8. The largest body of data on the lacustrine adaptation of aboriginal inhabitants of this region comes from Lovelock Cave overlooking the Humboldt Sink. The nearest pinyons to this locality are about 40 miles to the southeast in the Stillwater Mountains.

# Chapter V

## THE RETURN TO DESERT CONDITIONS

About the end of the fifteenth century a change occurred in the course of the Colorado River which allowed it to flow across the southern slope of the delta directly into the Gulf of California, as it did in historic time. This cut off the inflow of water to Lake Cahuilla. The waters of the lake evaporated, and within 60 years--perhaps less--what had once been an inland sea of fresh water some 115 miles long was reduced to a barren salt playa. While almost no archaeological data are available on the cultural adjustments which occurred in this period of accelerated environmental change, the sequence of natural and cultural events is reckoned as follows: (1) loss of aquatic resources; (2) coincident adjustments in both subsistence and settlement patterns by the Indians of the region; (3) establishment of desert vegetation on the lakebed; and (4) occupation of the lakebed (at least that portion of it in Coachella Valley) by the Cahuillas who lived there in historic time. This sequence of events may have ensued within about a century, centering on the beginning of the sixteenth century, A.D.

From the standpoint of its role in shaping the late prehistory of southeastern California, the drying of Lake Cahuilla was probably one of the most important factors, as suggested by Aschmann (1959:45). It forced substantial populations to undergo a transition from lakeside oriented existence to one that relied entirely on low desert and upland resources. Many groups no doubt found it necessary to physically remove themselves to new surroundings in the process. But the fact remains that of this period of transition almost no archaeological documentation is available. At this point we can only infer what must have occurred when Lake Cahuilla receded, summarize the meager data available from the regions bordering the Salton Basin, and devise ways of researching the cultural adjustments which transpired.

### DECLINE OF AQUATIC RESOURCES

The first important change to occur in the biotic environment as the lake level began to drop was the loss of the Freshwater Marsh plant community in Coachella Valley.[1] As shown in the previous section by the analysis of coprolites from the Myoma Dunes, the Freshwater Marsh had had been of major importance as a source of plant products for the Indians living at the northwest end of Lake Cahuilla. Emergent marsh vegetation will tolerate moderate fluctuations in lake levels, and will even thrive if the fluctuations do not exceed four or five feet seasonally or annually (cf. M. Weide 1968:87-95). But emergent plants like bulrush (*Scirpus*) and cattail (*Typha*) will not tolerate a progressive decline which both lowers the water level and causes the shoreline to regress several thousand feet each year. These species expand into

shallow waters as much by vegatative reproduction as they do be seeding. If the retreat of the water is slow, and the chemistry of the water not greatly altered, such growth can accommodate the change and the marsh can maintain itself, provided that there is a favorable substrate. However, if the water retreats 1000-3000 feet per year, as it would have in Coachella Valley, the effect on marsh vegetation is devastating. The loss of bulrush, cattail, and other economically important plants was therefore one of the first changes to occur in the inventory of natural food resources as Lake Cahuilla began its latest recession. Within the vegetation went the assemblage of birds and animals common to the Freshwater Marsh plant community. The Myoma Dunes were probably abandoned, except for seasonal harvesting of mesquite and screwbean, and perhaps *Dicoria*, within a year or two after the lake started its decline.

It was shown earlier that the shellfish *Anodonta dejecta* was of some importance as a food item in Coachella Valley where the Indians obtained it in water up to a yard or so deep. This clam all but disappeared within the first 12 years of the recession of Lake Cahuilla, as shown by Bowersox (1973), who found the shells of this species largely confined to the first 60 feet below the main shoreline. He attributed the disappearance of *Anodonta* to an increase in salinity as the volume of water in the lake diminished. L. A. Payen (personal communication) suggests, however, that destruction of habitat may have been of greater importance than the change in salinity of the water. The sandy mud substrate in which the clam thrived would have been laid bare within a year or two as the lake level began to drop. It is doubtful whether this shellfish could have maintained viable breeding populations for more than a few years even if the salinity had remained unchanged. Probably both factors were important in its disappearance. Although it was not a major food item, the clam was eaten, as indicated by the beds of shells exposed in deflating sand dunes along the former lakeshore in Coachella Valley. Its disappearence therefore figured into the overall adjustments in food-getting that accompanied the drying at Lake Cahuilla.

Fish fared better than shellfish and aquatic plants, at least for a time. The mullet (*Mugil cephalus*) tolerates the salinity of the open sea, but also ascends rivers that enter the sea. Its spawning habits are not well understood, but based on reports by Fitch (1972) and Johnson and McClendon (1970), it would appear that the species can and does spawn in both fresh and salt water. It was probably able to spawn in the declining Lake Cahuilla, at least in the early years of its recession. If so, it and the desert pupfish (*Cyprinodon macularius californiensis*) may have been the last species of fish to survive in the lake. Bones of the humpback sucker (*Xyrauchen texanus*) and bonytail (*Gila elegans*) were found in abundance in the ruins of a house excavated at an elevation of about -95 feet in a field of several hundred fish weirs on the west side of Coachella Valley (Figs. 24, 25). The bones indicate that these species still survived about 25 years into the recession, which lowered the lake by about 140 feet. But this was probably about the end for both of these species, as the construction of weirs, which was evidently built for taking these species, ended at that locality within two years after the house was occupied. The lowest complete and definite weir occurred at about -99 feet, and no indication of others was found at lower elevations there or elsewhere. Recently a midden containing the bones of humpback

Fig. 24. Fish weirs built annually as Lake Cahuilla receded. Earliest of seven construction episodes shown is at top. Aerial view from 2750 feet. Horizontal distance across photo is 790 feet.

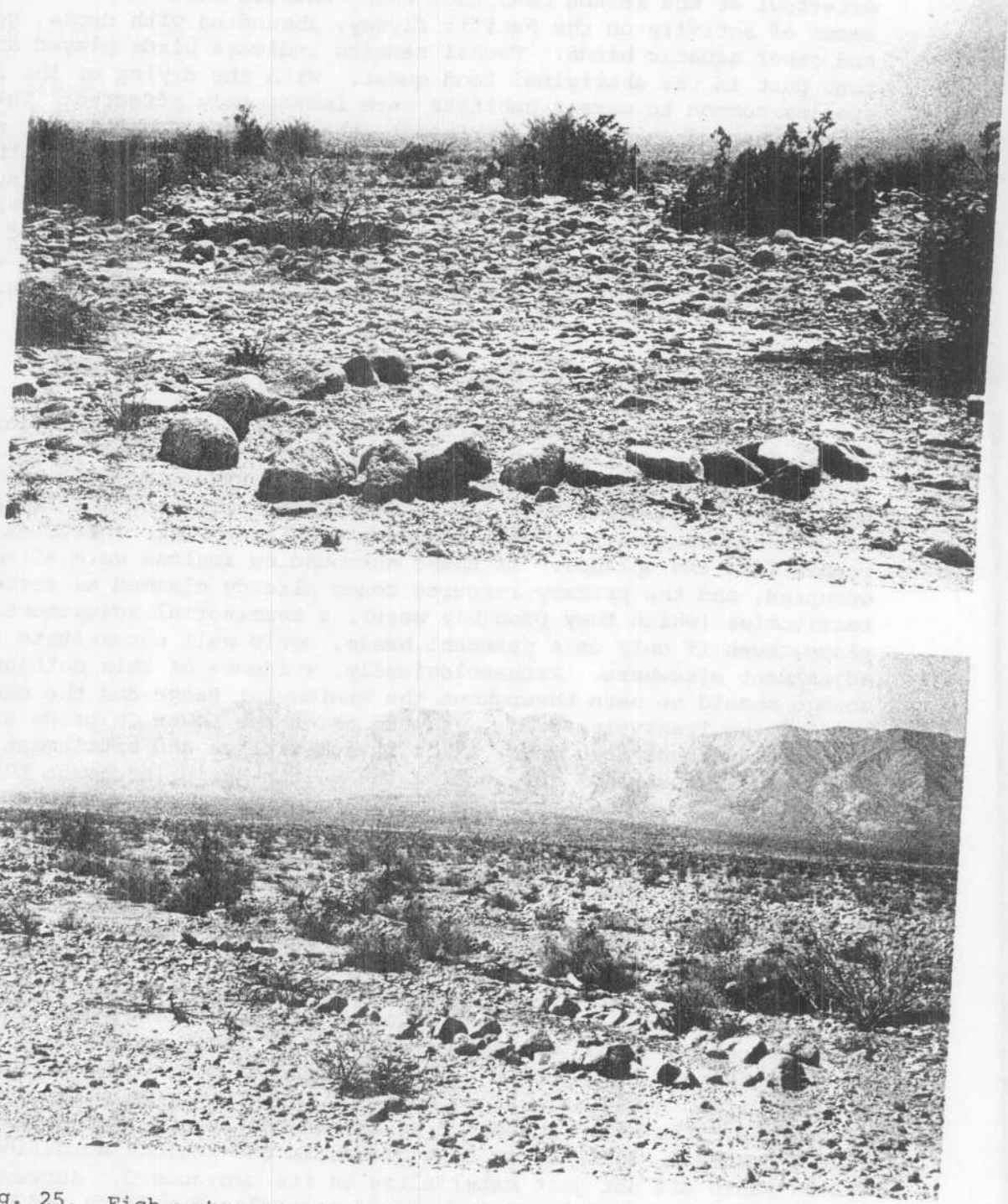

Fig. 25. Fish weirs, west side of Coachella Valley near Alamo Canyon. Upper: weir with rock wings about eight feet long. Lower: weir with wings about sixteen feet long. The vegetation is characteristic of the Creosote Bush Scrub plant community.

sucker and bonytail was found at the Thermal Airport at an elevation of -103 feet.

It was shown above by comparison with U. S. Fish and Wildlife Service data (U. S. Department of the Interior 1970; Lincoln 1950) on waterfowl at the Salton Sea, that Lake Cahuilla must have been a major focus of activity on the Pacific flyway, abounding with ducks, geese, and other aquatic birds. Faunal remains indicate birds played an important part in the aboriginal food quest. With the drying of the lake, species common to marshy habitats were immediately affected. These included the mudhen (*Fulica americana*), the remains of which were so common at the Myoma Dunes, as well as the various ducks and geese that feed on the seeds of bulrush, cattail, and other marsh plants (Martin, Zim, and Nelson 1951). The disrupted ecological balance of the ever-diminishing lake no doubt had a devastating effect on the food chains of many species. It seems logical to assume that the focus of activity on the Pacific flyway simply shifted to the nearby Colorado River Delta.

## ADJUSTMENTS IN SETTLEMENT AND SUBSISTENCE PATTERNS

Increased seasonal intrusions into the mountains for plant and animal foods to replace those no longer available at Lake Cahuilla would soon have been followed by both intensive and extensive reliance on the resources of those regions. It is difficult to imagine the range of adjustments necessary in such a sudden and large-scale intrusion of people into the uplands. If these surrounding regions were already occupied, and the primary resource zones already claimed as gathering territories (which they probably were), a territorial adjustment one place, even if only on a seasonal basis, could well necessitate another adjustment elsewhere. Archaeologically, evidence of this settlement change should be seen throughout the Peninsular Range and the eastern part of the Transverse Range, as well as on the Lower Colorado River. This would amount to a major shift in subsistence and settlement patterns throughout the regions surrounding the Salton Basin (Aschmann 1959, 1966; Wilke 1971).

Several regional studies in inland southern California seem to bear out the notion that a change in settlement patterns occurred, and that it occurred at about the right time to be linked to the drying of Lake Cahuilla. However, it is realized that with presently available methods of archaeological dating, it is difficult to fix events in time with sufficient precision to suggest cause and effect relationships. About the best that can now be employed is cross-dating, with such items as ceramics and small triangular arrowpoints taken to indicate a date of "roughly post-A.D. 1000." In the absence of other data, sites yielding such items could as well date to A.D. 1750, or even later. One thing is certain: the known abundance of so-called Late Horizon or Late Period (i.e., post-A.D. 1000) sites that occurs in the regions bordering the Salton Basin did not just materialize on its own accord. Surveys have repeatedly documented large numbers of specialized milling and other processing sites, together with many small camp sites, in regions that yield evidence only of late occupations characterized by ceramics and small triangular projectile points. There is simply a profusion of such

sites, and they date, according to conventional understanding of artifact chronologies in the area, to sometime between A.D. 1000 and 1750. It does not seem unreasonable to suggest that this profusion of sites in regions bordering the Salton Basin reflects a profound change in life style for some substantial human populations, and that the change was, at least in part, triggered by the drying of Lake Cahuilla. Some of the regional studies can be reviewed briefly.

Settlement Changes in the Peninsular Range

Investigations in the Peninsular Range include first of all the surveys and excavations conducted in the Anza-Borrego Desert on the arid eastern slope of the mountains to the west of the Salton Sink.

Borrego Sector, Anza-Borrego Desert State Park. Meighan (1959) reported on a reconnaissance of portions of the Borrego sector of the Anza-Borrego Desert State Park. Portions of San Felipe Valley, Culp Valley, Collins Valley, Coyote Canyon, Indian Canyon, and Clark Dry Lake basin were surveyed. One hundred seventy-three sites, including milling stations, mescal pits, temporary camps, and village sites were recorded. All of these sites are believed to date to the period of ceramic use in inland southern California, or to sometime after A.D. 1000. Meighan estimates that the sample represents only 5-10% of the 2000-4000 archaeological sites actually present in the Borrego sector of the park. Such an abundance of late prehistoric sites suggests that there was a significant influx of people into the Anza-Borrego Desert in late prehistoric time. It also suggests that in earlier periods the region was only sparsely populated, if at all. This seems to be borne out, since no evidence of earlier occupations was found in the course of survey despite attempts to locate older sites. The limited excavations conducted in this region (site SDi-474 in Culp Valley and site SDi-453 in Grapevine Canyon) (Townsend 1960) also failed to uncover evidence of occupation dating prior to the late prehistoric period.

Anza Sector, Anza-Borrego Desert State Park. Archaeological reconnaissance and limited excavations were conducted in the southern (Anza) sector of the park under the direction of William Wallace. In the vicinity of Mountain Palm Springs, Wallace (1962a) recorded 14 sites, all but one of which yielded pottery from the surface. All of the sites recorded in this district are assigned to the ceramic period, or sometime after A.D. 1000, according to Wallace.

Wallace also reported (1962d) the findings of a site survey in the Indian Gorge-Indian Valley district of Anza-Borrego. Twenty-eight sites were recorded here, including many mescal pits. These sites were assigned to some portion of the interval from A.D. 1000 to historic time, as all but one of them yielded ceramics from the surface, and projectile points were of late prehistoric styles (now classified as Cottonwood series and Desert Side-notched series). No evidence of earlier occupation was found in this district.

Additional surveys were conducted in the Bow Willow Canyon and Indian Hill districts (Wallace and Taylor 1958, 1960a). A total of 48 sites were found in these districts, and again, the occupation at all of them was judged to date to sometime after A.D. 1000.

One of the sites in the Indian Hill district, designated the Indian Hill Rockshelter (Wallace and Taylor 1960b; Wallace, Taylor, and Kritzman 1962), was trenched and found to contain about five feet of cultural deposits. The lower levels of the deposits dated to pre-ceramic times. Projectile points from these levels were large lanceolate, and notched forms (Elko series or equivalent), indicating use of the atlatl. Scraper planes were confined to these lower levels also. A gradual transition to small triangular arrowpoints occurred in the upper levels, which also yielded ceramics. The deposits appear to span the last 2-3000 years, with abundant evidence of use in late prehistoric times. Many hearths were reportedly discovered, but the chronology of the deposits was not refined by radiocarbon dating.

Test excavations at another site (survey site BW-9) in the Bow Willow Canyon district (Wallace 1962c) yielded evidence of use only in late prehistoric and/or historic time.

The overall impression that emerges from published reports on the archaeology of the Anza-Borrego Desert is that the region contains a great many sites, including campsites reflecting short-term occupance, milling sites, mescal (agave) roasting pits, quarries, and substantial village sites. But with the exception of the lower levels of the Indian Hill Rockshelter, the archaeological data that can be cross-dated with artifact forms of known age suggests intensive use only in late prehistoric and historic time. The range of site types indicates a pattern of seasonal hunting and plant collecting not unlike that of the Cahuilla of Coyote Canyon in historic time (Barrows 1900; Bean and Saubel 1972).

Perris Plain (San Jacinto Plain)

Some of the best evidence for a late prehistoric population intrusion into a locality that had previously seen little use comes from surveys and excavations conducted on the Perris Plain west of the San Jacinto Mountains (O'Connell *et al.* 1974). Surveys at Perris Reservoir revealed the presence of at least 61 archaeological sites, including temporary campsites with bedrock milling facilities and midden deposits, rock art sites, and many isolated milling sites with one to a dozen or more bedrock metate "slicks." A careful search failed to disclose anything approximating the large ethnographic village sites such as those excavated and described by McCown (1955b), True (1970) and True, Meighan and Crew (1974) on the Pacific slope of the Peninsular Range. This fact, together with functional interpretation of the various site types based on local ethnographic comparisons, and excavation data from five temporary campsites, indicates that the region was used for seasonal hunting and plant food collecting. Stratigraphic interpretation of the deposits revealed almost no evidence of occupation prior to the late prehistoric period; intensive use of the locality did not begin until about A.D. 1500 or 1600. Thereafter, the region saw intensive seasonal use, apparently from spring through fall, by small groups of people who used ceramics and engaged in the collection and processing of small seeds, holly-leaf cherry fruits (*Prunus ilicifolia*), and possibly some acorns (*Quercus dumosa*). Hunting was also an important activity, with a minimum faunal count of well over 1000 individual animals representing more than

30 taxa tabulated from the bone scraps collected in the course of excavation. These were mostly small mammals, but waterfowl and large animals like mule deer and bighorn sheep were also represented (Hammond 1974). The data clearly indicate an intensification of land use after ca. A.D. 1500. The artifact forms recovered in the excavations at Perris Reservoir are largely duplicated at the Christensen-Webb site in Menifee Valley about 30 miles to the south (Kowta *et al.* 1965).

Upper Coachella Valley

Under agreement with the Agua Caliente Band of Cahuilla Indians, an archaeological survey was made of the mouth of Tahquitz Canyon. The survey (Wilke, King, and Hammond 1975) revealed abundant evidence of occupation on the alluvial fan where Tahquitz Creek, a perennial stream, sinks upon emerging from the San Jacinto Mountains. Ceramics were everywhere abundant. Limited excavations at one site locus (TC-27N) revealed faunal and floral remains reflecting the hunting and gathering aspects of historic Cahuilla lifeway in the Colorado Desert. The deposits were dated by radiocarbon at 245±50 radiocarbon years B.P., or A.D. 1510-1640 when corrected to calendar years.

Little San Bernardino Mountains

Several studies across the Coachella Valley in the vicinity of Joshua Tree National Monument seem to reflect a late prehistoric population intrusion into the Little San Bernardino Mountains and adjacent ranges to the east and northeast. These studies are reviewed and summarized by T. F. King (1976). Campbell's (1931) report of early reconnaissance and excavation, largely in the territory arount Twentynine Palms, provides a sampling of the artifacts of this region; but little information on specific sites or on artifact provenience and frequency is contained in the report. Consequently, it is difficult to draw conclusions on possible increased use of the region in post-Lake Cahuilla time. Certain projectile points from the collections described are of types that date to at least 5000 years ago, according to current understanding (Hester 1973; Hester and Heizer 1973), but these may have been collected around the dry lakes to the north and east of Twentynine Palms. Among the most common points, however, appear to be those now included in the Cottonwood series and Desert Side-notched series. Ceramics are well represented in the collections, having been found in many small storage caves and shelters. It seems probable that much of the material is of recent origin, dating from the late prehistoric and historic periods. The pinyon- and yucca-clad uplands of the Little San Bernardino Mountains would have been one of the more attractive regions adjoining the Salton Basin for seasonal gathering and hunting after the decline of Lake Cahuilla. Certainly, the many cached vessels found in this region (primarily ceramic *ollas*, or storage jars) suggest that it was visited annually by groups of people who gathered plant foods as they became available, and then cached their implements until the following year. The region is characterized by very limited water sources. Permanent occupation by large groups of people would be impossible, given present climatic conditions. The available data, which are admittedly difficult to interpret,[2] may, however, indicate intensive seasonal plant collecting by small groups since the recession of Lake Cahuilla in the adjacent Coachella Valley.

Such small groups of people could have foraged from isolated springs, probably carrying their water supplies with them.

More recent studies seem to document a late prehistoric intensification of land use in this region. Wallace and Taylor (1960c) described the findings of a survey in the Deep Tank-Squaw Tank district of Joshua Tree National Monument. Twenty-three sites were found, all but two of which yielded pottery. Milling implements were common. The sites in this district reflect the seasonal collecting pattern of the historic period, a pattern that we can logically infer extended at least several hundred years back into prehistoric time.

One of the sites near Squaw Tank was excavated (Wallace and Desautels 1960). Pottery occurred throughout the deposit and small arrowpoints were common. The site was apparently occupied seasonally in the late prehistoric period, with occupation continuing into historic time as well.

Similar findings were reported for the Sheep Pass district (Wallace 1964), including portions of the adjacent Queen and Lost Horse valleys. Sixteen sites were found, all but two of which yielded ceramic artifacts from the surface. All of these sites are thought to date from the late prehistoric and historic periods, and seem to duplicate the pattern of land use seen at the nearby Deep Tank-Squaw Tank district.

Other Regions

Although detailed archaeological reports are available for several other regions of inland southern California, it is not possible to draw any firm conclusions about possible population movements into those regions in late prehistoric time. True (1970) described the Cuyamaca complex, a late prehistoric manifestation from the Laguna Mountains of southern San Diego County. A large number of sites in this region, many of them yielding ceramics and side-notched projectile points, reflect an adaptation of a large population to the forested uplands at least on a seasonal basis (probably summer and fall). It was suggested earlier (Wilke 1971) that the inception of the Cuyamaca complex sites might be traceable to the drying of Lake Cahuilla. It now seems apparent that the Cuyamaca complex is the culmination of long process of adaptation to upland resources and contains elements which are seemingly derived from the Hohokam of Arizona. These latter elements include the characteristic long, serrated projectile points and urn burial of cremations.

The related counterpart of the Cuyamaca complex, the San Luis Rey complex (Meighan 1954; see also Kowta *et al.* 1965), extends from northern San Diego County across western Riverside County, and is represented by an absolute profusion of archaeological sites. The complex is divided into preceramic (San Luis Rey I) (Meighan 1954) and ceramic (San Luis Rey II) (True, Meighan, and Crew 1974) phases. The dating of these phases is uncertain, but use of pottery probably began about A.D. 1600 or a little later, according to current estimates for this region. As one moves northward, pottery becomes less frequent. This is perhaps linked to a decreasing reliance on a few important resources like acorns and an emphasis instead on many plant and animal foods (and the greater

mobility required in the pursuit of these resources) as one proceeds to the north and especially the northwest. It appears that the San Luis Rey complex, as documented in the San Luis Rey River basin, also represents a long process of settling in to the resources of the inland hills and valleys. But near the north and northwest end of the range of the San Luis Rey complex, as observed at Perris Reservoir, there is clearly a late prehistoric movement, on a seasonal basis, into a region that had previously seen little use.

Summary

Excluding from this discussion the probable movement of groups from the receding Lake Cahuilla to the Lower Colorado,[3] available data seem to document a movement into the habitable uplands surrounding the Salton Basin in the late prehistoric period. Such a settlement shift was suggested as one apsect of the cultural adjustments which accompanied the disappearance of Lake Cahuilla.

Lying immediately to the west of Imperial Valley, the Anza-Borrego Desert is a logical region to have received populations from the drying lake. It is a region which extends from nearly sea level to high elevations on timbered mountains. Its range of environmental zones is well suited to a diversified pattern of hunting and collecting like that of the historic Cahuilla. Perhaps some major aspects of Cahuilla Indian subsistence date to the drying of Lake Cahuilla and are reflected in the abundance and diversity of archaeological sites in the Anza-Borrego Desert.

A reasonable explanation for the abrupt settlement change seen at Perris Reservoir does not lie in local population growth. Rather, it would appear more likely that the locality was not considered an essential gathering territory until late prehistoric time when overcrowding (or less likely, a reduction of resources) in nearby regions necessitated use of the Perris Plain. Given the time that intensive use of the locality apparently began, it would seem reasonable that the drying of Lake Cahuilla may have initiated a restructuring of territories in the Peninsular Range, forcing some groups to make use of the plains and outlying mountain masses to the west in the summer months. The mountains were probably able to accommodate larger populations in the fall when acorns and pinyon nuts were available, but the summer months would be the time that small groups of people would have had to forage more widely for small seeds and game animals. Use of the Perris Reservoir locality thus seems to represent such a situation of overcrowding and consequent territorial restructuring in the Peninsular Range, and the drying of Lake Cahuilla may well have initiated the process (O'Connell 1971; Wilke 1974b).

Tahquitz Canyon is located about 20 miles from the northwest end of former Lake Cahuilla, and water sources like Tahquitz Creek would have become very important settlement locations after the lake dried. More excavations are needed to determine the relationship between historically occupied sites in the Palm Springs region and the disappearance of Lake Cahuilla. However, at present the oldest dated feature at Tahquitz Canyon (corrected to A.D. 1510-1640) certainly suggests that this region saw a population influx in about the sixteenth century.

Taken as a whole, it appears that the entire uplands of the Little San Bernardino Mountains-Cottonwood Mountains chain to the northeast of Coachella Valley contain a profusion of late prehistoric sites. The sites reflect intensive foraging on a seasonal basis, probably from spring to autumn, by pottery-using groups. This pattern continued also into historic time (cf. T. J. King 1976). It seems most reasonable to conclude that the region became an important gathering territory after the drying of Lake Cahuilla.

Thus, it would appear that the Anza-Borrego Desert, the Perris Plain, the region of the Little San Bernardino Mountains, and the upper Coachella Valley contain large numbers of ceramic period sites of a variety of types. These include many temporary camps, milling stations, mescal pits (in regions where agave is found; it is all but absent in the Little San Bernardino Mountains), etc., reflecting the extremely diversified food quest of the historic Cahuilla (Barrows 1900; Bean and Saubel 1972; Wilke 1976). It is suggested that this abundance of specialized late period sites, and a corresponding scarcity of sites from early periods in time in regions surrounding the Salton Basin, reflects the restructured settlement pattern that would have become necessary when Lake Cahuilla receded.[4]

## REVEGETATION OF THE LAKEBED

Little information is available that might suggest the rapidity with which vegetation reoccupied the ground laid bare by the recession of Lake Cahuilla. There is reason to believe that plants of some sort would have been quick to appear on the newly exposed soil, but whether these would have included species of primary economic importance to the Indians is uncertain.

When the Salton Sea reached its maximum elevation (-197½ feet) in February, 1907, and began to recede, observations made by the Carnegie Institution's Desert Botanical Laboratory recorded the colonization of the exposed strands by plants (MacDougal 1914b). As might be expected, given the low elevations at which these strands occurred, the plants were largely those characteristic of the Alkali Sink plant community, including *Suaeda, Allenrolfea, Sesuvium, Atriplex, Pluchea,* etc. Seedlings apparently germinated from seeds stranded by the receding waters. It is impossible to identify the species which might have early vegetated the exposed bed of Lake Cahuilla, when it started its decline, but initially these would probably have been representative of the Creosote Bush Scrub plant community.

From an economic standpoint, the key plants would no doubt be the mesquite (*Prosopis glandulosa* var. *torreyana*) and screwbean (*P. pubescens*), both of which had been eaten previously by the lakeshore inhabitants and produce substantial quantities of nutritious food that is highly storable. They could therefore have been of considerable importance to the human populations undergoing the transition from aquatic to desert conditions. If these species early colonized the exposed strands, and if they reached a productive stage within a few years, the severity of the transition would no doubt have been reduced. If, however,

two or three decades elapsed before they became established and productive, they may have appeared too late to benefit the lake dwellers who were witnessing their environment being transformed into a desert. There is simply not enough information presently available to discuss this point objectively.

## OCCUPATION BY THE HISTORIC CAHUILLA

There seems little question that aboriginal settlement of Coachella Valley was seriously disrupted by the drying of Lake Cahuilla. Reoccupation of the lower valley, especially the dry lakebed, would also seem to have occurred when previously displaced groups moved down from the uplands. There are several reasons to believe that this was the case. For one thing, it was recalled by historic Cahuilla when W. P. Blake visited them nearly 125 years ago. He was told that when the lake dried (perhaps some time after it dried?) the Cahuillas moved their villages down from the (Santa Rosa?) mountains into the valley the lake had formerly occupied (Blake 1856:98).

More concrete evidence that historic groups in Coachella Valley came from the adjacent uplands was recorded by W. D. Strong (1929:37):

> The migration legends and place names of the earliest family homes remembered, originate in the mountains, giving some reason for the belief that at an earlier time the people lived there--later moving out into the desert.

In recording notes on Cahuilla lineages on the desert in Coachella Valley, Strong was repeatedly told that a particular lineage was originally from the Santa Rosa Mountains (1929:41-42). From his data, one gets the impression that nearly all Cahuilla lineages on the desert originally came from these uplands.

Thus, by the Indians' own testimony they came down to the Coachella Valley from the mountains to the west. But, also by their testimony, they had earlier lived at Lake Cahuilla (as discussed in Chapter I). So the notion of the ancestral Cahuilla as lake dwellers, whose existence was disrupted by the drying of Lake Cahuilla, and who moved up into the mountains for a time before settleing in the lower Coachella Valley is supported by oral history. It would be difficult to date the resettlement of the valley by the radiocarbon method or other means, but presumably it occurred in about the seventeenth century.

Within three years after Blake's original passage through Coachella Valley, surveyors for the U. S. Land Office recorded the locations of probably all Cahuilla villages in San Gorgonio Pass and in the valley proper (Fig. 26).[5] These notes comprise the best record available on the aboriginal settlement pattern of Coachella Valley. Availability of surface water was not the primary factor determining village locations in the lower valley, although many of them were located around springs and oases. Some of the villages had developed springs or excavated conical walk-in wells to obtain water. If one considers the population estimates usually given for the Cahuilla as a whole, roughly 2500-3500,[6] there must have been at least 2000 people residing in the 22 villages recorded by

the surveyors in the San Gorgonio Pass and Coachella Valley. This would have been on the order of 100 persons per village, which is probably a reasonable figure. Some of the villages are known to have been substantially larger.

Agricultural fields were also recorded at several locations in the valley in 1855-56 (Fig. 26), and crop growing had been noted also by Blake in 1853 and Estudillo in 1823 (Bean and Mason 1962). The crops are identified as corn, pumpkins, melons, and watermelons. Barley was added to the inventory in 1853. There was ample time and opportunity for these Cahuilla to have acquired the practice of agriculture from the *Californios* in the half-century prior to 1823, however careful examination of this problem reveals that Cahuilla agriculture was probably of some antiquity (Lawton and Bean 1968; Bean and Lawton 1973; Lawton 1974). Agriculture figures prominently in Cahuilla myth and ritual, there are Cahuilla terms for crop plants, the planting methods (including multiple cropping) are not those which might have been borrowed from Anglo settlements, and the crop plants themselves are probably derived from the Lower Colorado agricultural complex (Castetter and Bell 1951). There were also substantial irrigation works at Tahquitz Canyon at present Palm Springs (Wilke, King, and Hammond 1975) and down the valley at Agua Dulce (Wilke and Lawton 1975). The latter system involved a reservoir surrounded by an earthen embankment, a sort of flood-gate, and presumably ditches or canals to deliver the water to the fields one-half mile away. The Cahuilla of Coachella Valley were clearly involved to a considerable extent in agricultural pursuits in early historic time, and apparently were so in the late prehistoric period as well. We can as yet only speculate on the origin of food production among the Cahuilla. But inasmuch as agriculture does not appear to have been part of the subsistence pattern at Lake Cahuilla, but was well developed by early historic time, perhaps it originated as one facet of the cultural adjustments that followed the environmental changes that occurred in Coachella Valley 300 years earlier.

Agriculture is best viewed as but one aspect of Cahuilla Indian subsistence that had arisen by early historic time. The seasonal food quest of these people has been studied in considerable detail (Barrows 1900; Bean and Saubel 1972) and involved the pursuit of a host of plant and animal species. Ethnobotanical data on the Cahuilla are probably more complete than those on any other aboriginal group in the arid western United States. Although the number of plants collected at various seasons of the year was large, there were a few staple resources that were regularly sought. Some, such as mesquite (*Prosopis glandulosa* var. *torreyana*), screwbean (*P. pubescens*), and pickleweed (*Allenrolfea occidentalis*), etc., were obtained locally on the floor of Coachella Valley. Others, like agave (*Agave deserti*) and pinyon (*Pinus monophylla*) occurred high on the slopes of the mountains. Gathering territories characteristically cross-cut the several plant communities ensuring that each lineage village had access to a wide range of plant foods. And each plant community had its associated fauna which was avidly sought by the hunters.

The seasonal round of food gathering activities on the desert has been reviewed elsewhere (Wilke 1976) based on available information on

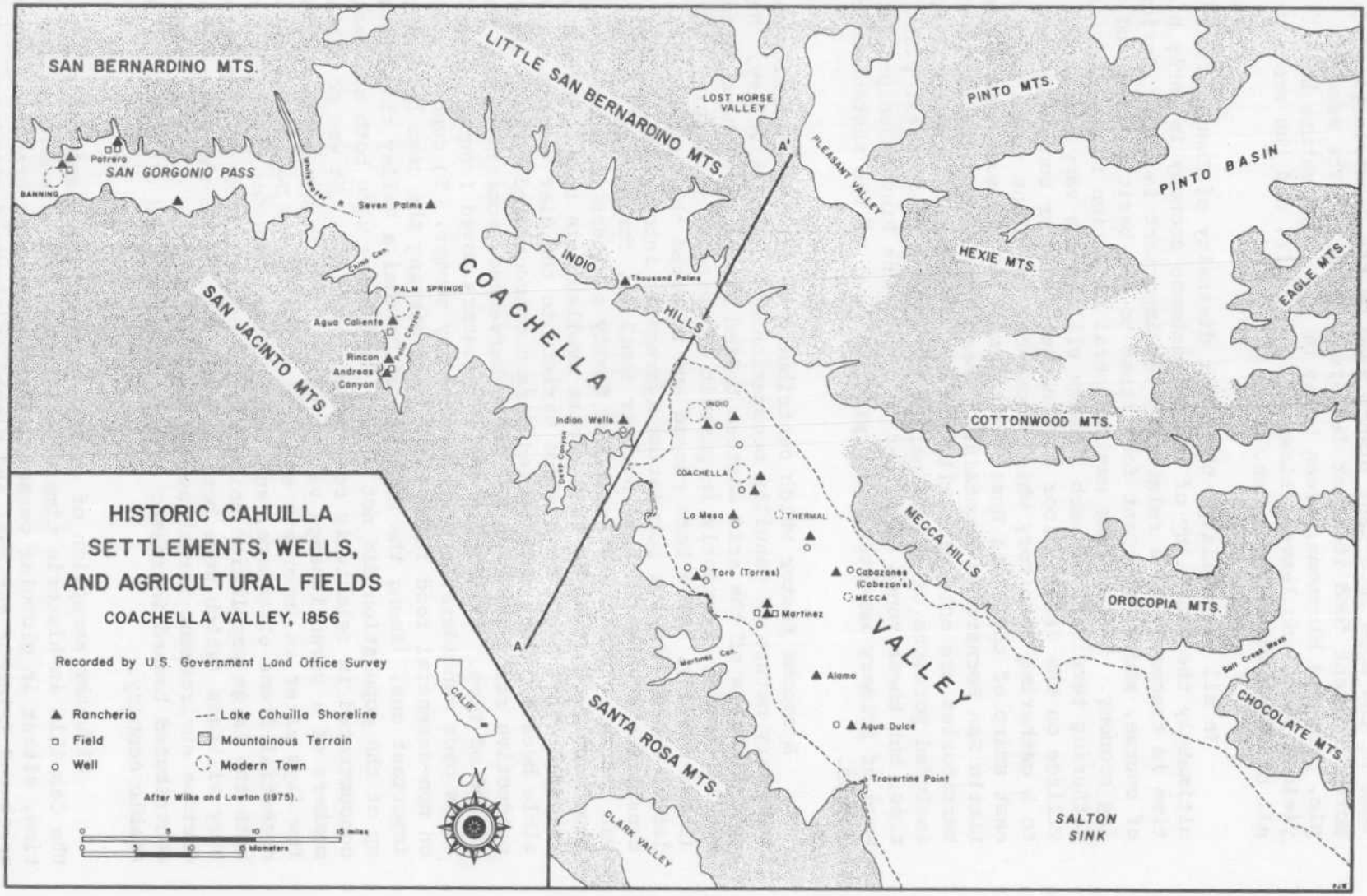


Fig. 26. Historic Cahuilla settlements, wells, and agricultural fields in Coachella Valley, as observed in 1856. Data from U. S. Government Land Office Survey. Section A-A' marks location of vegetation transect shown in Fig. 4.

species utilized and season of availability. It is significant that some of the more important plants used by the Cahuilla yielded two or more different food items at different seasons. The mesquite, for example, produced blossoms, green beans or pods, and mature beans. Agave yielded succulent leaves, blossoms, the stalk, and the crown or heart, all of which were also eaten.

In all probability, the great diversity of Cahuilla diet and ultimately the stability of the subsistence economy in early historic time is traceable to a relatively few important factors. Agriculture, of course, added important food items to the basic hunting and gathering economy. The extreme environmental variation represented in the gathering territory of each lineage village was very important. Each village on the desert floor also either owned or controlled use rights to a gathering territory which cross-cut the plant communities on the east scarp of the Santa Rosa Mountains or on the southwest slope of the Little San Bernardino Mountains. Locations and boundaries of gathering territories are only partially known. Some territories could not have included portions of the Chaparral and Yellow Pine Forest plant communities, but these zones up to and including the Pinyon-Juniper Woodland were of primary importance and provided most of the sustenance of desert groups.

A second factor which contributed to dietary diversity was the sedentary nature of Cahuilla occupation of Coachella Valley. Hunters and gatherers of the arid western United States were characteristically mobile, moving frequently in pursuit of seasonally ripening plant foods (Steward 1938). This both caused and required the fragmentation of larger winter village population aggregates into smaller units, usually consisting of one to three nuclear families, for most of the year. It was necessary for these scattered family clusters to focus on a few important food items as they became available in turn. Pursuit of minor resources that might have added variety to the diet was often not possible because every able-bodied person concentrated efforts on the more productive resources that had to be harvested, sometimes in a very short period of time. The little family clusters moved frequently, and sometimes over considerable distances, every summer. To concentrate effort on non-essential food items might mean missing the next harvest of an important one. Among the Cahuilla of Coachella Valley this annual breakup of the population did not occur. Resources were both abundant and concentrated in relatively convenient locations. It was possible for members of a given lineage village to go high in the mountains for a few days after an important resource while others could seek out less essential items elsewhere, and then exchange one for the other. Thus, both the large population units and the organization of them into sedentary villages (which were both possible because of the relatively productive environment for those who knew how to make a living from it) contributed toward increased dietary diversity and ultimately a more stable economy.

With the exception of greens, most of the plant foods used by the Cahuilla in historic time were storable for extended periods of time, either in globular ceramic *ollas* or in large granaries woven from arrowweed (*Pluchea sericea*) and placed on elevated platforms. Ability

to store most of the food items helped to prevent shortages in seasons of lesser productivity.

Finally, the very structure of Cahuilla society included a series of built-in failsafe mechanisms to ensure that everyone always had enough food to go around. Society was organized into exogamous moieties, sibs, and patrilineages. Any given person's kin ties extended from his own village into perhaps a dozen or more others scattered across Cahuilla territory in sometimes markedly different environmental settings. This created a broad network across which a person was not only able, but constantly required to reaffirm social ties and relationships through gift-giving, and the gifts were usually food. Such gift-giving was often a reciprocal arrangement, so everyone more or less had access, either directly or indirectly, to all resources available in Cahuilla territory, whether they occurred in the specific gathering territory of his village or not. Ceremonial exchanges usually took the form of redistribution of substantial quantities of food and other goods. And the primary ceremonies at which such redistribution of goods took place were conveniently held in the winter, the season of least abundance, when shortages were most likely to occur. Thus, the very solemn and reverent *nukil* (mourning) ceremony served a sometimes critically important economic function as well (cf. Blackburn 1974).

These adaptive aspects of Cahuilla Indian society that had arisen by early historic time are discussed indetail by Bean (1972). Which aspects of this adaptation were brought to Coachella Valley when the Cahuilla settled on the desert floor, and which of them developed after they got there, can only be speculated upon. But it would seem that a very effective cultural adaptation to a harsh and arid environment had evolved in the two or three centuries prior to Estudillo's arrival in Coachella Valley in 1823, when the prehistoric epoch drew to a close.

## NOTES

1. Similar changes occurred in the southern end of Imperial Valley and the region of the Colorado Delta as the lake began to recede. A useful discussion of this event and the cultural adjustments that occurred in the delta region is presented by Aschmann (1966).

2. According to archaeological research strategy of the period, it was "necessary to rush about and save as many specimens as possible" (Campbell 1931:24). Data collected in such a manner simply are often not suited to answering questions raised a half-century later. I do not wish or intend to decry Mrs. Campbell's work; it is still one of the best available contributions to the prehistory of the region. A half-century from now researchers two generations up the road will probably wish I had collected my own data in a manner more suited to their needs.

3. The possible impact of this gravitation to the Lower Colorado (Aschmann 1959, 1966) in bringing about the chronic intertribal warfare that characterized the region in historic time is certainly one of the most interesting research problems in southeastern California prehistory. The problem is not pursued in this paper because the emphasis here is on developments in Coachella Valley. Lower Colorado warfare was treated

recently by White (1974), but he did not emphasize the significance of out-migration from the Salton Basin as a causal factor.

4. Meighan (1975), in reviewing the work done at Perris Reservoir (O'Connell *et al.* 1974), found it difficult to believe that the survey had located a representative sample of sites of various ages that were actually present there. (Almost all of the sites were assigned to the late prehistoric period.) He stated his view that older sites are present, but difficult to find. He thought older sites would be surface phenomena, even though younger sites do have considerable depth. The reason for such an improbable situation was not given. The various regional surveys in inland southern California were conducted by various teams, with varying survey experience, and undoubtedly with varying survey method and procedure; yet, their results are broadly similar. If the older sites are out there, why are they not more consistently found?

5. According to Mrs. Jane Penn of the Morongo Reservation, another village was located in Whitewater Canyon until it was destroyed by floods in about 1862, after which it was moved to *wanapiapa*, site of the Whitewater stage station. This village would have escaped the observations of the surveyors, who restricted their activity to comparatively flat land.

6. Estimates for Cahuilla population range from about 2500 to 6000. See Kroeber (1925:692), Hicks (1961), Harvey (1967), and Lovell (in Heizer 1974).