have found Rogers early sequence to accord better with findings in adjacent areas and have adapted it, with needed changes, rather than his later terminology (see for instance Wallace 1962:176).

Rogers returned to the Museum of Man in 1958 to reorganize his collections and prepare them for publication, a work cut short by his accidental death in the fall of 1960. He had completed at least one manuscript, and the San Diego Museum of Man used it as the basis of a handsome volume that serves as a memorial to Rogers work, *Ancient Hunters of the Far West* (Rogers 1966).

## UNIVERSITY OF CALIFORNIA, BERKELEY: ADAN E. TREGANZA

Treganza did his first formal field work as an undergraduate and graduate student in the desert of southern California and Baja California. It was an area he had come to know as a youth, and he worked there periodically from 1937 to 1942, summarizing the results in his first published paper (1942). While Treganza's continued interest in the area is reflected by papers in 1945 and 1947, he apparently did no more field work in the area. His 1942 paper reports on a reconnaissance of a number of sites within the Yuha study area. He did little or no excavation, and surveyed selectively – "The most likely places were selected for examination, then worked intensively on foot" (1942:152). He found evidence of non-ceramic sites which he equated with Rogers' San Dieguito phase, and later, Yuman, sites with pottery. His report is descriptive, commenting on the patterns of site locations and surface collections made at the sites. Treganza assumed that during Yuman times hunting and collecting populations were moving seasonally between the sites of the desert and the mountains, although he contrasted the pottery from the two areas (1942:153-154, 158). Although he shows the line of the ancient Blake Sea (Lake Cahuilla) shore on this map, he apparently did not survey it extensively.

Site sheets from Treganza's survey comprise the first 24 numbers of the University of California's Imperial County site records. There is little information on them, and they appear to have been made up well after the fact, perhaps to get the Imperial County file started. They are dated 1950 and state that the site was recorded by Treganza, but it is not possible to determine whether he made up the sheets himself, or whether they were made up by someone else from his notes. See also comments in the section entitled "Museum Collections."

## THE ARCHAEOLOGICAL SURVEY ASSOCIATION: B. E. McCOWN, C. HUBBS, AND G. STANLEY

Beginning in December of 1953, B.E. McCown and members of the Archaeological

Survey Association of Southern California, an avocational group, undertook survey of parts of the beach line of Lake Cahuilla (Lake LeConte). They received the cooperation of Carl L. Hubbs of Scripps Institution of Oceanography, who obtained a large series of radiocarbon dates in a concerted attempt to unravel the history of Lake Cahuilla. No thorough report was issued on the work (see McCown 1954; 1955; 1957). Collection dates of radiocarbon measurements indicate that McCown worked on the beach lines in 1953, 1954, 1955, and 1956. Hubbs continued his interest in the lacustrine sequence, collecting additional material for dating in 1961. As early as 1958, Hubbs was also working with George Stanley, geologist from Fresno State University, on the problems of the lacustrine sequence.

Despite the fact that the archaeological record of the ASA survey was never submitted to the statewide files, and that a clear picture of the lacustrine phases has not emerged from the radiocarbon measurements, the work of McCown and Hubbs is a major component of the history of archaeology in the area. George M. Stanley is still doing active field work relating to Lake Cahuilla, dealing primarily with evidences of Pleistocene beach lines.

The Archaeological Survey Association, now in enlarged headquarters in La Verne, California is undertaking to organize and publish much of McCown's unreported work, and it is probable that more of his information will become available. According to Dr. Gerald Smith of the San Bernardino County Museum, a documentary film in color was made of McCown's Lake LeConte survey, by Harry Reid, and prints of it are still extant.

## UNIVERSITY OF CALIFORNIA, LOS ANGELES

When the Archaeological Survey was established at UCLA in 1958, it took over principal responsibility for the ten southern California counties from the Archaeological Survey at UC Berkeley, which had been in operation 10 years. The UCLA Archaeological Survey received copies of site records for those counties from the Berkeley Survey to begin its files and it appears that only Treganza's sites were recorded at that time in Imperial County.

Since that time, UCLA has not undertaken an active research program in Imperial County, and the site records that have been filed resulted primarily from work done by the Survey in response to public and government requests, and from avocational archaeologists who have filed site sheets. The following activities of the UCLA Survey bear on the Yuha Study area.

In February of 1960, having been contacted by Kenneth Shaw, Fred Reinman, D. L. True and Claude Warren recorded a series of rock shelters that Shaw had located, now known as Imp-49 through Imp-55. Imp-49 was excavated, and the results published (Reinman, True and Warren 1960).

In December of 1960 UCLA crews surveyed the proposed route of Highway 80 across San Diego and western Imperial counties at the request of the Division of Parks and Beaches. Sites Imp-56, through Imp-59 were recorded by Max Pavesic and Don Benito at this time. Continuing the survey in May of 1961, sites Imp-77 through Imp-79 were

recorded by R.J. Fitzwater, Robert Crabtree and Max Pavesic.

Sites Imp-80 through Imp-84 were recorded by Emma Lou Davis and Keith Johnson, accompanied by W. Morlin Childers in January of 1963, under a project entitled Yuha Wash Ground Figure Survey. Gravel effigies at Imp-80, 81 and 83 are described and illustrated in "Giant Ground Figures of the Prehistoric Deserts" (Davis and Winslow 1965). This represents the last record of UCLA archaeological work in the area.

## AVOCATIONAL ARCHAEOLOGY

In addition to the work of the Archaeological Survey Association discussed above, examination of the UCLA site records pertinent to the Yuha study area reveals the contribution of avocational archaeologists to our knowledge of the prehistoric resources of the area. The file includes sheets by Aileen McKinney, a long-time member of the Pacific Coast Archaeological Society, Costa Mesa, California, with an active interest in the archaeology of the desert. Bob Begole, another PCAS member, has recorded sites within the Yuha study area as a result of his systematic recording of early sites in the Anza-Borrego and Colorado Desert areas.

## UNIVERSITY OF CALIFORNIA, DAVIS, D.L. TRUE AND RICHARD CASTEEL

Continuing the long term research interests of D.L. True in southern California, UC Davis is undertaking survey of selected portions of the northern half of the Yuha study area in the initial phases of a study of settlement patterns and subsistence base. The area under consideration includes the watersheds of San Felipe, Carrizo and Fish Creeks, and adjacent portions of the 40 foot beach line of Lake Cahuilla. Their work to date comprises preliminary investigations emphasizing collection of soil and midden samples for laboratory microanalysis aimed at recovery of fish remains from the 40 foot beach line of Lake Cahuilla (True and Casteel 1973).

## IMPERIAL VALLEY COLLEGE MUSEUM

Records of archaeological activity of Imperial Valley College date back to 1970 when the first site sheet from that institution, filed by Myron Insko, appeared in the UCLA Survey file, and continued until March 1973, when the last records for Imperial County were received by UCLA. In the summer and fall of 1974 the museum expanded its staff considerably and has initiated several field programs in archaeology and paleontology. Concurrently, they ceased to file site sheets at the established repository and are now setting up independent files (Appendix 2). Work currently reported includes the excavation and preliminary dating of Yuha Man (Barker, Burton and Childers 1973: Childers 1974 a and b) and the reported discovery of a series of clay caches (von Werlhof 1974). In addition to the work on record, Morlin Childers' collections pertaining to early man, obtained over the past thirty-five years, were made in conjunction with Imperial Valley College.

## MUSEUM COLLECTIONS FROM THE YUHA AREA

Archaeological collections pertaining to the Yuha inventory area were examined at three museums in the course of this study. The University of California, Los Angeles, the Lowie Museum, University of California, Berkeley, and the San Diego Museum of Man have holdings from the area. Inquiry placed with the Santa Barbara Museum revealed that they have no materials from the Yuha inventory area. While it is possible that materials from this area have found their way into other museum collections, we have found no trace of them in the research currently reported.

The Archaeological Survey Association of Southern California has retained possession of the materials collected in the course of their Lake LeConte survey described by B. E. McCown (1954; 1955; 1957). Now housed in their new headquarters in LaVerne, the ASA has set up a laboratory to process the Lake LeConte materials under the direction of McCown's son. We did not have the opportunity to examine these collections in the course of preparing this report, but judging from the material published and radiocarbon dates (Hubbs, Bien and Suess 1960; 1963; 1965; Hubbs and Bien 1967) that emerged from the work, these are extremely important collections.

### MUSEUM OF MAN, SAN DIEGO

Malcolm Rogers' collections from his more than 30 years of work in the desert are housed in the Museum of Man, as are his field notes and site sheets. As indicated in the section on the history of archaeological fieldwork in the Yuha, Rogers did extensive site surveying and surface collection. He surveyed the 40 foot beachline of Lake Cahuilla throughout the length of the inventory area and also surveyed down San Felipe Wash. Rogers worked in the area early enough so that he was able to make extensive, well balanced collections. He generally collected large ceramic samples from sites, but also collected the lithic tools as well. Generally, provenience of the pieces is to site only, except in the cases where he found cremations weathering out. Pieces are numbered by cremation lot and are separated from the general surface materials. Rogers' collections are well catalogued and stored in a straightforward manner. The documentation is good as far as general site location and assignment of pieces to site goes. They constitute a most valuable resource for scientific study, being well suited to examination with respect to questions of geographic distributions of ceramic varieties and lithic materials. They may also yield information on overall assemblage content such as relative frequencies of major artifact types within assemblages. In making his collections Rogers did not use a grid system or make other provisions for spatial controls within sites. His collections will not yield intra-site distribution patterns for study of functional associations, identification of activity areas within sties, or other forms of analysis requiring within-site provenience data.

Rogers was inclined to define sites rather loosely, and from his site sheets it is evident that he included zones of occupation sometimes more than a mile in extent under a single site number. The late Yuman occupation patterns of the area are dispersed, so that sherds

and fire-cracked rock are scattered widely in mesquite dunes, and fish bone middens occur intermittently along the 40 foot beachline of Lake Cahuilla. None of his materials are derived from excavations, and his collections do not include faunal material.

As part of Rogers' collections, the Museum of Man has his pottery type collection with representative pieces of each of his designated pottery types.

We did not learn of other materials in the Museum of Man that relate to the Yuha area. A number of the site sheets in the UCLA Archaeological Survey file from Treganza's survey state that collections from those sites are in the Museum of Man, but according to museum personnel, they have none of Treganza's materials and know only of his collections in the Lowie Museum, UC Berkeley.

## LOWIE MUSEUM, UC BERKELEY

The Lowie Museum is the repository for materials collected in the course of research done by the Department of Anthropology, University of California, Berkeley. Archaeological materials collected by the Archaeological Survey (now the Archaeological Research Facility) of UC Berkeley are housed there, as well as materials donated to the museum over the years. Several collections in the Lowie Museum pertain to the Yuha inventory area.

### Clements and Warner Collection

The collection, made in 1924, consists of materials from two caves in "T15S, R9E Imperial County" with no further location data, nor does the catalog indicate if excavation was involved in making the collection. The location suggests that the caves were situated along the northern edge of the Carrizo Mountains. The collection includes 100 sherds, grinding tools, a pot with vertical red stripes, a wooden shovel-like object (Treganza [1942:Fig. 9b] illustrates one as a mescal shovel), and a bundle of six sharp pointed sticks each with a fork at the end.

### Treganza's Collections

Materials from six sites which are numbered in Treganza's paper, "An Archaeological Reconnaissance of Northeastern Baja California and Southeastern California (1942)" are included in the Lowie Museum's holdings from Imperial County. Seven additional small collections related to Treganza's work are included, but without site numbers.

As a whole the collections are of limited scientific value. Most of the collections are small and appear to have been picked up incidentally and selectively. The bulk of the materials were not collected by Treganza but by Happy Sharp, apparently a local collector, with whom he worked closely. Treganza acknowledges Sharp's assistance (1942).

The Mountain Springs locality, which Treganza numbers as site 4, serves as an example

of the quality of the collections. Seven different lots are ascribed to this site, four of them to Mountain Springs proper, and others to 1 mile south, 2½ miles south and ½ mile east.

Lowie Museum holdings from Treganza's sites catalogued in Imperial County include collections from his sites with numbers published in *American Antiquity* (1942) as site 4, Mountain Springs, which is actually just into San Diego County; site 6, Dos Cabezas, a larger collection from this site being in the San Diego County file; site 8, which appears to be situated at Dos Cabezas Spring on his published map, and for which the Lowie Museum catalog gives no location data; site 13, Carrizo Creek near Fish Creek Mountains; site 15, two locales, Harper's Well and north of Harper's Well on San Felipe Creek; and site 17, Lake Cahuilla shoreline. Seven additional collections from the Yuha inventory area with very vague locations are also in the Lowie Museum.

**Other Lowie Museum Collections**

Malcolm Rogers filed a complete collection of his pottery typology for the Colorado Desert area at the Lowie Museum, including types 1A to 29D. Many of the sherds are from the east and west shore of Lake Cahuilla. Original Museum of Man site numbers are on the sherds, and the sites are given provenience as Upper Terrace (presumably the ca. + 40 foot shoreline), Sea Level Terrace and Sub-sea level terrace. This type collection duplicates that in the Museum of Man.

A number of collections made by M. J. Harner, primarily in eastern Imperial County, are included. There is a collection containing three sherds, seeds and a corn cob from a sealed jar from near Ogilby and Ripley which he obtained from a collector and pothunter. The remainder are primarily surface collections of potsherds of Colorado River wares which formed the basis for his publication "Lowland Patayan Phases in the Lower Colorado Valley and Colorado Desert (1958)." The numbering of Harner's sites in the Lowie Museum file indicates that sites in Imperial County are numbered differently in the UCLA and UC Berkeley files.

## UCLA COLLECTIONS

Museum storage for the Department of Anthropology and the UCLA Archaeological Survey is in room S-26, Haines Hall.

**Yuha Wash**

The collection housed as Accession No. 372 was made by Emma Lou Davis and Keith Johnson, accompanied by Morlin Childers, on January 10, 1963, when the two former were affiliated with the UCLA Archaeological Survey. A drilled sherd was collected 20 yards west of the gravel effigies which comprise Imp-80. A large projectile point and seven core tools from Imp-82, Yuha Well, complete the collection. This project was titled Yuha Wash Ground Figure Survey (UCLA Archaeological Survey Annual Report 1962-63:x) and

included the recording of Imp-80 through Imp-84. The ground figures were published by Emma Lou Davis and Sylvia Winslow (1965).

**Shaw Cave No. 1**

Artifacts recovered from the excavation of Shaw Cave No. 1 (Imp-49) in the Coyote Mountains are housed as Accession No. 274. The collections include a wooden paddle, shafts, a fiber bundle, deer bone fragments, a hooked stick, and a sandstone arrowshaft straightener. The circumstances of the find are described by Reinman, True and Warren (1960).

**Imp-56, 57 and 59**

Materials from these sites are combined with artifacts from SDi-213 and SDi-846 under Accession No. 363. The accession comprises 12 trays consisting primarily of core tools, hammerstones, and handstones from the San Diego County sites. According to the site sheets, sherds and a few chipped stone tools were recovered from the Imperial County sites. These collections were made by Don Benito and Max Pavesic of the UCLA Archaeological Survey in the course of surveying the route of U.S. 80 December 22-31, 1960 (UCLA Archaeological Survey Annual Report 1960-61:xi).

**IMPERIAL VALLEY COLLEGE MUSEUM**

Morlin Childers' collections pertaining to the question of very early man in the Yuha are housed at the IVC Museum, as are collections resulting from field work done by the college. The holdings are described in Appendix 2.

# A CULTURAL SEQUENCE FOR THE YUHA AREA

## INTRODUCTION

An archaeological sequence fully appropriate to the Yuha Desert area remains to be developed. It is reasonable to expect that as the prehistoric record of the Colorado Desert becomes known, it will follow that of the better known Mohave Desert to the north in its general outlines. The Colorado Desert is divided somewhat arbitrarily from the Mohave to the north by the Little San Bernardino and Eagle Mountains, and several of the major food sources of the prehistoric inhabitants are distributed in both areas, particularily mesquite and agave. On the other hand, the Colorado Desert lies generally at lower elevations than the Mohave, resulting in lower precipitation, higher summer temperatures, generally sparser vegetation and more pronounced scarcity of water, which would lead us to predict sparser human population densities from much of the prehistoric period. The Yuha Desert region also differs from the Mohave in its close association with the Colorado River and its delta. The environmental history of the Yuha is intimately related to the history of the intermittent stands of Lake Cahuilla, and in the later part of its prehistory at least, cultural influences from the Colorado River peoples are an important component of the cultural history of the Yuha Desert area. With the precaution that extrapolating from the adjacent Mohave Desert region can provide only the general outline of the prehistory of the Yuha Desert area, we can proceed from the substantial work of Malcolm Rogers to suggest the outlines of the prehistoric record in the Yuha Desert.

Rogers himself worked extensively in the Mohave Desert as well as the Colorado Desert and had an excellent sense of the overall archaeological sequence in the California Desert, even though he worked largely before radiocarbon and other chronometric forms of dating were developed. He based his sequence on degree of patination and/or desert varnish developed on artifacts, changing patterns of site locations relative to topographic features and general assumptions regarding trends of evolution in stone tools and archaeological assemblages. His sequence forms the core of our understanding of Colorado Desert prehistory at present, and we can assign more accurate dates to his sequence based on radiocarbon dates from adjacent areas, primarily the Mohave Desert, the southern Great Basin, and coastal southern California. (Table 3).

## PRE-PROJECTILE POINT CULTURES

The possibility exists that archaeological cultures predating San Dieguito materials and the established period of man's occupation of the New World have been and are being recovered in the Colorado Desert, although their definition and dating have yet to be fully accepted by the archaeological community. In the Yuha Desert these are represented by simple lithic forms chipped by stone on stone percussion. The bulk of the pieces are primary flakes including teshoa flakes, struck from the unprepared shoulders of cobbles, and flakes in which the striking platform is a flake scar and whose exterior face reveals the scars of previous flakes removed from the core. Choppers, scraper planes and ovate bifaces may also be found. These forms are so basic to man's chipped stone technology that their form

## TABLE 3

## YUHA DESERT CULTURAL SEQUENCE

| Geologic Periods | Yuha Desert | Regional Sequence |
|---|---|---|
| HOLOCENE | Localized Aboriginal Agriculture | –1850 disruption of aboriginal lifeway<br>YUMAN III |
| | Final Lake Cahuilla Adaptation | –1450 Lake Cahuilla desiccation<br>YUMAN II |
| | | –1050 Lake Cahuilla filling (?)<br>YUMAN I |
| | Sparse populations of hunter-collectors<br>Possible stands of Lake Cahuilla | –A.D. 600 |
| | | AMARGOSA |
| | | –2000 B.C. |
| | Truckhaven man<br>3840 B.C.<br>± 250<br>(bone apatite) | PINTO |
| | | –5000 B.C. |
| | | SAN DIEGUITO |
| | San Dieguito I | |
| LATE PLEISTOCENE | | –10,000 B.C. |
| | Yuha Man<br>preliminary date greater than 21,500 years ago (caliche) | PRE-PROJECTILE POINT |

gives no clue to dating. In the Old World, such forms are widely distributed long before man had spread to the New World. In California such tool types continued to be used up to the time of Spanish contact, although they are given little attention in reports from later sites where more specialized, carefully formed and chronologically sensitive artifacts are featured.

In the Colorado Desert the term *Malpais* is sometimes used now to refer to these materials, very much as Rogers (1939) used it when he published "Early Lithic Industries of the Lower Basin of the Colorado River and Adjacent Desert Areas." Rogers later (1950; 1958) added some tool types to the complex, recognized it as the earliest form of San Dieguito and renamed it San Dieguito I to emphasize its oneness with the later parts of the San Dieguito Complex (Warren and True 1961:273). Nevertheless, sites which fit Rogers' original description of Malpais and which predate the spread of projectile point manufacture in North America, currently dated as beginning about 12,000 years ago may exist in the Colorado Desert.

A series of radiocarbon dates obtained on calcium carbonate of the Yuha formation have been interpreted as dating a human skeleton found under a cairn in the Yuha Desert, and as lending support to the idea that man was present in the area in very early times (Childers 1974a; Barker, Burton and Childers 1973).

The dates, which range from 21,500 to 32,000 years ago were made on the calcareous coating of the skeleton and associated boulders (Childers 1974). Calcium carbonate which forms in the process of pedogenesis results from the segregation of groundwater carbonates. Dissolved carbonate in groundwater is not uniquely atmospherically derived organic carbon, but typically includes geologically ancient carbon in undetermined quantities. Calculation of a date from such a sample requires application of correction factors. Until extensive geochemical studies of the groundwater regime of the Yuha Basin have been made, any conclusion as to the age of carbonate samples will remain problematical. Discussing dates of this nature, Williams and Polach state, "The dates so obtained will be between about 500 and 7,000 yr. too old" (1971:3081). According to Barker, Burton and Childers (1973) Imperial Valley College Museum considers these dates as preliminary and plans additional dating to place Yuha Man more firmly in time.

It is expected that if there were pre-projectile point cultures in the New World, the peoples responsible for them would have pursued an unspecialized hunting and collecting lifeway, moving frequently from one camp to another within a loosely bounded area with which they were highly familiar. A group would consist of a few related families and would on occasion interact with adjacent groups. Although they did not make stone projectile points, a variety of techniques were available for taking small game, and on occasion the group would bring down large game. Gathered foods such as eggs, seeds, fruit and insects would comprise their staples. Since these proposed cultures date to Pleistocene times, the Colorado Desert would have been a better watered environment with more ample food resources than are presently available.

## SAN DIEGUITO

The complex of early materials that Rogers named San Dieguito form the earliest established and dated period in the Colorado Desert area. His site sheets at the Museum of Man record his observations of many sites within the Yuha inventory area which he assigned to the San Dieguito complex, specifically San Dieguito I. These sites are characterized by cleared circles in the desert pavement, 6-8 ft. in diameter, which Rogers termed sleeping circles, and which he felt were the bases of temporary brush shelters used only a few nights at a time. Often no artifacts were associated with them. The sites were to be found on mesalands and rocky terraces sometimes associated with modern sources of water such as the Colorado and its tributaries. In the Yuha Desert area he related the sites to the now-dry watercourses and washes. Rogers also noted that in large washes where two sets of terraces can be observed, the cleared circles occur on the surfaces of the upper, older set (Rogers 1939:6-8).

The pattern of distribution of the San Dieguito I sites in the western Colorado Desert as described by Rogers suggests temporal assignment to a period when water was more readily available than during the historic present. Since Rogers' work, chronometric data have become available which place the San Dieguito complex at about 9,000 years ago (Warren and True 1961:261, 271). San Dieguito is part of a more widespread horizon which includes the Lake Mohave complex and other, more vaguely defined materials from the Mohave Desert and the Great Basin which share similarities in artifact forms, appear to be associated with relict hydrological features and to date from the same general time period (Warren and True 1961:271-272).

Rogers (1950; 1958) postulated three phases of the San Dieguito complex, forming a sequence in which tool types of increasing specialization and refinement were added to the assemblage, pressure flaking supplemented percussion flaking as a manufacturing technique and increasing amounts of jasper and chalcedony were used (Rogers 1939:26-27). To date we have no stratigraphic or chronometric evidence to indicate the validity of Rogers proposed sequence within San Dieguito.

Rogers assigned all San Diegutito sites within the Yuha inventory area to San Dieguito I, according to his site sheets at the Museum of Man. Thus when artifacts were associated they were from the basic San Dieguito assemblage of flakes, choppers, scraper planes, ovate bifaces, notched pebbles cores, hammerstones, cleavers, keeled scrapers, pulping planes, side scrapers and spokeshaves. Presumably the additional forms that characterize San Dieguito II and III were not found. Rogers commented (1939:27) as to his inability to trace the Playa Industry, which he later renamed San Dieguito II and III, westward from the Lower Colorado River across the desert to tie in with the San Dieguito materials he first recognized on the Pacific littoral.

Rogers also recorded a large number of gravel pictographs in the Colorado Desert and

recognized that they spanned a long period of time. He believed that those of geometric pattern were of considerable antiquity and might be associated with the San Dieguito I materials. Figures representing life forms appeared more recent and he associated them with the Yuman occupation of the area (1939:9-16). Of the gravel pictograph sites Rogers describes, only SDMM-C-166 is situated within the Yuha inventory area. It consists of an alignment of cairns which Rogers thought dated from San Dieguito I times but which was much disrupted by a later Yuman occupation of the site (Rogers 1939:13).

## PINTO AND AMARGOSA PERIODS

In Rogers surveys of the Colorado Desert he found no sites away from the Colorado River dating from the period between San Dieguito I and Yuman II. By current dating this suggests a gap of more than 5,000 years, from perhaps 5000 B.C. to A.D. 500, in the archaeological record for the area. Subsequent work in the area has resulted in the identification of a scattering of archaeological material dating to this period. Treganza illustrated two projectile points that may well date to this time period, judging from their style (Treganza 1942:Fig. 11, 1 & 3). Davis and Johnson collected a point at Imp-82 which also may be assigned to this period.

Other tantalizing reports include that of McCown (1955) who reported finding several Playa or Pinto points from a deep occupation layer in a site referred to as "Split Mountain sand-dune site off the mouth of Fish Creek Canyon." No ceramics were in association and the layer was well stratified below wind-blown sand. While the apparent style of the points suggest greater antiquity, a radiocarbon date (LJ-GAP-59) placed the layer at A.D. 1230 (Hubbs and Bien 1967). McCown also reports finding Playa points, which presumably would now be called Pinto points, in locations which led him to suggest that peoples using these points were in the basin during a period when the lake stood full, and followed its margins onto the lake bed as it receded (McCown 1957:3). The available literature has not established the presence of a lake in the basin during this time period, but it is not impossible that the basin was filled once or several times during the Pinto-Amargosa period.

A radiocarbon date of 4,980± 100 (3030 B.C.) was obtained from a buried occupation stratum containing a quartzite point of unspecified form in valley fill in San Felipe Creek Valley in eastern San Diego County (Fergusson and W.F. Libby 1962).

A radiocarbon date on bone apatite from Truckhaven man, a burial excavated by Imperial Valley College, also falls in this period. The date, by Geochron Laboratories, was 4,990±250 radiocarbon years, yielding an uncorrected date of 3840 B.C.±250. Truckhaven man was found under a cairn of about the same size of Yuha man. Despite similarities in the situations of the two interments, the excavators point out contrasts between them as well, which they interpret as consistent with the difference in ages suggested for the two burials (Barker, Burton and Childers 1973).

This scattering of materials suggests that the area was not entirely unoccupied during the Pinto-Amargosa period. Yet it is not unreasonable to suggest that the Yuha Desert area in fact had a very sparse population during this period, and that the activities that might have been carried on have left us little archaeological indications. The hunting and collecting peoples of this time are likely to have found greater concentrations of food sources just west of the inventory area in the mountains where game was more abundant and vegetation richer, and to have spent most of their time in these uplands. Preceramic sites are rare in the uplands, but they do occur (Weide 1972). It is also possible that the sloughs along the New and Alamo Rivers attracted hunters and collectors in some numbers as well, although evidence for this is lacking.

During much of the period under discussion it seems unlikely that Lake Cahuilla maintained a prolonged high stand (see Regional Environmental History) that would have supported extensive human populations. Instead, much fluctuation in level resulting in extensive and frequent transgression/regression sequences may have occurred, disrupting any archaeological remains within the reach of the waters.

A final factor affecting the apparent sparsity of remains from this period is that collection of foods such as mesquite requires little equipment that is not perishable. Collecting sites from the ceramic period yield little more than pottery. Since basketry served as the functional equivalent during the period under discussion, the remains of a collecting camp would be primarily fire cracked rock, and flakes, easily obscured and mixed unrecognized into materials from subsequent use of the sites in ceramic times.

Projectile points would be the single most diagnostic artifact that might identify remains from the Pinto-Amargosa period and we must look to the sequence to the north, in the Mohave Desert, as indicators of the projectile point sequence we might expect. Following the San Dieguito-Lake Mohave period, sites characterized by Pinto style points are found along the edges of watercourses that are now primarily dry, associated with shallow lakes. Pinto sites often have some milling tools for food processing in their inventory but they are in low proportion to the chipped stone tools which dominate the asemblages (Susia 1964:30-31). By 3000 B.C. sites emphasizing a food collecting lifeway characterized by larger number of food grinding tools, choppers, scrapers and hearths with cooking rocks are known in the southern Great Basin (Williams and Orlins 1963).

Rogers later (1950) dropped the Pinto-Gypsum stage from his sequence, converting it to Amargosa II. Subsequent authors, however, have retained a stage characterized by Pinto points and dating about 5000-2000 B.C. Gypsum points are now assigned to the subsequent Elko/Amargosa period to which various authors have given different names (Wallace 1962; Bettinger and Taylor n.d.; Warren and Crabtree 1973; Mortland and Connelly 1974).

Shortly after 2000 B.C. large stemmed and notched projectile points with triangular blades in varying proportions come to characterize archaeological sites. They are widely

recognized in the Desert West and are usually referred to as Elko points in the Great Basin. In southeastern California the local variants are often called Amargosa points and Rogers (1939:16) illustrates several examples. As Wallace indicates (1962:176-177), knowledge of site locations and assemblages from the Amargosa period is extremely scanty in the southern California deserts, a situation which stands in strong contrast to the northern Great Basin where materials from this period are well known, evidencing a well-developed hunting and collecting subsistence with specialized adaptations including use of lacustrine resources (Weide n.d.).

**YUMAN (Fig. 5)**

Arrowpoints spread through the western Great Basin about A.D. 500, first as small versions of Elko series and related point styles, their smaller versions called Rose Springs points. Shortly thereafter, peoples with ceramic technology became established along the Lower Colorado River. Rogers (1945:169) used the term Yuman, a linguistic designation, to refer to their prehistoric and historic periods. There have been objections to the term because it implies cultural and linguistic continuity through these periods and the terms Patayan (Colton 1945) or Hakataya (Schroeder 1957) are often substituted.

Rogers (1945:174) describes a preceramic pattern in the Mohave Desert which replaced Amargosa and needed only pottery to make it "Yuman." This pattern has not been reidentified, but it may have some relation to Amargosa II as Wallace (1962) uses it.

The establishment of ceramic-producing peoples on the Colorado River is not yet well dated, but is thought to have occurred about A.D. 600-700. Schwartz (1956:28) placed the Cohonina branch with pottery along the Colorado River in Northwestern Arizona about A.D. 600. Schroeder (1961:2) dated the first ceramic production at Willow Beach to about A.D. 900.

Rogers believed that the earliest Yuman occupation (Yuman I) was confined to the Lower Colorado River. Yuman II saw the spread of Yuman ceramics into the Salton Sink, coincident with the filling of Lake Cahuilla. Sites along the Lake Cahuilla shoreline were assigned to Yuman II by Rogers based on their ceramic content, and Rogers dated this period from about A.D. 1050 to 1450 (1945:190-191). Although these dates were suggested prior to the availability of radiocarbon dating they are not inconsistent with dates now available (Wilke 1974) and were based on the dating of intrusive sherds from the Southwest.

However, Lake Cahuilla may have had a more complex history in the period from A.D. 1 to the present than Rogers anticipated. Although its recent history is not well understood, radiocarbon dating which has been done suggests several high stands of the lake in relatively recent times. The picture that emerges from the dates (Appendix 1) is not entirely congruent with our concepts derived from the current archaeological picture. There is a cluster of six dates which fall between A.D. 1480 and 1730, all but one of which date

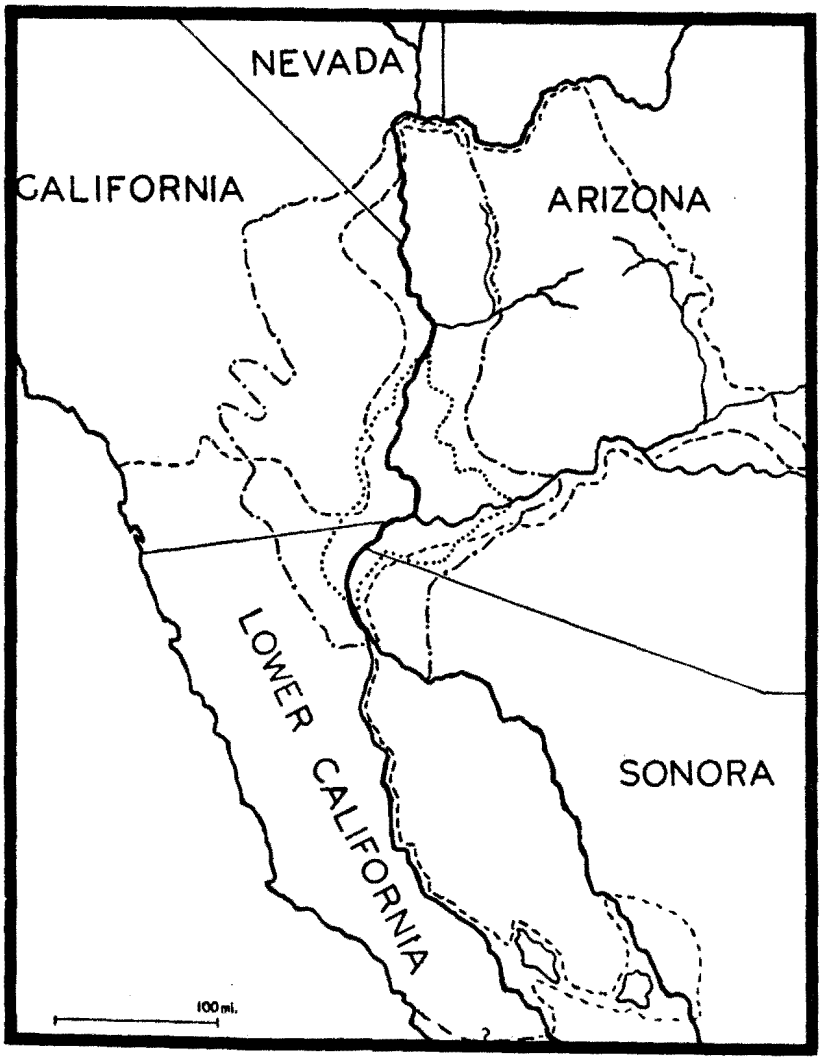


**Fig. 5. Boundaries to maximum areas of Yuman I, dotted line; of Yuman II, dot and dash lines; of Yuman III, dash line. (After Rogers 1945).**

charcoal associated with fish bone on the high beach line. A date of A.D. 1680 from occupation at 160 feet below sea level is interpreted as dating a period of infilling. Three charcoal dates, one of which dates fish middens at the high beach line, fall between A.D. 950 and 1190. Two earlier charcoal dates of A.D. 370 and 510 also date an apparent high stand.

It is fair to say that no satisfactory picture of the history of Lake Cahuilla, even for the past 2,000 years, emerges. Carl Hubbs, who was responsible for the dating program which yielded the bulk of the Lake Cahuilla dates, offered interpretations of the lake sequence in 1960 (Hubbs, Bien and Suess 1960:217) and in 1963 (Hubbs, Bien and Suess 1963:269). In 1965, summarizing radiocarbon dates obtained to that time, he said more simply "the history of Lake LeConte is complex" (Hubbs, Bien and Suess 1965:89).

It is clear that much more work is needed both with respect to archaeological stratigraphy in occupation sites and sedimentary stratigraphy of the Holocene deposits before we have anything like a realistic picture of the relationships between man and Lake Cahuilla during much of its history. Sedimentary stratigraphy described by Stanley suggests at least two cycles of filling of the Lake (or fluctuations of it) in recent times, perhaps three, the intermediate one dated A.D. 1190 (Hubbs, Bien and Suess 1960:215). Description of the archaeological strata for a number of the dates obtained from charcoal associated with fish middens suggest that stratified archaeological sites exist in the area, with occupation layers separated by silts and wind blown layers, depending on their situation.

While it is presumed that maize agriculture was established along the Lower Colorado at the same time as ceramic manufacture, Rogers himself was not concerned with the spread of agriculture. Recent excavations along the northern portion of Lake Cahuilla indicated a lacustrine adaptation associated with the final high stand of Lake Cahuilla, evidenced by middens with abundant evidence of fishbone, shell of *Anodonta californiensis* and aquatic avifauna (Wilke 1973). Although pottery is present in these sites, they have not yielded evidence of agricultural foods.

Two major effects of the final decline of Lake Cahuilla have been postulated. First there may have been wholesale movement of populations from the Salton Basin both into the Colorado River Valley and into the mountainous region west of the basin (O'Connell 1971:180). Second, agriculture may have first spread into the Colorado Desert away from the river at this late date, with the Cahuilla developing specialized water control techniques such as well and spring irrigation and building of reservoirs and ditches which enabled them to grow crops from the Lower Colorado agricultural complex in the non-riverine environment of the Coachella Valley (Wilke 1973). The history of the Kamia adaptation of the Lower Colorado complex to the overflow distributaries of the Colorado along New and Alamo Rivers remains unknown, but may also date to this period.

The post-Lake Cahuilla period was called Yuman III by Rogers (1945). Sites from that

period in the Yuha Desert area are generally associated with mesquite dunes and springs or wells. They are thought to represent gathering camps resulting from seasonal reliance on mesquite and other gathered goods by the Diegueño and the partially agricultural Kamia.

Most of what we know of this period is extrapolated from the ethnographic record, summarized elsewhere in this report. The archaeological record includes Rogers' site reports, reports in the UCLA site records of cremations weathering out at various locales, and the reported discovery of a large cache of ceramic clay (von Werlhof 1974).

Ethnographic evidence also indicates that the Yuha Desert served as much as an area to be traversed as a resource base. This is reflected in the archaeological record of a series of shelters in the Coyote Mountains. The shelters, Imp-49 through Imp-55, were situated along a canyon which forms a pass from the desert to the vicinity of Carrizo Springs. Excavated by Reinman, True and Warren (1960), the shelters were found to have only slightly developed midden deposits, probably reflecting intermittent use, and a group of artifacts found clustered in a corner of one shelter as though they had been stored there. Ceramics present suggest that use of the shelters dated after A.D. 1100. Cairns which appeared to be trail markers were also observed in the canyon.

## SUMMARY

The scanty archaeological record of the Yuha Desert area, when examined from the perspective of the Colorado and Mohave Deserts, suggest that major occupation of the area by prehistoric man falls into the earliest and latest periods respectively, separated by a time period of perhaps 5000 B.C. to A.D. 500 in which the period was very sparsely inhabited. During early periods prior to 7000 B.C. the area may have been more richly vegetated and better watered under the influence of late Pleistocene climate, although we do not yet have documentation of the late Pleistocene-early Holocene climate and vegetation record. After 5000 B.C. the climate was much like that at present and most of the Yuha Desert yielded scant resources for the support of hunting and collecting peoples. With the final stand of Lake Cahuilla beginning ca. A.D. 1050 a lacustrine resource complex became available in the northern and eastern portions of the Yuha Desert area. It was suggested earlier that this resource base was most likely subject to wide fluctuations in productivity as a result of fluctuations in the inflow of water from the Colorado River. If so, certainly the plant complex would have been ephemeral, and therefore not something which aboriginal populations could have relied heavily upon. Settlements would have moved back and forth along the advancing and receding shoreline, and the most stable resources of the lake during such fluctuations may have been fish and aquatic avifauna. This interpretation is not altogether in agreement with that of Wilke (1973), who has suggested that the resource base of the most recent stand of the lake was generally stable rather than generally fluctuating. The answer to this question of how stable the lake, food resource complex, and cultural adaptation actually were will ultimately be derived from archaeological and geomorphological studies, and the Yuha Desert area can be expected to contribute some

important information in this regard. In any event, it is probable that after about A.D. 1400 or 1500 Lake Cahuilla receded with some rapidity, and the resultant population movements from the dying lake may have had a fairly profound effect on neighboring populations in the Peninsular Ranges of California, in northern Baja, and on the lower Colorado River. The spread of agriculture into southeastern California from the Lower Colorado may be viewed as part of this general period of adaptation to changing abundance, nature, and distribution of available food resources. At the time of historic contact the Cahuilla of Coachella Valley and the Kamia of Imperial Valley were to some extent involved in agricultural pursuits, although they both probably relied to a large extent on the collecting of wild foods. Thus during the final period of prehistory, and in early historic time, the Yuha was again a peripheral region, providing some food resources for gathering to supplement crop growing to the east along New River, and serving as a zone of interaction between the Kamia and their Southern Diegueño neighbors.

## CURRENT AND POTENTIAL THREATS TO THE ARCHAEOLOGICAL RECORD

The archaeological record remaining in the Yuha area after more than a century of Euro-american occupation is an extremely fragile one. Incomplete though it may be, it comprises a major resource for the understanding of the development of the cultures of the southern California Indians, particularily the Kamia, whose heartland has long ago been destroyed by modern agriculture. Man's adaptation to the most arid of lands, the processes of spread of ceramics and horticulture from the Southwest to the Californian peoples, and possible evidence of early man illustrate the range of questions that may be investigated in the area.

Threats to the archaeological record of the Yuha come from several sources. The most evident of these is the expanding recreational use of the desert facilitated by self-contained motor homes and versatile off-the-road vehicles. Development of recreational facilities to accommodate and channel mechanized recreational use will pose an additional danger to archaeological resources unless adequate planning and necessary mitigation precedes construction. Expansion of urban areas and agricultural lands is not progressing at a rapid rate at the present time, but with the constant threat that salinity levels in the Imperial Valley will reach the level where present fields will be rendered unusable, it is possible that the Bureau of Reclamation may cast its eye west to the gently sloping periphery of the present agricultural zone. While the Yuha seems at first to be an area with little economic potential, gravel operations and surface stripping for fill, roadbed development and gravel are common activities which destroy archaeological remains in the area. Limestone quarrying necessary in the production of concrete destroys the rock type most likely to include rock shelters and caves and is a threat to one of the most valuable kinds of archaeological sites, the dry cave situation where seeds, nets, basketry and other items which perish in open locations have their only chance of preservation. Spring development, whether for recreational use or watering animals and wildlife almost always puts archaeological resources at risk, for springs have been foci of human use through their history. Finally, military use of some areas poses a very real threat, particularily where bombing and gunnery are invloved, or use of heavy equipment such as tanks occurs, or where networks of service roads are developed.

Recreational use of the desert increasingly aided by versatile vehicles is resulting in the destruction of archaeological resources in two ways. First is the incidental destruction that results from operation of vehicles over previously undistrubed land surfaces. This scatters archaeological remains whose patterns could be discerned and interpreted by trained archaeologists in terms of the activities and tool kits of past occupants. Running of vehicles on soft sediments and sand dunes breaks through protective natural crusts and initiates erosion, accelerating the natural attrition of the archaeological record. The wheeling and turning of vehicles on desert pavements destroys the sleeping circles and rock alignments attributed to the San Dieguito phase and thought to date at least 7000 years ago. The intaglios and other fascinating, man-made features on the desert pavements which date from

subsequent periods of prehistory are similarily vulnerable. Several of those in Yuha Wash, reported by Davis and Winslow (1965) are now gone, destroyed by ORV traffic (Emma Lou Davis, personal communication, 1974). The one that remains, recorded as Imp-80, has been fenced by the BLM, thus receiving some protection.

Collecting of archaeological materials which has long been a major threat to the prehistoric record increases in intensity and distribution with the aid of off-the-road vehicles. It ranges from the dedicated collector who systematically loots archaeological sites for his own private collection or to sell artifacts for profit, to more incidental, thoughtless collection in which casual collecting of arrowheads and other items as encountered is part of the desert experience. Scanning issues of *Desert Magazine* over the past 30 years makes clear the extent that collecting of oddities such as fossils, petrified wood, concretions and arrowheads has long been a prime attraction of the desert, and would seem to have been encouraged by articles in that magazine.

Development of recreational facilities in the Yuha area, either by the BLM or by contractual arrangement with concessionaires may prove to be a positive step in protecting the archaeological resources or a disaster, depending on the planning and considerations of direct and indirect impact on the resources that result from location of facilities and access roads. Development of such facilities provides the opportunity to channel recreational use into particular parts of the area, reducing use and impact on other parts. On the other hand, almost any area suitable for present development has a high potential for having been a focus of prehistoric or historic use as well. Systematic archaeological survey and adequate provision for mitigation of expectable impacts, direct and indirect, of planned programs need to precede any such development.

Opening up of new areas which have had restricted access either by military usufruct or lack of roads should be avoided. Due to popular attitudes and non-enforcement of pertinent laws, the only real protection for archaeological resources is inaccessibility. Davies Valley is a primary example of an area that may have a more intact archaeological record than other areas of the Yuha, because it is difficult to get into.

Federal environmental protection laws now confer considerable protection on archaeological resources if Federal agencies follow them in good faith. Should the Bureau of Reclamation seek to expand the irrigated land of the Imperial Valley westward into the Yuha for instance, it should be permitted by the BLM only under conditions which result in thorough archaeological survey of endangered areas and consideration of impact of alternate routes, plus mitigation. Similarily, requirements for archaeological survey should be made a condition of all permit applications for grading, scraping, gravel operations and quarrying.

Spring development, an activity likely to be undertaken by the BLM in areas where lands are open to grazing or where there is wildlife use (see Weaver, Mensch and Fait:1968 for example), should be preceded by archaeological examination. Springs constitute microenvironments that have attracted man's activity over a long period of time and may

preserve stratified records of his visits, a rarity in other kinds of archaeological sites in the desert.

Military use of desert areas may constitute a mixed blessing. Many forms of military activity are extremely destructive of the earth's surface (see for instance UCLA site sheet Imp-101). Yet in some areas restriction of access to military reservations has resulted in preservation of materials from either systematic looting or casual collection. Working in areas of the China Lake Naval station, Emma Lou Davis has found important materials bearing on the late Pleistocene/early Holocene periods of man's occupation of the desert still in place, and has been able to carefully map their distribution and study their relationship to the paleoenvironments of the area and the fossil fauna (Emma Lou Davis, personal communication, 1973). The situation relative to the Naval Reservation in the middle of the Yuha inventory area appears to be without redeeming qualities however. It is receiving considerable impact from military use of tanks, and at the same time is completely open to ORVs and is heavily used.

Current and potential threats and impacts on the archaeological record seem to be broadly distributed in the Yuha. In the course of this study, the apparent pattern that emerges is that of an area receiving heavy but dispersed impact due primarily to recreational use, made possible by its sparse vegetation and extensive flat areas which permit ready access to most of its reaches. We requested (letter February 25, 1974) that Imperial Valley College Museum include in its report a summary of its view of current impacts and problems, but the report received included no such information (Appendix 2). As directed by the BLM, we again requested this information (letter June 7, 1974) from Imperial Valley College Museum. In this same request, we asked that site numbers be affixed to all symbols on the IVCM map. To date, this information has not been received from Imperial Valley College Museum and is not included in this report. It will be forwarded to the BLM when received.

# ARCHAEOLOGICAL INVENTORY OF THE YUHA AREA

The "Archaeological Element of the California Desert Study" (Weide 1973) outlines a program of statistical sampling of inventory areas in the California Desert, designed to yield projections of patterns of site locations and densities in the desert. These projections will be most useful in long-term planning of use and development in the California Desert, providing the kind of data useful in early planning stages of use corridors, regional facilities development, etc.

## SHORT TERM PROGRAM

Funding for such a large scale inventory now seems as far off as it ever has been and in considering the Yuha inventory area, the need for a complementary approach, geared toward more immediate needs is evident. Such a program should be closely integrated with interim management planning for the Yuha. It may require intensive, systematic survey of areas currently under heavy impact which cannot be redirected and of areas to which interim management or development will serve to channel impact.

Such intensive, systematic survey of areas, coupled with test excavations as needed will tell the BLM precisely what is there by way of archaeological values. If the boundaries of survey areas are defined in such a way as to be congruent with archaeological inventory sampling polygons, data collected will be doubly valuable, yielding information as to site densities and locations relative to inventory variables. With proper manipulation it can be integrated as a very useful portion of the data base for inventory projections. If survey units are also designed to be of sufficient size to constitute reasonable research universes, a third benefit will result in that increased knowledge obtained in the course of survey can be integrated into interpretive programs enhancing the public value of archaeology as a resource.

It is recommended that a short-term archaeological program complementary to the Desert Study Archaeological Inventory be developed for the Yuha area. Designed to meet immediate protection and management needs, it would involve systematic evaluation of archaeological resources within subregions of the Yuha, defined with boundaries congruent with the sampling polygons and of sufficient size to constitute research areas. Systematic evaluations should be followed by positive action in the short term program, either by closure of areas until protection can be provided or mitigation if no other alternative exists to the continuing destruction of the archaeological record.

## APPLICATION OF THE ARCHAEOLOGICAL INVENTORY PROCEDURE TO THE YUHA AREA

The "Archaeological Element of the California Desert Study" (Weide 1973) outlines procedures for statistical sampling of an inventory area. As part of this background study,

stratification of the area into sampling polygons was begun, the first stage in implementing the sampling design.

The basic purposes of stratifying the area prior to drawing a random sample are two: first, to assure good spatial distribution of the sample and second, to ascertain that significant portions of land pertaining to selected variables are examined. In the sampling design for the Desert Study the variables of vegetation, hydrology and physiography were selected as the primary variables. Each of these variables was separated into a series of subdivisions (Weide 1973:Table 1). The variables and their subdivisions were outlined with an eye to desert-wide correlations, and it was expected that some adjustments in the stratification would be needed as the sampling design was adapted to individual inventory areas. Stratifying variables for the Yuha are summarized in Table 4.

It has not been possible to complete the stratification of the inventory area because BLM mapping of soils, from which physiography is partially derived, and vegetation is not complete. Stratification has been undertaken for the quads which fall in the areas which received preliminary mapping by Raytheon, for which overlays are available, and the following comments are derived from this stratification.

## VEGETATION

Virtually the entire area mapped falls into stratum $A_1$, Saltbush and Creosote Bush Communities, and $A_2$ Desert Shrub Communities. Since the portions of the inventory area that fall at higher elevations on the Coyote Wells and In-Ko-Pah Gorge Quads were not included in the Raytheon overlays, we cannot yet judge how satisfactory the higher elevation vegetation zones will be. Given the monotony of the vegetation over much of the area, vegetation handled as proposed in the Desert Study sampling design is not going to be a very sensitive indicator within the Yuha. We suggest that a vegetation stratum ($A_5$) based on the Mesquite Communities (BLM Code 12) be identified to include areas of extensive mesquite, such as the Great San Felipe Mesquite Forest.

In drawing boundaries on the stratification maps the goal was to identify general zones, so, for instance, isolated patches of Desert Shrub surrounded by Saltbush and Creosote Bush Communities were not split out.

## HYDROLOGY

Three kinds of hydrologic sources are included in stratifying for hydrology, each requiring that some judgments be made in drawing boundaries of sampling polygons.

### Stream Order

Stream order was determined as in Weide and Weide (1973) using stream channels as indicated by blue line symbol for intermittent or permanent stream on 7½ min. USGS

## TABLE 4

## STRATIFYING VARIABLES FOR THE YUHA INVENTORY AREA

A. Vegetation

| Archaeological Element Stratum | BLM Vegetation Map Legend Communities | BLM Code |
|---|---|---|
| $A_1$ | Saltbush Communities | 13 |
| | Creosote Bush Communities | 11 |
| $A_2$ | Desert Shrub Communities | 16 |
| $A_3$ | Mountain Shrub Communities | 05 |
| | Conifer Communities | 06 |
| | Pinyon-Juniper | 09 |
| $A_4$ | Grass Community | 01 |
| | Sagebrush Community | 04 |
| $A_5$ | Mesquite Communities | 12 |

B. Hydrology

| | |
|---|---|
| $B_1$ | Springs and tanks, area defined as a circle .5 km radius from the spring or tank. |
| $B_2$ | Stream order less than three, area defined as a strip 1 km wide centering on the stream line. |
| $B_3$ | Stream order three or larger, area defined as a strip 1 km wide centering on the stream line. |
| $B_4$ | Areas within .5 km of relict features of past hydrology, such as past lake stands, now-dry washes, springs and tanks. |
| $B_5$ | Areas at distances greater than .5 km from water resources as defined above. |

C. Physiography

| | |
|---|---|
| $C_1$ | Sand dunes. |
| $C_2$ | Basin floors and valley floodplains. |
| $C_3$ | Bajada slopes and alluvial fans, areas not included in $C_4$. |
| $C_4$ | Mountain/bajada intersection, area defined as a strip 1 km wide centering on the break in slope. |
| $C_5$ | Slopes with exposed bedrock and/or greater than 10% slope. |
| $C_6$ | Upland surfaces with less than 10% slope. |

quads. Drainage indicated only by crenulations in contours were not considered. The three stream segments that have permanent flow, Myer Creek, Carrizo Creek, and San Felipe Creek, fell into stratum $B_3$, stream order 3 or higher.

**Springs**

The spring locations used as springs in identifying stratum $B_1$, springs and tanks, in the Yuha area are summarized in Table 5.

**Lake Cahuilla Shoreline**

The +40' contour serves to approximate the prominent shoreline of the last high stand of Lake Cahuilla, serving as the center of a strip 1 km. wide constituting stratum $B_4$. Lake Cahuilla does not have other recognized beachlines which were a focus of man's activity or mark a significant stand of the lake within the time period of man's occupation. Stanley (1962, 1965) has recognized a late Pleistocene beachline of the order of 120 to 160 feet above sea level in places, but it is much distorted by tectonics and subsidence, and mapping of it is not available. Barker, Burton and Childers (1973) have proposed a beachline at +420-440' levels with which Yuha man and Truckhaven man were associated. Until the existence and extent of such beachlines are confirmed by geological mapping, they should not be split out as a sampling stratum. Should the presence of additional beachlines, above or below the +40' line be confirmed in the course of inventory work, restratification would be appropriate prior to subsequent sampling phases.

**PHYSIOGRAPHY**

The soils legend used both by BLM personnel preparing vegetaion maps and by the Raytheon Company in preparing overlays has a strong element of topography implicit in it. Thus the Raytheon overlays were used as a guide in stratifying the Yuha area according to physiography.

The mapping of sand dunes on the Raytheon photos proved to be most disconcerting because there are areas shown on the 7½ min. topographic maps that were obviously dunes, but were not so mapped on the Raytheon overlays. In stratifying the area all dune fields evident from either source were included as stratum $C_1$.

Stratum $C_2$ was used to include the long, sloping surfaces that reach from the foot of the hills and mountains to the western edge of the Imperial Valley, and thus includes a large amount of the area. $C_3$ was confined primarily to active alluvial fans, recognizable from their concentric contour pattern on the map. Outlying remnants of earlier fan systems, common along the mountain fronts, were not included because of the unwieldy complexity they would introduce into the sampling design. Raytheon designations for parent material and land form within the soils legends were of considerable value in deciding where to draw lines between stratum $C_2$, basin floors and floodplains, and $C_3$, bajada slopes and alluvial fans.

## TABLE 5

## SPRING LOCATIONS IN THE YUHA REGION

| NAME | LOCATION | INFORMATION SOURCE |
|---|---|---|
| Kane Spring | Kane Spring 7½' quad, NW¼, SW¼, Sec. 21, T12S, R11E. | Mendenhall 1909:85 |
| Coyote Wells | Coyote Wells 7¼' quad, NW¼ Sec. 32 T16S, R10E. | Mendenhall 1909:86 |
| Yuha Spring | "in a wash near the corner of sections 5, 6, 7 and 8, about 5 miles southeast of Coyote Well and a mile southwest of the derrick of the Yuha oil well. . . .In 1905 there was a trough and pump there." | Mendenhall 1909:86 |
| Mountain Spring | Mountain Spring proper is just outside the inventory area, but part of its ½ km. radius falls in the inventory area, and there is a closely associated spring at the stage station. In-Ko-Pah Gorge 7½' quad, S½ Sec. 19, T17S, R9E. | Mendenhall 1909:86 |
| Recluse Spring | In-Ko-Pah Gorge 7½' quad, NE¼, Sec. 33, T17S, R9E, el. 2,580' | Weaver, Mensch and Fait 1968 |
| Juniper Spring | In-Ko-Pah Gorge 7½' quad, NW¼, SW¼, Sec. 34, T17S, R9E, el. 2600' | Weaver, Mensch and Fait 1968 |
| Pinto Wash Spring | In-Ko-Pah Gorge 7½' quad, NW¼, NW¼, Sec. 3, T18S, R9E, el. + 1400' | Weaver, Mensch and Fait 1968 |

**TABLE 5 (cont.)**

| | | |
|---|---|---|
| Unnamed Spring | In-Ko-Pah Gorge 7½'quad, NW¼, NW¼, Sec. 29, T17S, R9E, el. 2,200'. | Weaver, Mensch and Fait 1968 |
| McCain Spring (another) | Kane Spring NW 7½'quad, NW¼, Sec. 30, T11S, R10E. Spring is indicated by vegetation only at present, no flow. | Billy Templeton (personal communication) |

Notes on other localities not treated as springs:

1. Harper's Well: (Harper's Well 7.5 min. quad, SW¼ of NW¼ of S26, T12S, R10E). There is no reason to think there was a spring here until the drilling of a prospective oil well struck water at a depth of 300 feet (Mendenhall 1909:85).

2. Three springs shown on the USGS 7.5 min. topographic map, Harper's Well quad, situated on the floors of San Felipe Creek, Fish Creek Wash and Carrizo Wash, respectively, serve to bring the water of these washes to the surface to initiate permanent flow downstream. The areas of these springs are included in the stratum $B_3$ (stream order 3 or greater), and should not be placed in stratum $B_1$ with the other springs, which are point sources of water.

All upland areas with exposed lithology and rugged topography were placed in stratum $C_5$. No effort was made to calculate slope. No significant upland flats were noted on the topographic maps of the areas stratified, so that no areas are assigned to stratum $C_6$.

## INITIATING THE INVENTORY

After completing the stratification of the area the first stage sample would be drawn and executed as per the archaeological inventory procedure (Weide 1973:25-31). The further course of the inventory would be determined taking the results of the first phase sample into account, and cannot be specified here.

## SITE LOCATION RECORD FOR THE YUHA INVENTORY AREA

The map of archaeological locations which accompanies this report includes information from the following sources:

(1) UCLA Archaeological Survey which is the designated office for site survey records for Imperial County;

(2) Some, but not all of Malcolm Rogers site locations from his site sheets in the Museum of Man;

(3) Two site locations from the Archaeological Survey Association of Southern California's survey of the Lake Cahuilla shoreline, derived from the location published for radiocarbon dates from the archaeological sites.

Only in the case of UCLA records are there site sheets for the mapped archaeological sites. Comment sheets have been compiled for each site mapped from Rogers site records or from radiocarbon dates. Comments on and amendments to the UCLA site sheets are included on commentary sheets interpaginated with the UCLA site sheets. Three additional sources of site location information exist but were not fully accessible due to limitations placed by the holding institutions. The site records of the Archaeological Research Facility, UC Berkeley should duplicate those at UCLA, but judging from the assignment of site numbers to collections in the Lowie Museum, Berkeley, there may be discrepancies. It is recommended that when additional funding becomes available, the BLM enter into direct negotiations with the Archaeological Research Facility, Berkeley, to obtain copies of any site records pertaining to site locations in the Yuha inventory area, and also to obtain any background information on Treganza's work that might increase its value. Similarly, extended negotiation and payment of fees would be required to obtain copies of pertinent Museum of Man site records.

Those of Rogers' sites that are mapped by the authors are based on notes made from his site sheets at the Museum of Man, and on published sources. No notes were made of the large number of sites he recorded along the +40' beachline of Lake Cahuilla, nor on the sites he recorded along San Felipe Wash. At the time of our work at the Museum of Man, it was understood that his data would be incorporated in a satisfactory manner into the material to be prepared by Imperial Valley College Museum (IVCM).

The site location map compiled by Imperial Valley College Museum from its files accompanies this report. Imperial Valley College Museum declined to make available copies of its site records; therefore, our comments will be restricted to the museum's handling of the UCLA site locations as incorporated into its map.

The presentation of the IVCM map in its present form, entirely lacking documentation,

poses a number of problems in evaluating the site locations as presented. IVCM has encircled site locations which it considers imperfectly located, but none of the comments below refer to sites so indicated. One cannot comment on the locations reported either by Rogers or by IVCM's own people, but they appear to have been somewhat cavalier in their treatment of sites from the UCLA file. For, while no great accuracy is claimed for UCLA site locations, to modify them without explanation only lends further confusion.

The following problems are noted:

1. The IVCM map omits the site locations for UCLA Imp-17, 20-21 and 23 which were recorded by Treganza in Davies Valley.

2. Other Treganza sites were omitted, including UCLA Imp-12, 18 and 19.

3. No site approximating UCLA Imp-28, recorded by Aileen McKinney in 1966 is included, although a number of other sites are attributed to her on the map.

4. IVCM has given specific site locations to the Coyote Mountain sites, UCLA Imp-49 through Imp-55, described by Reinman, True and Warren (1960), even though neither the site sheets nor the published record provides this information. In addition, the general location of the sites has been moved 1½ miles to the northeast of its published and recorded location, placing them in Sec. 31, T15S, R31E, in a patch labeled "Warren".

5. UCLA Imp-56, which was very accurately located since a section corner was found within the site, is either mislocated or omitted on the IVCM map.

6. UCLA Imp-73, recorded by Lavielle and Lawbauch, is either mislocated or omitted on the IVCM map. There is a site labeled Lavielle '50 which IVCM locates in T11S, R10E, Sec. 11. This may be a misplotting of Imp-73, which is in *T12S,* R10E, Sec. 11.

7. UCLA 80, 81 and 88, Yuha Wash gravel effigy sites, are apparently plotted as a single locale in Sec. 2, T16½S, R10E.

8. IVCM mapping of UCLA Imp-96, which is presumably the X labeled Shepard '50, places the site atop a ridge, highly unlikely from the description and sketch map in the site report. UCLA mapping agrees well with the sketch map.

9. UCLA Imp-97 is apparently omitted, although the site sheet filed at UCLA by Aileen McKinney gives excellent location data.

10. The brown dot situated where UCLA Imp-115 is recorded indicates "Circles; stone lined, not just cleared areas" (Appendix 2), rather surprising since this is the recorded location of the burial known as Yuha Man.

11. The cremation site UCLA Imp-117 is omitted unless it is one and the same with UCLA Imp-101, which appears on the IVCM map as a blue dot labeled Insko '70.

12. UCLA Imp-119, another cremation site, is omitted.

The University of California, Davis, has research in progress in the Yuha inventory area (True and Casteel 1973) but to date has not completed site sheets and site location data. That information will become available to the BLM under normal operation of the Federal Antiquities Act permit and reporting system. Similarly, as the Archaeological Survey Association of Southern California processes the Lake Cahuilla survey material (McCown 1954; 1955; 1957) contact with them should result in additional site location information.

## ACCURACY OF AVAILABLE SITE LOCATION DATA

The overall accuracy of the compiled site location data for the Yuha area must be judged as low. Significant amounts of site survey information remain unreported or of curtailed usefulness. There is not a single square mile in the Yuha inventory area for which we have an inventory of the archaeological resources present. What we have is a rather haphazard collection of site sheets of varying quality which were filed over the years, and of site locations which were mapped therefrom. That this record exists at all is due to the voluntary cooperation of archaeologists, avocationalists and the UCLA Archaeological Survey which has served as the Imperial County repository since 1958. Imperial County site records are no worse than those in many counties in California, but the quality of the present record must be understood if it is in any way to form a basis for interim management.

The University of California system is based on the completion of a site sheet, a form which requires information as to site location, nature of the remains, condition, who recorded the site, date of recording, etc. The sheet is to be completed by the person recording the site, and then is turned in to the Archaeological Survey where an employee or student volunteer would determine if the site has been previously reported. If not, it would be assigned the next site number in the county series, its location entered on the master set of topographic maps and the site sheet filed.

Errors in location can creep into the process of mapping at a number of points. It is fair

to question how certain the person was of the actual location of the site when he recorded it. The sites in the Yuha were not generally recorded with the aid of aerial photographs or surveying instruments, but by the recorder's judgment as to his location on a map. Quality of map varies as well, depending on what was available at the time of the survey, and what map was taken to the field. Another source of error is the plotting of site locations on the master set of maps. It was ordinarily done from the information on the site sheet only, by someone unfamiliar with the locality and who had never seen the site, so the point location cannot be any better than the description of the site sheet reads. Recently, to increase the accuracy of site location plotting archaeologists have taken to photocopying the appropriate portion of the pertinent USGS 7½' quad with the site location plotted thereon, and appending it to the site sheet, resulting in much more accurate site locations in the master map file.

It is beyond the scope of this report to undertake systematic field checking of reported sites. However, in working with the reported site locations a number of problems have been noted, reported here as a caution against literal interpretation of the site records and maps that accompany this report.

The first 24 sites numbered in the Imperial County file are the result of Treganza's pioneering work in the area, and appear to have been made up long after the fact. Examination of them reveals that they include little information, with locations given only in a coordinate system which was dropped from maps in the late 1940's, but was the apparent basis for locating them on the master set of maps. Further work with Treganza's sites reveals that (1) not all sites in Imperial County to which Treganza (1942) referred are represented by site sheets, and (2) some sets of sites which Treganza lumped under a single number in 1942 and in labeling materials in the Lowie Museum were split into several sites for entry into the site files. An example of the former is *American Antiquity* site 15, which Lowie Museum files locate at Harpers Well. UCLA site files do not include any reported site in the vicinity of Harpers Well. The Mountain Springs localities referred to as *American Antiquity* site 4 in the Lowie Museum apparently include Imp-10 and Imp-11 judging from their mapped locations, although the site sheets make no such claim. However the sheet for Imp-14 states "Treganza's Antiquity site no. 4; Smuggler's Cave," and describes it as "A large rock shelter with deposit on the floor." The site is plotted in the SE¼, SE¼ Sec. 31, T17S, R9E, In-Ko-Pah Gorge 7½' quad, placing it 2¼ miles south-southeast of Mountain Spring proper. Smuggler's Cave itself is shown on the In-Ko-pah Gorge sheet as well, situated about ½ mile further south-southeast from Mountain Spring than the plotted location of Imp-14.

Another kind of error that has crept into the files results from recording a site without going to it and establishing its actual location. Imp-48 was apparently recorded by C.W. Meighan, without field examination, from an article in *Desert Magazine*. An error has crept into the described location by which Squeaky Springs became "Squalsky Springs." Review of the *Desert Magazine* article and plotting the location from the description in the article places it 1–1¼ miles west of its mapped location in the UCLA files, at an elevation between

sea level and +40', according well with its original description (Weight 1952:22) placing it on the shore of Lake Cahuilla. The UCLA plotting puts it at an elevation of -50'.

Sites Imp-49 through Imp-55 are plotted as a zone rather than as point locations. The general plotting appears to be accurate, according well with the published description and site map (Reinman, True and Warren 1960). However, the locations cannot be derived from the site sheets, and in this case the accurate location may result from the fact that the authors were closely associated with the Archaeological Survey and may have plotted the location personally.

Sites recorded from 1963 and later appear to have generally more accurate site locations based either on thorough descriptive locations or accurate plotting on 7½ min. topographic sheets. Thus sites numbered Imp-80 and higher may be expected to be found near where they are plotted.

## COMMENTARY ON MAPS ACCOMPANYING THE YUHA REPORT

Two maps and two map sets accompany this report. The first is on the BLM 15' Yuha Desert base map and summarizes site locations and archaeological sensitivity as assembled by Weide and Barker. The second, also on the 15' Yuha Desert base map, was compiled by the staff of Imperial Valley College Museum from their records. Third, a set of 7½ min. USGS topographic maps covering the area, with site locations plotted, are included, and finally, sampling stratification maps for part of the area have been compiled.

The Yuha Desert map compiled by Weide and Barker summarizes site locations for which we have site records or site commentary sheets, and are primarily derived from the UCLA Archaeological Survey's Imperial County site files. We have indicated area of known high archaeological sensitivity on this map. At the present state of our knowledge, we feel this is premature and a very subjective designation. We prepared it with considerable reluctance, but it may be of aid in interim management until a more complete inventory of the archaeological resources can be made.

The map prepared by IVCM includes site location from its records. The Museum staff have also indicated areas that have been surveyed to their knowledge, and their map comprises the best summary of the areas within the Yuha that are in any sense known archaeologically. We expect that the quality of information within the areas they include as surveyed is extremely variable, but since we have not had access to their documentation, we cannot comment further.

The set of 7½ min. sheets covering the area includes mapped locations for all sites for which we can provide site sheets of site commentaries. The *Imp-* site locations were plotted directly from the maps at the UCLA Archaeological Survey, and have not been modified except in the cases indicated by the Site Commentary sheets interpaginated in the notebook of site records. Documentation of additional site locations is provided on Site Commentary sheets in the site record notebook.

Sampling stratification maps have been prepared for quads for which Raytheon vegetation and soils overlays existed. The remainder of the area cannot be divided into sampling strata until vegetation and soils mapping is complete.

# ARCHAEOLOGICAL POTENTIAL OF THE YUHA AREA

The archaeological resources of the Yuha area derive their primary values from two separate but complementary considerations. They comprise the untapped scientific data for reconstructing the prehistory of the peoples who lived there for thousands of years, and for testing scientific theories related to man's changing adaptation to a rigorous and fluctuating environment. They can also enhance the area as a public, recreational resource.

## YUHA ARCHAEOLOGY AS A PUBLIC RESOURCE

Taking these in reverse order, interest in the area has been aroused by publicity surrounding the dating of the Yuha Man burial, and Morlin Childers' collections of artifacts which may date to early periods as well. In addition, the remains of the area's more recent prehistory intrigue the public. However, as pointed out in the section "Current and Potential Threats to the Archaeological Record," public interest is generally manifested in destructive ways. The American public has no inherent respect for antiquities, but reacts to the recognition of them with a desire to collect them as objects or curiosities. The remains in the Yuha are not spectacular monuments which command respect of themselves. Without a positive program of protection and interpretation, public interest will result in continuing erosion of the scientific potential of the Yuha. And the primary public benefit will be the pockets full of arrowheads, potsherds and beads taken home after a successful weekend in the desert.

Of the archaeological sites in the Yuha region, the gravel pictograph or intaglio sites are the most visual, along with "sleeping circles" and fish traps which may occur in the area. One extensive intaglio has been fenced for preservation by the BLM. It needs additional protection if it is to survive and be enjoyed by the public. Almost invisible from the ground, it is surely being disturbed by people walking over it, trying to see it and puzzle it out. An elevated viewing tower, combined with an illustrative panel or display would make the intaglio much more discernible, and would prevent further damage. A similar installation at a selected site showing sleeping circles, trails and cairns would illustrate another aspect of Yuha prehistory.

With the exception of fish traps similar to those described by Treganza (1945) which may be situated in various places along the old shores of Lake Cahuilla, and the possibility that additional cairn burials such as Yuha Man exist, the bulk of Yuha prehistory will achieve its real value to people only through an intensive program developed from continuing research in the area. To move beyond the protection and development of the relatively visual remains discussed above to problems posed by the remainder of the archaeological record seems to require almost park-like arrangements for control of public use-patterns, elaborate interpretive displays and restriction of access to portions of the area. Properly developed, the story of the ways the Indians lived and worked in the stark environment of the Yuha, and the environmental changes due to climate and to the erratic

history of Lake Cahuilla, can much enhance the visitors' interest in and appreciation of the Yuha area.

Archaeological excavations can become an integral part of the effort to create respect for and enjoyment of prehistoric remains. If archaeological excavations are required in the face of site destruction, they should be organized not only to yield significant scientific data, but also to be visible and accessible to visitors in the area. A staff member should be available at all times to serve as a host, explaining the excavation and conducting tours. Watching the painstaking work of professional excavations teaches respect for sites which people would otherwise thoughtlessly damage. Moreover, the physical presence of a research team and an ongoing program of excavation, if it is fully accessible to visitors, makes archaeology real and immediate, and will go a long way in acquainting members of the public with the scientific value of what might seem at first to be insignificant remains.

## YUHA ARCHAEOLOGY AS A SCIENTIFIC RESOURCE

The scientific potential of the archaeological resources of the Yuha area derive from three considerations: first, we know very little about the prehistory of the area, having only the sketchiest outline largely interpolated from surrounding areas (see section "A Cultural Sequence for the Yuha Area"); second, the area probably includes the only extant remains of the Kamia Indians, for their heartland on the New and Alamo Rivers has been long destroyed (see section, "Ethnographic Sketch of the Yuha Desert Region," above); and third, the area is crucial to the examination of current theories regarding man's socioeconomic responses to changing environments, and major processes affecting the population dynamics of California's prehistoric Indians.

The interpretation of the materials from the Yuha area which are currently produced as evidence of man's presence in the area prior to 20,000 years ago are a specific example of the problems which beset such claims in any area of the New World. The larger scientific world maintains a wait-and-see attitude, and demands strong proof before accepting as established results which substantially alter current scientific interpretation. Enough questions remain regarding the Yuha early man finds that the case must remain open. The assignment of the burial of Yuha Man to the period prior to 20,000 years ago is based on a preliminary set of radiocarbon dates made on soil carbonate, and a continued dating program will shed more evidence on the possible antiquity of the burial. The present carbonate dates will not suffice to establish its place in the prehistoric record (see "Cultural Sequence" section, above).

A systematic presentation of the larger body of artifacts collected by Morlin Childers has not been prepared. Field examination of a few localities with him suggests the importance of curtailing further collection of these materials. The Imperial Valley College Museum has a large sample of collected pieces now. The collection currently under study is of ample size to examine the question of which of them are the result of man's handiwork, as far as can be determined from the objects themselves. As important as that study is, the

larger questions of dating and interpretation will be answered only from study of the pieces in their original situation where the effects of thermal fracturing and weathering can be evaluated, as well as questions regarding human agencies in transport of rock types, patterns of debris distribution resulting from man's activities, and relative dating of the surfaces on which they occur can be approached. The current trend of Childers' dating of these materials is strongly tied into an interpretation of the local geology and geomorphology, as would be true in almost any archaeological situation of comparable potential antiquity. A major geological/geomorphical study of the sedimentary sequences, sequences of surface formation, and the interrelationship of terrestrial and lacustrine deposits, will be necessary before Childers' claims can be evaluated, and before we can achieve significant understanding of subsequent occupation periods.

The Salton Sink is an area of extreme aridity and a resultant low biomass. It would support only a sparse population of hunters and collectors under conditions that have prevailed for the past 9000 years. The intermittent occurrence of an exotic, freshwater lake accompanied by marshes, fish, shellfish and waterfowl would substantially alter the productivity of the area for man. Hunting and collecting peoples of western North America have long had versatile apparatus for taking fish and birds, and would have been well equipped to exploit the resources of the lake. The effect for the lake on the culture history of the local populations depends in fact on details of the behavior of the lake, a knowledge of its history in the far greater detail than we have now.

The model of the lake presented in the section "Regional Environmental History. . ." suggests that the lake was typically a fluctuating and undependable resource over the long run of its history, and generally would not have supported a specialized hunting and collecting population primarily dependent on its resources. During its final stand, however, Wilke (1973) interprets archaeological remains to indicate that a dense, sedentary population developed on the shore of Lake Cahuilla, implying that it stood at its maximum depth as a dependable resource for such a period of time that local populations changed their basic subsistence patterns to depend on the lake, and increased significantly in size. With the final recession of the lake perhaps 400-500 years ago, two effects are postulated. One was a significant outmigration in several directions and population readjustments throughout interior southern California. This is invoked as a phenomenon to explain the apparent increase in occupation density of other interior southern California areas in late period times (O'Connell 1971; Wilke 1974, 1973). It is also suggested that the spread of agriculture to the Kamia of the Imperial Valley and the Cahuilla of the Coachella Valley was "a means of restoring population/resource equilibrium in the period of stress which accompanied the drying of Lake LeConte" (Wilke 1973:12).

While a local readaptation involving the spread of agriculture is a reasonable model for the final retreat of the lake and is currently under investigation in the northern part of the Salton Sink, the widespread repercussions postulated throughout inland southern California seem open to challenge. The apparent coincidence of the general dating of the desiccation of Lake Cahuilla and the Late Period population increase elsewhere may be no more than that.

Neither event is in fact accurately dated and it is not impossible that increasing use of extensive areas of interior southern California based on intensive collecting and processing of seeds and vegetal foods preceded the final decline of Lake Cahuilla.

Of greater concern is the periodicity of the filling of Lake Cahuilla, and its ability to maintain stable stands intermittently through its history, for it certainly filled a number of times. If prior fillings were comparable to the final one in temporal extent, we would expect similar population responses. Acceptance of the dispersion model for the final retreat of the lake requires that we either consider the final stand a unique event in the history of Lake Cahuilla, or that we postulate periodic pulses of population from the Salton Sink area through the prehistoric era. We are thus faced with a quandary by the model proposed by Wilke and O'Connell. We have no reason to think that the final stand was unique in its freshness or longevity, yet we see it used to explain an apparently unique event in southern California prehistory, a Late Period population increase.

The second effect, adoption of agriculture by the Kamia and Cahuilla, poses no such quandary, for it undoubtedly spread from the Lower Colorado River peoples. Since agriculture was not present along the Lower Colorado until A.D. 900 or so, it was not available as an option at earlier desiccations.

## A MODEL LAKE CAHUILLA SUBSISTENCE-SETTLEMENT SYSTEM

To make the point, it is possible to suggest an alternative model for the prehistory of the Salton Sink area. It can be argued at the present state of our knowledge that when Lake Cahuilla filled, it generally remained full for relatively short periods of time, more of the order of 50 years than of several hundred years. Relative to human populations, a high stand would hardly span much more than a generation. Hunting and collecting peoples in the area would maintain flexible subsistence and settlement patterns similar to those of Great Basin peoples to the north who exploited similarily fluctuating resource bases. The length of the lake stands would be short enough so that significant population increases did not occur. Consequently, readaptation to non-lacustrine periods involved only minor shifts in settlement patterns and somewhat more local dispersion of population. The model creates no excess populations, therefore we no longer need to explain away the absence of earlier versions of the Lake Cahuilla diaspora.

Viewed from the perspective of this model, two aspects of the proposed adaptation to the final high stand are called into question: First, if a significantly increased population is actually evidenced, and second, if actual sedentary occupation patterns can be demonstrated. If they are demonstrated, then we must ask either (1) how was the final stand different from previous stands, eliciting such a strong population and socio-economic response, or (2) what has become of the evidence or comparable earlier populations around the lake and their dispersal with previous desiccations?

On the other hand, with evidence presently available it could be argued that the middens

associated with the final beachline represent the residue of relatively small non-sedentary populations that exploited the lake margin extensively and underwent limited population increase. With the final desiccation they added agricultural pursuits learned from their Colorado River neighbors to the hunting and collecting lifeway and thus continued to live until the Spanish intrusion.

The above discussion is not designed primarily to challenge current interpretations of southern California prehistory, but to demonstrate that:

(1) we have much to learn about southern California prehistory and the prehistory of the Salton Sink particularly;

(2) what we may learn will have important implications for our understanding of the population dynamics and adaptive systems of hunting and collecting peoples and the processes involved in the spread of agriculture to non-agricultural peoples;

(3) understanding of the periodicity and temporal extent of lacustrine periods of Lake Cahuilla must be considered as important a research goal as are the more straightforwardly cultural and socio-economic consideration that result from an archaeological study;

(4) the area included in the Yuha inventory area, which encompasses many miles of shoreline of Lake Cahuilla, the Yuha Basin and the permanent streams in the Harpers Well area, is a most important archaeological resource, both for science and for the public.

## CONCLUSIONS

We must conclude that our present knowledge of site locations in the Yuha inventory area is spotty and unreliable for inventory and planning purposes. Site locations that have been plotted in the past may only approximate the true location, due to carelessness on the part of recording archaeologists and to the absence of checks in the system that results in the present site records.

Similarly, there is not a single square mile for which we have an adequate inventory of its archaeological contents. None of the work reported here includes the systematic survey of a bounded area which we can consider inventoried. It may be that some of the areas shown on the IVCM map are fully surveyed, but it is not possible to be certain in the absence of documentation of the Museum's work. The Museum has used but a single symbol for areas surveyed, a pink line around an area, and it apparently indicates any area where the staff are aware that someone has gone in and had a look, so the quality of information from within those areas is extremely varied.

The potential importance of the archaeological resources of the Yuha inventory area derive from both their scientific and public value. Presently the needs of neither are well served. Work in the area is ill-coordinated and little of what has been done has resulted in usable information, either for scientific or interpretive purposes. Scientific work in this area suffers from inadequate funding and lack of long term planning of scientific objectives and methods. Increasing visitor use of the area has accelerated damage to the archaeological resources, and without measures to protect the archaeology and to display highlights of the areas, visitor and recreational benefit remains nil.

We have suggested the outlines of an archaeological program for the area paralleling the long-term inventory. The key to it is a short term program of site survey, and where required, salvage excavation keyed to current and expected impacts and to interim management planning. By defining area boundaries congruent with sampling strata for the long term inventory, short term program data would be usable in the inventory as well. By developing the Lake Cahuilla subsistence-settlement system model proposed here into a full-blown research design, important scientific information would result from the short term program. Finally, if excavations undertaken within the short term program were organized with an eye to visibility and visitor access, they would serve both as an asset to the area's recreation potential and as a contact focus for communicating to the public the scientific importance of the archaeological resources of the Yuha inventory area.

## ACKNOWLEDGMENTS

Members of the Anthropology Department at UC Riverside, especially Dr. Sylvia Broadbent and Dr. R.E. Taylor offered their comments and discussion at several junctures in the preparation of this report.

Billy R. Templeton and Albert Endo of the BLM Desert Planning staff shared with us their knowledge of the Yuha region gained while they were preparing vegetation and soils inventories respectively. Jim Owings discussed current assessments of visitor use in the area and possible direction of BLM management planning.

Personnel of several museums showed us every courtesy in allowing us to review their records and holdings pertinent to the area: Ken Hedges of the San Diego Museum of Man; Frank Norick and Dave Herod of the Lowie Museum, Berkeley; Dr. Gerald Smith and Bob Reynolds at the San Bernardino County Museum; and Patrick Finnerty at UCLA.

C. William Clewlow and Steve Kirby, UCLA Archaeological Survey, gave us full cooperation in compiling site records for the area. Ben McCown discussed with us the current status of the Archaeological Survey Association's work on his father's collections. Dr. D. Travis Hudson of the Santa Barbara Museum of Natural History, Dr. Emma Lou Davis of San Diego, Dr. Paul Ezell, San Diego State University, and Dr. D. L. True, University of California, Davis, corresponded with us regarding the archaeology of the area.

We enjoyed a pleasant day in the field with Jay von Werlhof and W. Morlin Childers of Imperial Valley College Museum, accompanied by the BLM Desert Rangers attached to the El Centro office. The staff of IVCM prepared Appendix 2.

Philip J. Wilke, who edited this report and oversaw its final production, served as an invaluable discussant throughout its preparation, sharing his extensive knowledge and ideas of the area derived from his research in the Coachella Valley and the northern Salton Sink.

Our special thanks go to Harry W. Lawton and David L. Weide who prepared sections of the report, and to all those above who contributed so much to its successful completion.

# APPENDIX 1

## SUMMARY OF RADIOMETRIC DATES FOR THE SALTON SINK REGION

| Source | Code | Date, B.P. | Location | Material | Comment |
|---|---|---|---|---|---|
| [1] | M-598 | 120±200 | 33°11.8N/115°56.3W | Charcoal | Archaeological, House rings on beachline |
| [1] | M-597 | 130±200 | 33°2.2N/116°1.9W | Charcoal | Archaeological, Split Mtn. Dune Site. Date is not considered accurate. Redated as LJ-GAP-57. |
| [2] | LJ-17 | <200 | 33°19.7N/116°15.8W | Charcoal | Archaeological. SE margin of Clark Dry Lake Playa. |
| [2] | LJ-102 | 220±100 | 33°24.1N/115°39.5W | Burned tules | Evidence of extensive tule fires on E. shore. |
| [4] | UCLA-192 | 270±60 | 33°23'21"N/115°42'12"W | Charcoal | Archaeological. Hearths w/freshwater fish bones. |
| [2] | LJ-15 | 300±100 | 32°36.8N/115°41.3W | Charcoal | Archaeological. Site in Baja California. |
| [7] | LJ-GAP-58 | 420±100 | 33°2.2N/116°1.9W | Charcoal | Archaeological. Surface of Split Mtn. Dune Site. |
| [1] | M-596 | 450±200 | not specified | Charcoal | Archaeological. Site w/fishbone at Coachella main canal. Depth 26" in cla behind gravel bar. |
| [7] | LJ-GAP-59 | 470±100 | 33°2.2N/116°1.9W | Charcoal | Archaeological. Split Mtn. Dune Site. 0.6 m. below surface. |
| [2] | LJ-16 | 700±150 | 33°22.2N/116°16.8W | Charcoal | Archaeological. N side of Clark Dry Lake Playa. |
| [7] | LJ-GAP-57 | 720±100 | 33°2.2N/116°1.9W | Charcoal | Archaeological. Split Mtn. Dune Site. 1.5 m. below surface. |
| [2] | LJ-99 | 760±100 | 33°24.9N/116°4.4W | Burned tules | Questionably archaeological. Charcoal is interstratified with lake silt. |
| [6] | LJ-965 | 830±140 | 32°59'00"N/116°13'00"W | Mussel | Archaeological. Hearth site on Fish Creek. |
| [2] | LJ-106 | 960±100 | 33°21.7N/115°35.0W | Charcoal | Archaeological. Material w/pottery at 1.7 m. below surface. |
| [2] | LJ-7 | 1000±200 | 32°59'00"N/116°13'00"W | Charcoal | Archaeological. Hearth site on Fish Creek. |
| [6] | LJ-960 | 1010±220 | 33°17'30"N/116°00'00"W | Mussel | Run as cross check on LJ-530. |
| [2] | LJ-105 | 1440±100 | 33°21.7N/115°35.0W | Charcoal | Archaeological. Same site as LJ-106 but material was from 2.0 m. below surface. |
| [5] | LJ-530 | 1510±180 | 33°17'30"N/116°00'00"W | Tufa | Same locality as LJ-960. Beachline at an elevation of 13 m. |
| [2] | LJ-101 | 1580±200 | 33°33.1N/116°12.4W | Charcoal | Questionably archaeological. From beachline at 13.4 m to 13.7 m. Sample at 45 cm. below surface. |
| [5] | LJ-513 | 1800±200 | 33°25'23"N/116°03'25"W | Tufa | Replicate measurement on LJ-458. |

## APPENDIX 1 (Cont.)

| Source | Code | Date, B.P. | Location | Material | Comment |
|---|---|---|---|---|---|
| [5] | LJ-458 | 1890±500 | 33°25'23"N/116°03'25"W | Tufa | Sample from outer 5 cm. rind of tufa sample LJ-457. |
| [4] | UCLA-190 | 3970±100 | 33°22'12"N/115°47'55"W | *Tagelus* | Species requires marine environment. |
| [7] | LJ-GAP-70 | 4800±500 | 32°31.1N/115°35.3W | Mussel | Questionable date. See LJ-928. |
| [3] | UCLA-117 | 4980±100 | 33°07'58"N/116°29'43"W | Charcoal | Archaeological. Oldest charcoal date for Lake Cahuilla Basin. Sample from alluvium 10.5 m. below surface in valley of San Felipe Creek. |
| [5] | LJ-528 | 9630±300 | 33°24'25"N/116°02'03"W | Shell | Freshwater gastropods from 3 m. depth in valley fill alluvium. Same horizon contains artifacts. Oldest published date for Lake Cahuilla Basin that indicates possible presence of man. |
| [5] | LJ-457 | 13,040±200 | 33°25'23"/116°03'25"W | Tufa | Sample from inner core of tufa from Travertine Point. See LJ-458. |
| [8] | LJ-1632 | 21,800±1000 | 33°24.96'N/116°04.37'W | Tufa | From shoreline 14.3 to 18.3 m. above sea level antedating last stages of Lake Cahuilla. |
| [8] | LJ-1634 | 24,000±1200 | 33°24.96'N/116°04.37'W | Tufa | Same as LJ-1634. |
| [3] | UCLA-116 | 24,900±800 | not specified | Wood | Sample from wood dredged from bottom of well 34 m. below surface of flat Coachella Valley floor. |
| [8] | LJ-1637 | 25,600±1300 | 33°34.74'N/115°59.54'W | Tufa | Same tufa line as dated by LJ-450. |
| [8] | LJ-1636 | 26,200±1500 | 33°37.72'N/115°59.575'W | Tufa | Box Canyon Wash locality. |
| [8] | LJ-1627 | 29,000±1500 | 33°24.96'N/116°04.37'W | Tufa | Same as LJ-1632. |
| [8] | LJ-1629 | 29,200±1500 | 33°24.94'N/116°04.37'W | Tufa | Same as LJ-1632. |
| [8] | LJ-GAP-93 | 30,600±1500 | 33°34.72'N/115°59.575'W | Tufa | Inner and outer layers of tufa combined, Box Canyon Wash Locality. |
| [8] | LJ-1630 | 31,200±1600 | 33°34.72'N/115°59.575'W | Tufa | Box Canyon Wash locality. |
| [4] | UCLA-189 | 32,200±2000 | 33°22'12"N/115°47'55"W | Shell | *Rangia* sp. indicates brackish water environment. |
| [8] | LJ-1631 | 33,400±1700 | 33°34.76'N/115°59.50'W | Tufa | Box Canyon Wash locality. |
| [4] | UCLA-191 | >34000 | 33°23'32"N/115°42'00"W | Shell | *Chione* sp. Specimens from exposed lake bottom surface. Indicate marine environment of deposition. |
| [5] | LJ-450 | >35000 | 33°34'46"N/115°59'29"W | Tufa | From Lake Cahuilla shoreline at an elevation of 38 to 42 m. Dates a freshwater stand. |
| [8] | LJ-1628 | 36,000±2000 | 33°34.72'N/115°59.575'W | Tufa | Inner and outer tufa layers, Box Canyon Wash locality. |
| [8] | LJ-1635 | 36,900±1900 | 33°34.77'N/115°59.465'W | Tufa | Box Canyon Wash locality. |

## APPENDIX 1 (Cont.)

| Source | Code | Date,B.P. | Location | Material | Comment |
|---|---|---|---|---|---|
| [5] | LJ-504 | 37,100±2000 | 32°47'55"N/115°53'07"W | Shell | *Physa* sp. From old Lake Cahuilla shoreline at an elevation of 43 m. |
| [6] | LJ-959 | 37,400±2000 | 32°44.85N/115°49.75W | Tufa | Shoreline of Lake Cahuilla at an elevation of 43.05 m. Agrees well with LJ-504. |
| [5] | LJ-532 | >45000 | 33°34'37"N/116°12'50"W | Wood | From a depth of 30 m. in a well drilled near west shore of Lake Cahuilla. |
| [8] | LJ-1625 | >45000 | 33°34.72'N/115°59.57'W | Tufa | Box Canyon Wash locality. |
| [8] | LJ-1633 | >46950 | NE¼ Sec. 12, T7S, R9E and Sec. 7 adjoining on east | Tufa | Box Canyon Wash locality, outer, sandy crumbly tufa. |
| [6] | LJ-928 | >50000 | 32°31.1N/115°35.3W | Mussel | From very high Lake Cahuilla beachline at an elevation of 22 to 24.5 m. Indicates downwarping of sill at Volcano Lake. |
| [6] | LJ-954 | >50000 | 32°15'N/115°20'W | Mussel | From Lake Cahuilla beachline at an elevation of 26-27 m. Agrees with LJ-928. |

Underlined sample numbers indicate that the material is from the Yuha Desert study area.
All data are from *American Journal of Science, Radiocarbon Supplement.*

Sources:
[1] Crane and Griffin 1958
[2] Hubbs, Bien and Suess 1960
[3] Fergusson and Libby 1962
[4] Fergusson and Libby 1963
[5] Hubbs, Bien and Suess 1963
[6] Hubbs, Bien and Suess 1965
[7] Hubbs and Bien 1965
[8] Bien and Pandolfi 1972

**EDITOR'S NOTE:** The following paper, designated Appendix 2, was prepared by the staff of the Imperial Valley College Museum. It is reproduced here as received. References to Barker in this Appendix refer to Michael Barker of the Imperial Valley College Museum.

# APPENDIX 2

## TYPE AND DISTRIBUTION OF ARCHAEOLOGIC SITES IN THE YUHA BASIN STUDY AREA OF WESTERN IMPERIAL COUNTY, A REPORT AND MAP

Prepared for the Bureau of Land Management and
submitted to Dr. Margaret Weide
by
Imperial Valley College Museum Staff Members

29 May 1974

Imperial Valley College Museum
442 Main Street
El Centro, California
92243

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# I. GENERAL MAP, BUREAU OF LAND MANAGEMENT YUHA STUDY AREA

## A. Introduction

The Bureau of Land Management requested that Imperial Valley College Museum prepare a map from IVCM site record files to indicate the types and locations of reported sites within the study area. The accompanying map, then, is self-explanatory. The site records upon which the map is based are on file at IVCM. Where the records do not enable us to pinpoint accurately a location we have placed the site in the approximate area insofar as the report allowed. About twenty percent of our records were made prior to availability of surveyed maps or aerial photographs, and in due time these will be re-examined by IVC field crews under the direction of Site Recorder Sherilee von Werlhof.

## B. Presentation of the Map

All areas enclosed with a pink line are areas that we know have been surveyed at least once. The areas not so enclosed have not been site surveyed as far as we know. Where possible, we have indicated on the areal enclosures the names and dates of the persons surveying. We do not know when Malcolm Rogers covered specific areas. Morlin Childers' areal surveys do not show specific site areas, but each area has yielded a concentration of site materials, mainly of Early Man (Malpais and San Dieguito) cultures. Howard Pritchett is now completing a specialized study of aboriginal springs and wells, so his material is not yet ready for inclusion on the map; his study reveals at least fifty such sites. He has photographed and mapped each. IVCM will send a copy of this report to BLM as an appended report in a few weeks.

The Bureau of Land Management supplied Imperial Valley College Museum with the accompanying map. IVCM has located on this map those recorded sites, or general site areas, which IVCM has on record within the defined Yuha Basin Area. In order that the reader will have a more comprehensive view as to how those sites relate to the total area, IVCM has also located on the map those sites that are perimetric to the defined Basin.

## C. Site Types

IVCM has established a practical but trial schemata for typing sites on maps. This includes two different marks; a solid dot to indicate sites that are accurately enough described as to specifically locate them on the map, such as: ●. A second mark is a circle to indicate an imperfectly located site, and one which has not been field checked or simply remains lost at the present time, such as: 0 .

In addition, IVCM employs a color code to indicate the type site that is located on the map, whether in solid color or drawn as a circle, as shown above. The color code does not indicate all the features that are included or observed at any site, but as best as the observor could determine most fully describes the main feature or function of the site.

**1. Table of Map Symbols**

| | |
|---|---|
| 0 0 (Red) | Temporary campsite; potsherds, hearthstones, thermal-fractured stones, manos, metates or slabs, spalls, cores, etc. |
| 0 0 (Blue) | Crematory: potsherds, scattered and burned human bones, red sandstone or granitic and quartzite religious stones. |
| 0 0 (Pink) | Lithic shop, or quarry; anvils, hammerstones, cores, spalls, nodules, blanks, rejects, and cutting tools. |
| 0 0 (Brown) | Circles; stone lined, not just cleared areas. |
| 0 0 (Light Green) | Bedrock mortars; bedrock mortars or metates, pestles or manos, and slicks. |
| 0 0 (Dark Green) | Miscellaneous: ceramic cache, pottery scatter, assorted stones, cairn, etc. |

**2. Features**

| | |
|---|---|
| 0 | Petroglyph, pictograph. |
| - - - - | Trail |
| X | Well or waterhole |
| . . . | Associated site areas. |

## II. MUSEUM HOLDINGS

### A. Introduction

Imperial Valley College Museum is constantly expanding its holdings through field work, laboratory projects, and donations. The collection had not been inventoried completely before and at present the catalog system is undergoing a thorough revision based upon a comparative study of museum practices Jay von Werlhof and Sherilee von Werlhof made last year. The museums they visited included: University of California at Berkeley: the Robert E. Lowie Museum; San Francisco State University: the Adan Treganza Museum; and the San Diego Museum of Man. The staff at Treganza Museum discovered glowering inadequancies in its catalog system last year, and began the enormous task of redoing the the entire collection. IVCM does not want to face that possibility five or ten years from now, so until

it was decided what the exact but expanding system should be, the work remained untouched.

**B. Donated Collections**

1. Childers; Micro-fossils, paleontology. 1000 items.

2. Ware; Kumeyaay ethnologic materials; baskets, beads, points, pottery, etc. 150 items.

3. Childers; Early Man tools, Yuha Basin. 10,000 items.

4. Childers; A type projectile point collection. 150 items.

5. Manwaring: Potsherds, Southeast Supersititon Mountain, Kumeyaay. 150 items.

6. Barclift: Kumeyaay digging stick. 1 item.

7. Field collections: Kumeyaay potsherds, manos, metates, hammerstones, projectile points, beads, pipes, pendants, choppers, scrapers, spalls, cores, perforators, incised petroglyphs, stone bowls, pestles, ochre balls, knives. 2000 items.

8. Manuscripts, field notes, and records. 800 items.

9. Site records; 350 items.

10. Maps: 700 items.

11. Books, pamphlets, serials, sets: 1500 items.

12. Photographs and negatives. 350 items.

13. Tapes and recordings; 2 items.

**C. Local Collections**

IVCM has initiated a program to photograph and record local collections, the first of which shall begin during the Summer Course on Museum and Laboratory Practices. The Shelby Collection (175 items) and the Ware Collection (1000 items) will be the first to be completed. The procedures here will be to number and catalog each item, describe it by tape recording, and photograph the pieces. It is hoped that other collectors will offer IVCM their collections, or at least the opportunity to record their collections.

**D. Other Collections**

IVCM plans to record, or to obtain copies of, other collections obtained from its design area, including University and Institutional collections at large. From time-to-time, IVCM will publish a list of its holdings in the *Occasional Papers* series so other Institutions may borrow items or research the collections.

## III. RESEARCH PROJECTS AND QUESTIONS

### A. Introduction: (1) Research Form

This section poses the broad questions within which research designs are defined and specific investigative projects are developed. All designs and projects are viewed as on-going or open cases in which various persons make contributions as their time and talents become available. For example, a student interested in ethnobotany will begin a project where another student previously left off, and in this way will make his own contribution while advancing this particular project. Or, a staff member will begin a project, as Mike Barker with his ceramic rim study, and, as time permits, will advance the project over an extended period of years. Too, we view each project within research designs as *procedural* as well as substantive studies, and we re-investigate projects as new approach methods become known or a new procedural scheme deserves an experimental test. Here, for example, we are now experimenting with aerial infra-red photography to see how useful the technique will be in locating sites which have particular morphologies but which were missed in surface site surveys.

### 2. Research Design Area

Our research design area includes the easterly flowing watershed of San Diego County, northward to the Borrego region, eastward from the southerly flowing watershed of Santa Rosa Mountains to the Colorado River, southward into the Laguna Salada, westward across the Cocopa Mountains to the point of origin. Here, our interests overlap with archaeologic and ethnologic interests of San Diego State University with whom we have cooperatively worked on past projects and are planning others for the future.

### 3. Site Record File

To prevent duplication of field surveys, IVCM collated into a master file all pertinent site records of San Diego State University, San Diego Museum of Man, and University of California at Los Angeles, with our own. University of California at Riverside at first showed interest in participating in this unified site record project, but after several reminders over a period of six months failed to produce the copied site records pertinent to our design area. IVCM than proceeded without UCR and we have now compiled and correlated the records of participating institutions. They, in turn, will receive a copy of the master file. IVCM has, then, the most comprehensive records available, around which future investigative projects and field surveys can be conducted.

**4. IVCM and IVC Relationship**

Last year, Mike Barker re-organized the IVCM into cooperating compartmental units, each reflecting the interests and talents of personnel specially chosen to fulfil general and specific tasks. First, a word about the broadest lines of organization; Imperial Valley College is parental to the Imperial Valley College Museum, controlling its budget and having the final say in selecting personnel. Too, the College provides instructional facilities and curricular offerings that involve students with IVCM work. In short, IVCM is an instructional wing of the College, and investigative work undertaken there is the result of instructional programs or is fed into the instructional program of the College. In addition, Barker has utilized IVCM and its several phased operations to provide in-service training and work-study opportunities to talented and interested students. For example, he is selecting certain students from the roster of the physically handicapped to be trainees in the Museum laboratory this summer. Other students are employed on part-time bases to work at IVCM as preparators of exhibits, cataloguers of artifacts, and, as funded projects arise, as excavators, surveyors, etc.

**5. IVCM and IVCM Society**

IVCM has two major divisions; professional and lay. The IVCM Society is composed of both professional and lay members but whose main objective is to relate the IVCM to the public at large and to free the College from taking political stands on issues affecting IVCM functions, as, for example, ORV problems. The Director of IVCMS, Bill Farris, with a Board of Directors which the members elect, arranges for publicity, organizes meetings, publishes the monthly *Newsletter*, publishes professional papers in the *Occasional Papers* series, acts as intermediary to governing bodies and officials, hosts openings of IVCM exhibits, writes letters to editors, Congressmen, and others, and represents IVCM interests at CDAC meetings, and does all those other things that an inventoried list of activities could not fully cover.

**6. IVCM Staff and Personnel**

The professional division of IVCM is compartmentalized into four aspects, with Barker as Head. These include: John Clemmer, archaeologist and artist, as Curator of Exhibits whose main function is to provide at least two major exhibits annually that relate interpretively to instructional programs at IVC and the work of IVCM.

a. *Morlin Childers*, Curator of Paleo-Archaeology has as his main function the study of Early Man as related to our design area. In particular, his studies focus on the richest concentration of Early Man finds that are known in the Southwest – the Yuha Basin. Childers' studies, which extend over thirty-five years in this area, include field examination of cultural/geologic data; establish typologic lines of Early Man materials; the laboratory processing of such materials; and disseminating his finds through lectures, publications, and reading of papers at professional oriented meetings.

b. *George Miller,* paleontologist and geologist, is Curator of Paleontology. His main function is to field investigate in the IVCM design area the geologic and paleontologic past. These objectives include field examinations, processing collected and donated specimens, and disseminating results through his IVC courses on geology, publications, and reading professional papers at association meetings.

c. *Jay von Werlhof,* Curator or Archaeology, instructs IVC classes in anthropology and archaeology, conducts field surveys and excavations, designs research or field investigative projects for students and IVCM members, and is responsible for the fulfilment of museum/laboratory objectives. He also interprets field results for purposes of instruction and publication.

d. *Mike Barker,* physical and cultural anthropologist, and archaeologist, is Head of the IVCM and is on the instructional staff at IVC. His training enables him to relate to the work carried out in each divisional aspect, and his special interest in anthropometrics enables him to bring new measurement techniques into the laboratory to advance investigations as well as student-training. Also, the confidence the Administration has in his judgment enables him to obtain special and up-to-date equipment for the IVCM, as the Carbon-14 equipment and laboratory, microscopes, aerial mappings, Jeeps, photocopiers, special cameras and lenses, and hundreds of other items pertinent to modern field investigations, analyses and reporting.

e. *Sherilee von Werlhof,* Site Recorder and Photographer, maintains all site records and maps, and supplies special photographic studies in field investigations. She has collated the site records of participating institutions, and assigns site numbers to all sites for IVCM. Further, she alone has access to the site records and the accompanying site-maps. All must apply to her in order to use them.

f. *Rosie Gaddis* is Secretary to IVCM, and maintains regular hours Tuesday through Friday, 10 A.M. to 4 P.M., for keeping the Museum open. She also is Librarian, keeping books, pamphlets, serials, etc., which number about 1500 pieces, for students, staff and lay members of IVCMS.

g. *Others:* IVCM regularly employs four part-time students on task-assigned or non-assigned bases. Each, however, has at least one specially developed interest-area that relates to one or more IVCM functions or compartments. Too, Barker selects these aides for their incidental abilities, such as carpenter, cabinet maker, painter, etc., so as needs arise each might be called upon to help with the plant management and maintenance.

**7. Summary**

In sum, then, IVCM research form and function are directly related to the IVC, IVCM, and IVCMS institutional organizations and objectives. To put it another way, IVCM

function is essentially instructional, and its organization reflects this. Procedurally, IVCM designs and carries out research and investigative projects in order to fulfill its function, and its organization also reflects this.

**B. Broad Questions Prompting Research Designs and Projects**

The broad questions alluded to in Section A above, embrace five major subject areas: 1. Geology; 2. Paleontology: 3. Archaeology; 4. Physical Anthropology; 5. Cultural Anthropology and Ethnology. Taking these in turn, questions concerning each are:

1. Geology: What is the geology – structurally and geomorphologically – of the design area since mid or late Pleistocene times? This should include data from such related studies as palynology, paleo-climatology, and paleontology.

2. Paleontology: At what point in the geologic time did Early Man appear in our design area, and how did he relate to the ecosystem in which he found himself? This should include data from the full range of paleologic studies.

3. Archaeology: What are the cultural horizons within the design area, from X BP to Contact? This should include horizontal definitions, dates, and assemblages, and the demographic patterns of each horizontal strate, i.e., the perimetric range of each cultural horizon.

4. Physical Anthropology: What anthropometric differences occurred through time and cultural interation of aborigines in the design area, from X BP to P? This should include osteopathologic occurences as related to climatic change, presence or absence of nutrient-medicinal plants,animal food remains; etc.

5. Cultural Anthropology and Ethnology: What were the technologic developments of aborigines from X BP to P, and to what factors can one attribute the changes? Here, a full knowledge of lithic, ceramic, hunting, gathering, fishing industries need to be established, as well as art forms, stories, music, etc., to which the substance of change and its relationship to the form of change (or the procedures of change) need to be worked out.

**C. Current Research and Investigative Projects**

At the present time there are a number of on-going field and laboratory studies being conducted at IVCM. These include:

1. The demographic patterns of seasonally and permanently inhabited

campsites and villages as related to cultural horizons. This is carried out by site surveys. von Werlhof.

2. A typology of Kumeyaay pottery. Here, Barker devised an adaptation of a technique of establishing pottery styles and sizes from calculations based on rim sherds. Barker.

3. Chemical and physical analyses of discovered clay caches, and the determination of the sources from which the clays were dug. von Werlhof.

4. Field investigations on the paleontology of the horse in eastern San Diego County. Miller.

5. Distribution and typology of Early Man tools in the Yuha Basin; a field, laboratory, and computerized study. Childers.

6. Introduction of pottery to the Kumeyaay; date and source. von Werlhof and Barker.

7. Early Man within the design area but along the Colorado River; his tools, and the horizontal relationship of the sites to Malpais, San Dieguito, and Amargossa sites. von Werlhof and Childers.

8. Songs and stories of current aboriginal cultures within the design area; a collection of tapes. von Werlhof.

9. Trade, migration, and hunting trails of aborigines within the design area, from Early Man to Late Prehistoric times. von Werlhof.

10. Pathology of human remains within the design area. Barker.

11. Ethno-botany and water resources in aboriginal times, studies and collections. von Werlhof.

12. Ancient shorelines of Imperial and southern Riverside counties. Childers.

13. Fish traps of the northwestern Salton Sea area. von Werlhof, von Werlhof, and Childers.

14. Inventorying IVCM and local collections. von Werlhof.

15. Applications of new measuring devices in laboratory in dating and micro-analysis. Barker.

16. Historic adobe structure.

Most of the studies inventoried above are student-oriented, with various of the studies being carried out as long range projects in which portions or phases of any project are always under investigation.

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