COYOTE PRESS

ARCHIVES OF CALIFORNIA PREHISTORY

ARCHAEOLOGICAL INVESTIGATIONS AT CA-RIV-1179, CA-RIV-2823, AND CA-RIV-2827, LA QUINTA, RIVERSIDE COUNTY, CALIFORNIA

Edited by

Mark Q. Sutton and Philip J. Wilke

NUMBER 20

1988

Chapter 1
THE NATURAL AND CULTURAL ENVIRONMENT

by Philip J. Wilke

The Natural Environment

The setting for the investigations reported here is locally known as the La Quinta cove, and is situated about 8 km southwest of the town of Indio, at the southwestern flank of the Coachella Valley, Riverside County, California (Fig. 1). This valley comprises the northwest end of the arid Salton Basin of southeastern California. The study area is situated at the juncture of the rocky slopes of the Santa Rosa Mountains and the floor of Coachella Valley at an elevation of 20-50 m above sea level.

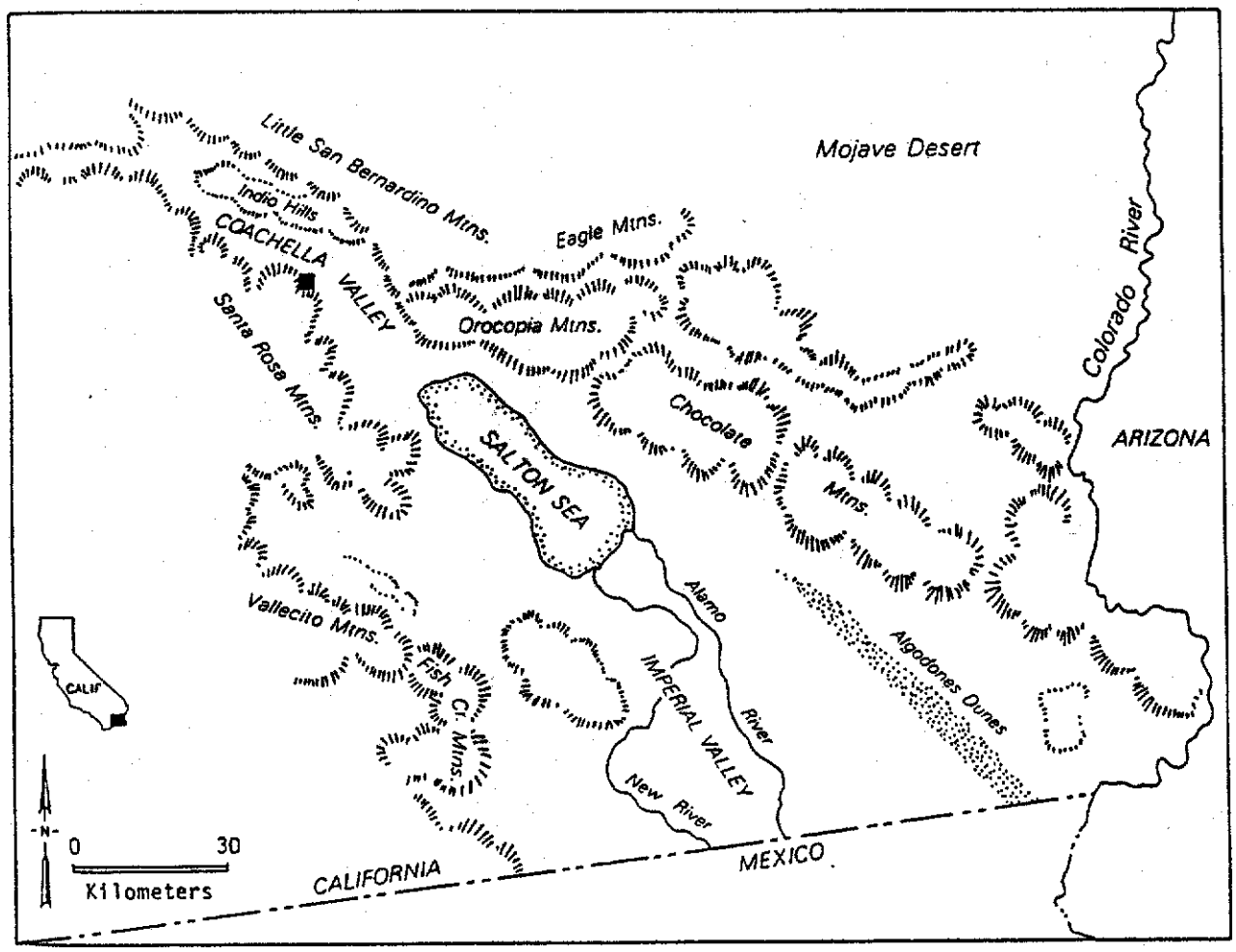

Figure 1. Vicinity map. The study area is marked by the black rectangle.

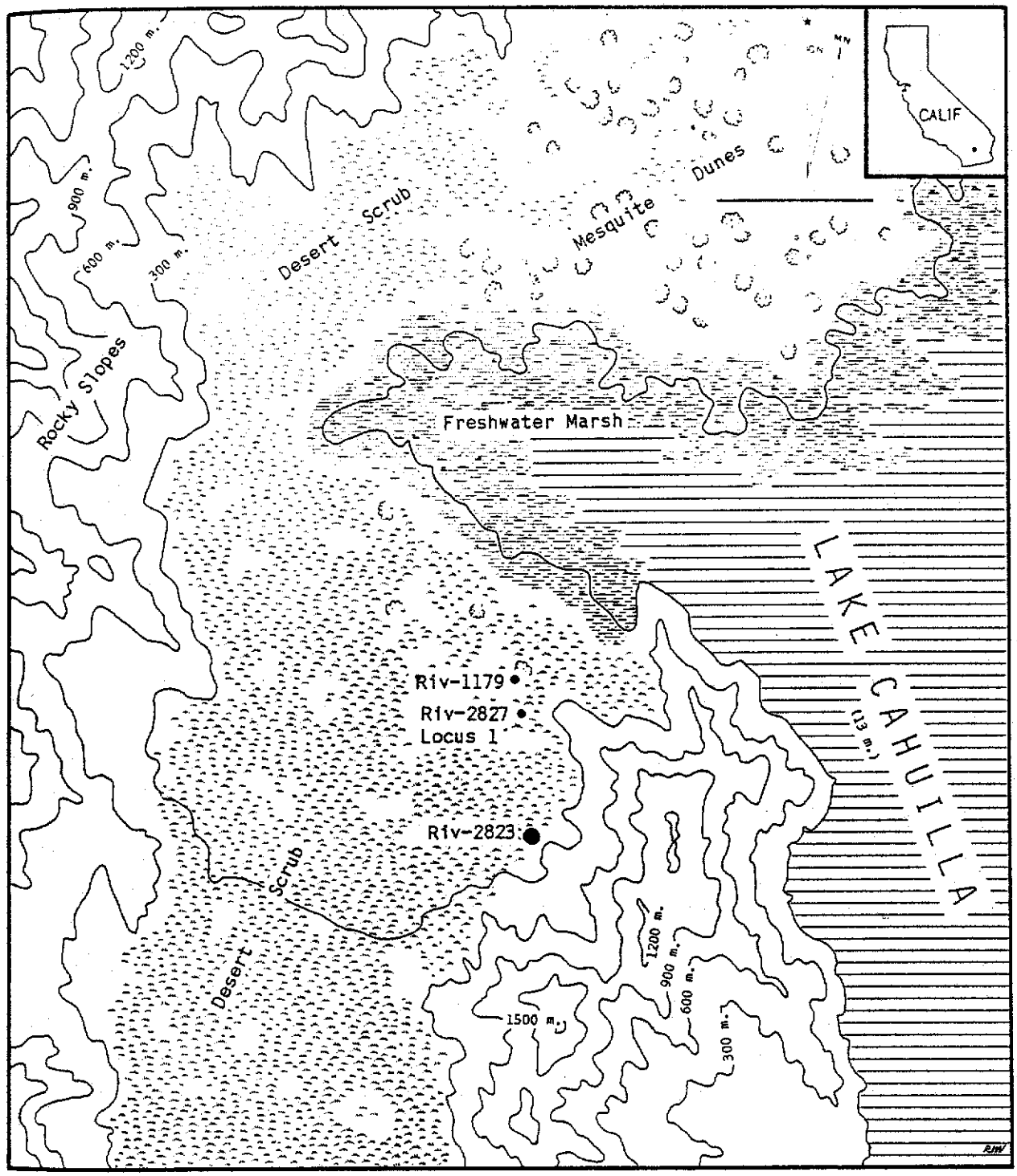

Figure 2. Location of sites with respect to former environmental resource zones.

Marsh plant community. Previous archaeological work in this area (Wilke 1978) established the fact that bulrushes (*Scirpus* spp.) and cattails (*Typha*) were important elements of this zone. It must have been one of the most productive segments of the entire 450-km shoreline of Lake Cahuilla, supporting rank growths of aquatic plants, fish, mussels, and various aquatic birds.

Lake Cahuilla dried when the Colorado River formed a new channel on its delta, which resulted in discharge directly into the Gulf of California, rather than into the Salton Basin. The lake, deprived of its inflow, dried by evaporation. This is the same situation that brought about the ends of all earlier lake stands in the basin. Historic accounts (Wilke 1978: Chap. 3) clearly document that the present pattern of river discharge was established by A.D. 1540 when the frontier of New Spain reached the Colorado Delta. A number of lines of evidence suggest, however, that the drying of the lake could not have taken place much before A.D. 1540. In all probability, the lake began to dry about A.D. 1475, and drying would have been completed after about 55-60 years of progressive decline.

A detailed account of the environment of the Coachella Valley, the geography of Lake Cahuilla, the dating of its various stands, and the biology of the lake is found in Wilke (1978). This brief overview is summarized therefrom. Figure 2 shows the location of the sites reported here to the aquatic features described above, and Figure 3 is a characterization of the natural environment as it existed during the last stand of Lake Cahuilla.

The Cultural Environment

Prehistory

The known prehistoric record of human occupation in the Coachella Valley does not extend back very far into the past. Nearly all of the available evidence is assignable to the last stand of Lake Cahuilla (ca. A.D. 1300-1500), and most of it was presented by Wilke (1978). The combined evidence from several sites and localities was interpreted to indicate that the northwest end of Lake Cahuilla was occupied by sedentary peoples who relied very strongly on aquatic resources from the lake, and the surrounding zone.

Through remarkable preservation never reported elsewhere from open-air sites in the entire western hemisphere north of Peru, coprolites (desiccated human waste) from the Myoma Dunes northwest of Indio revealed the nature of the prehistoric diet. By extension, these remains also provided abundant information on the regional ecology and on where people obtained the food resources of the day. Wilke (1978: Chap. 4) presented an analysis of 109 coprolite specimens and additional flotation samples assigned to the last stand of Lake Cahuilla. These residues contained nearly 50 identifiable species consumed for food (Wilke 1978: Table 7). Most of the consumables came from the open waters of the lake, from the shoreline marshes, and from nearby low-desert environments. Especially common were the seeds of cattail (*Typha*) and bulrush (*Scirpus*) and the pollen of cattails (represented macroscopically by anthers) from the marshes. Lowland purslane (*Sesuvium verrucosum*) and goosefoot (*Chenopodium*) seed came from the nearby flats. Honey mesquite (*Prosopis glandulosa* var. *torreyana*) and screwbean (*P. pubescens*) pods were collected from thickets anchoring the shore

Terrain above about 15 m elevation has probably been vegetated in much the same manner as at present (and hosted much the same mammalian and reptilian fauna) for the last several thousand years with one notable exception: mesquite thickets that formerly occurred on wide areas on the flanks of the Coachella Valley have died within the present century because of a declining water table. This occurred as a result of the drilling of many artesian wells after about 1890. In the study area the remains of such relict mesquite thickets are still observable. Creosote bush clones in the immediate area are as much as 1.5 m across, and thus are 500-700 years old (Vasek 1980). Together, these species indicate the nature of the local plant cover at a remote time.

At elevations below 15 m there have been drastic changes in the natural environment. The entire floor of the Salton Basin below 13 m elevation was inundated in the recent past. Evidence gathered around the basin reveals that on numerous occasions throughout the late Quaternary the Colorado River has flowed northward from its delta creating freshwater lakes of large proportions. Weide (1976) presented a compendium of radiocarbon ages that document those stands during the last 50,000 years.

In more recent times, there have been several stands of this lake, called Lake Cahuilla (Lake LeConte, Blake Sea), and it is these later stands that are of most significance to the present work. Wilke (1978: Chap. 3) assembled the available information and concluded that there have been probably three lacustral intervals during the last 2,100 years, and that each of these intervals documents at least one lake stand. Waters (1983) offered other chronological data suggesting four lacustral intervals, but the latest of these may represent a second rise to the 13-m level during the last wet cycle in the basin. The most recent cycle of Lake Cahuilla may have been of comparatively short duration, and is dated to the interval A.D. 1300-1500 (Wilke 1978: Fig. 14).

Lake Cahuilla extended from the delta of the Colorado River, where it overflowed into the Gulf of California via the channel presently occupied by the Rio Hardy, to just northwest of the present town of Indio, a distance of 185 km. It had a maximum width of 55 km, and was up to 97 m deep. Although the lake may have fluctuated about one-half meter seasonally during the summer runoff from the Rocky Mountains, it was remarkably stable and supported a fishery like that of the lower Colorado River. The major species, except for occasional entrants from the Gulf of California, included striped mullet (*Mugil cephalus*), which regularly entered the lake from the Gulf; a small pupfish (*Cyprinodon macularius*) endemic to the lower Colorado River; Colorado River squawfish (*Ptychocheilus lucius*), of large size and predatory on other fishes; razorback (humpback) sucker (*Xyrauchen texanus*); and Colorado River bonytail (*Gila elegans*). These are all warm water species that can tolerate the somewhat muddy conditions that were typical of the Colorado River delta. Mussels (*Anodonta dejecta*) were abundant in shallow water, and large deposits of the shells of these mussels, the remains of many prehistoric meals, formerly were found in the area. Then, as now, the Salton Basin was a major focus of activity on the Pacific migratory bird flyway, and a great many species of ducks, geese, and shorebirds were at least seasonal, if not permanent, residents.

The shallows at the northwest end of Lake Cahuilla, including the small embayment where the town of La Quinta now stands, were host to a Freshwater

The floor of the lower Coachella Valley (and of the remainder of the Salton Basin) lies well below sea level. To the west elevations reach 3,292 m at the crest of the Peninsular Range. The valley thus occupies a rainshadow on the lee side of the mountains, with annual precipitation averaging only about 8 cm. Most of this moisture falls in the winter, but some rain occurs as a result of intense summer thunderstorms that move northward from the Gulf of California. Summer temperatures are very high, sometimes exceeding 52° C., and winters are mild. The growing season averages about 300 days each year, and frosts frequently occur in the months of December and January. The climate and weather of the region are described by Felton (1965:93-95).

The environment of the study area is that of the hot, low desert; in fact, it is one of the hottest and driest regions on the continent. The vegetation is well-adapted to these conditions, and is classified Desert Scrub, or more specifically as Creosote Bush Scrub (Munz and Keck 1949, 1950). This characterization implies that most of the conspicuous perennials are shrubs, and that the dominant species is the creosote bush (*Larrea tridentata*). This species typically co-occurs with white bur-sage (*Ambrosia dumosa*), and, in comparison, all other species are decidedly in the minority over vast expanses of the desert floor. Locally, other shrubs common on the desert floor are cheesebush (*Hymenoclea salsola*) and allscale (*Atriplex polycarpa*). Less common are brittlebush (*Encelia farinosa*), dyebush (*Dalea emoryi*), and pencil cholla (*Opuntia ramosissima*). On flatter terrain honey mesquite (*Prosopis glandulosa*) thickets are often seen anchoring dunes, their roots tapping the water table.

The dry washes of the desert floor, which carry water only on rare occasions, are marked by small, thorny trees: palo verde (*Cercidium floridum*), smoketree (*Dalea spinosa*), and catclaw acacia (*Acacia greggii*) being the most common. As one approaches the foot of the mountains, and particularly along the washes, desert lavender (*Hyptis emoryi*), brittlebush, chuparosa (*Beloperone californica*), thornbush (*Lycium*), indigo bush (*Dalea schottii*), barrel cactus (*Ferocactus acanthodes*), and beavertail cactus (*Opuntia basilaris*) make their appearance.

The foregoing is not an exhaustive listing of the plants common to the Creosote Bush Scrub plant community, or a definitive listing of those found in the study area, but it is descriptive of the more conspicuous perennial species observed there. A useful general introduction to the plants of the desert is that of Jaeger (1957: Chap. 9). The natural environment of the southwestern flank of the Coachella Valley and the adjacent slopes of the Santa Rosa Mountains, with special emphasis on the mammalian fauna, is treated in detail by Ryan (1968:8-57).

Mammalian species common to the Creosote Bush Scrub plant community number about 25, most of which are small and nocturnal. There are nine mice (*Perognathus*, *Peromyscus*), three kangaroo rats (*Dipodomys*), desert wood rat (*Neotoma lepida*), desert cottontail (*Sylvilagus audubonii*), black-tailed hare (*Lepus californicus*), three ground squirrels (*Ammospermophilus*, *Citellus*), gray fox (*Urocyon cinereoargenteus*), kit fox (*Vulpes macrotis*), coyote (*Canis latrans*), bobcat (*Lynx rufus*), and, at higher elevations, desert bighorn sheep (*Ovis canadensis nelsoni*).

line dunes. The mountain slopes provided pinyon (*Pinus monophylla, P. quadrifolia*) nuts. These, supplemented by other stored seeds, and by the seeds of desert dicoria (*Dicoria canescens*), which ripens in the winter, were staples during the less productive seasons. Chief among the animal foods were fish, especially razorback sucker and bonytail, but waterfowl, especially mudhens (*Fulica americana*), were also important. The array of food items includes certain species that can only be gathered or hunted in specific seasons (for example, cattail pollen in the spring, pine nuts and bulrush seed in the autumn, dicoria seed in the winter). When these seasonally restrictive items are considered individually, it is apparent that the data are best interpreted as evidence of year-round occupation by a group relying on a diversity of plant and animal food resources, rather than of repeated occupations of the lakeshore during different seasons (Wilke 1978: Table 5).

Two sites, Wadi Beadmaker and Bat Caves Buttes, yielded evidence of specialized subsistence activities. The former is a fishing station on the northeast shore near the present oasis of Dos Palmas. Here thousands of razorback suckers and bonytails were taken, probably by net or some sort of trap, in a nearby lagoon. Terrestrial species represented in the site deposits include the bones of desert bighorn sheep and desert tortoise (*Gopherus agasizzi*). The users of this fishing site made ceramic vessels and they fashioned beads from small marine molluscs, most of which originated in the Gulf of California. Chipped stone artifacts were poorly represented but included small side-notched and simple triangular arrow points. Several fired clay figurine fragments were included in the assemblage.

Another site partially examined is located atop the Bat Caves Buttes, which formed an island in Lake Cahuilla about 7 km from the northeast shore. It represents a place where persons from shore made their way out to the island and raided the aquatic bird rookeries that existed there. Timing of the event was such that it netted a goodly haul of immature black-crowned night herons (*Nycticorax nycticorax*) and great blue herons (*Ardea herodias*) just before they were old enough to leave the nesting grounds. Under similar climatic conditions this would have been about the fourth week of May. Artifacts were few, and were almost entirely limited to ceramic sherds. Another excavated area of the site contained the bones of double-crested cormorants (*Phalacrocorax auritus*), and these bones are the cast-offs of butchered birds; axial elements such as vertebrae are generally lacking and were apparently removed from the islands and taken to shore along with the meat. More work is needed before a definitive statement can be made on the archaeology of the Bat Caves Buttes, but the rudiments of this specialized exploitative pattern are known (Wilke 1978:102-103; P. J. Wilke and P. E. Langenwalter II, work in progress).

Detailed descriptions of the artifactual assemblages from Lake Cahuilla sites have not been published (one, from Wadi Beadmaker, is currently in preparation). It is apparent, however, that stoneworking was not of great importance at sites along the shoreline of Lake Cahuilla. Apparently hardwood foreshafts usually sufficed in lieu of projectile points, or they were frequently made of some perishable material, since stone specimens are seldom found. Much reliance must have been placed on nets or traps for taking fish and waterfowl. Ceramic vessels were made in great numbers, as attested by the abundance of sherds of Salton Buff and Tizon Brown on shoreline sites. Perishable artifacts, such as

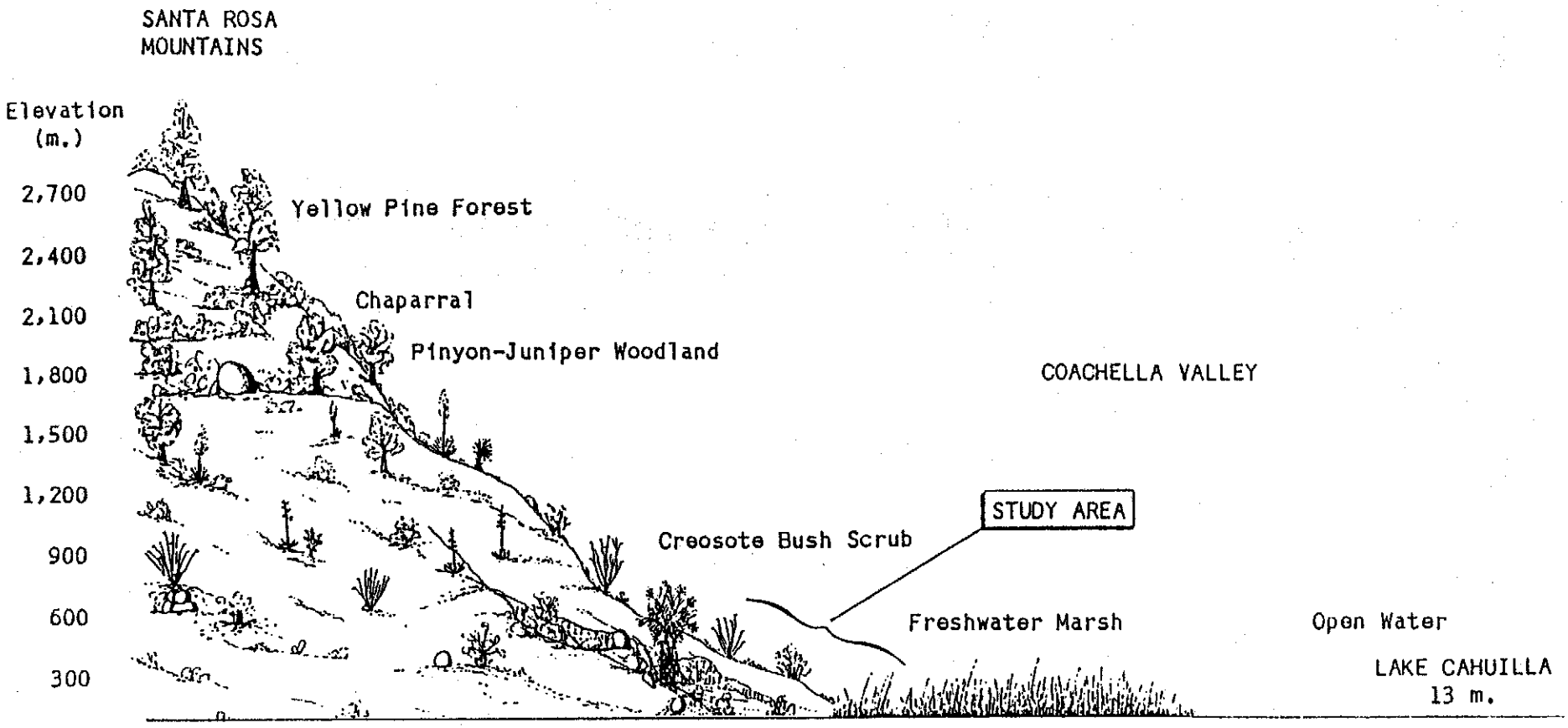

Figure 3. Generalized environmental profile, showing the location of the study area in relation to plant communities.

basketry or netting, have not survived the ravages of termites and would likely be found only if carbonized. Disposal of the dead was by cremation, and grave accompaniments frequently included beads and pendants of shell that originated on the Pacific Coast and on the Gulf of California.

The apparently stable adaptation indicated by the coprolites from the Myoma Dunes ended abruptly with the onset of the drying cycle of Lake Cahuilla. Within a few years the marshes were completely dry, the shellfish populations were stranded and died, and the lake was no longer capable of providing the array of food items it had when it was stable. Available information on the ways in which human populations adapted to the declining resource base are sketchy, but some information comes from examination of fishing sites along the recessional shorelines.

To the south, just a few kilometers north of Travertine Point (the approximate Riverside-Imperial County Line, on the west side of Coachella Valley), vast numbers of stone fish weirs were constructed. Most of them have since been destroyed by agricultural operations. These weirs were on gently sloping ground and were constructed of boulders averaging about the size of a human head. They were mostly a single tier high, and were V-shaped and about 3 m across. They were oriented with the diverging wings upslope (apparently onto the former shore), and the apex downslope. An opening about one-half meter wide occurred at the apex, which would have extended out into shallow water.

These weirs were built in rows that ran for long distances on common levels, obviously the former levels of the receding lake. Rows of weirs were separated by differences in elevation of about 1.5 m. At one site studied in detail (Wilke 1980), there were about 650 weirs in 15 such rows. The difference in elevation from one row to another matches the rate of evaporation from standing bodies of water in the Salton Basin today, and thus the rows of weirs must represent annual constructions built at about the same time each year. Ruins of houses contained bones of razorback suckers and bonytails. The evidence is by no means clear, because these fishes are now endangered and are very rare even in the Colorado River. Their spawning and feeding habits are not well-known, but it is believed that the fish entered these artificial environments to spawn in the quiet shallows along an otherwise wave-dashed shoreline. Once inside the enclosures, they could have been captured easily as they attempted to escape, with dipnets placed at the openings. The weirs could thus, if interpreted correctly, have been very productive fishing facilities, but they were probably only effective for a short time each year. This is evident because evaporation of the lake waters would have been continuous, but there is no great variation in the elevation of individual weirs along any given row. They may have been used for only several weeks each year. At other times of the year, when weirs were not effective, fishing may have been a more difficult, and less productive, mode of subsistence.

The weirs have only been found on the west side of the lake. It appears that the resident human populations at Lake Cahuilla had already moved into the Santa Rosa Mountains and were subsisting largely on non-lake resources by the time the weirs were built and used. And the remarkable thing about these weirs is that it is possible to say with a certain degree of certainty that they were built, at the site studied near Travertine Point, from about the 13th through the 28th year

of the recession cycle of Lake Cahuilla. After that time, it is believed, the fish succumbed as a result of the rising salinity of the water as the lake shrank.

The adaptation summarized here is described in considerable detail in the oral traditions of the Cahuilla Indians of the Coachella Valley. Brief sketches of these traditions were recorded in the last century and in the early years of this century by many writers, and they have been collected and discussed in detail by Wilke and Lawton (1975) and Wilke (1978). The traditions recall life around the lake, fishing and hunting there, and the disappearance of the lake. These traditions formed the baseline for the prehistoric studies summarized above. They also document clearly the fact that the historic inhabitants of the valley are the descendants of the people that lived at Lake Cahuilla some 500 and more years ago.

This is not to say, however, that the transition from life at prehistoric Lake Cahuilla to that described by the initial explorers in the Coachella Valley was without interruption. On the contrary, it appears that there was at least a partial occupational hiatus when the lake dried. Many of the Desert Cahuilla lineages living on the floor of Coachella Valley in historic time claimed origin in the Santa Rosa Mountains to the west, even though they recalled life around the lake in their songs and traditions. This would seem to indicate that they moved up to the mountains when the lake dried and lived there for a time before returning to the Coachella Valley. Their return would have been made possible by the establishment of mesquite groves and other useful vegetation on the dry lakebed, which may have required at least several generations.

Thus, while the outlines of the prehistory of the Coachella Valley are beginning to emerge, the known prehistory is almost entirely limited to the last several hundred years.

Ethnography

The aboriginal group that occupied the Coachella Valley in historic time, as noted above, was the Desert Cahuilla, one of the three rather arbitrary divisions of the Cahuilla tribe which collectively numbered perhaps 3,000 persons. The Desert Cahuilla spoke a distinct dialect and occupied about 14 villages when the U.S. Land Office survey was undertaken in 1855-1856. The village locations have been mapped (Wilke and Lawton 1975: Fig. 6; Wilke 1978: Fig. 26), and the one nearest to the study area was at Indian Wells, only about 5 km to the north. Another was at Thousand Palms Oasis 20 km to the north; the remainder occurred on the floor of the valley down to the Salton Sink. The map of village locations compiled from data gathered in the last century undoubtedly portrays the settlement pattern fairly accurately, but the precise locations of communities, and of residences within them, were probably always in a state of flux. It was the habit of the Cahuilla to burn the house of a deceased person, after which the survivors built another some distance away. By this means, villages tended to move around a bit.

Villages were located either where surface water could be obtained from springs (as at Thousand Palms Oasis), or where the water table could be reached by digging. Most of the villages relied on the hand excavation of walk-in wells for their water supplies. The conical wells were up to about 6 m deep and tapped the shallow water table beneath the floor of the Coachella Valley. Villages were loose clusters of houses over an area up to a kilometer across. The Desert Cahuilla,

like their counterparts in the Peninsular Mountains and in the San Gorgonio Pass, exploited a great number of plant species (Barrows 1900; Bean and Saubel 1972). Their unquestioned staple was the honey mesquite, which produced an edible bean. Screwbean, another mesquite, was also important. They obtained agave (Agave deserti) in the mountains to the west, along with pinyon nuts, and acorns (*Quercus* spp.). In all, they probably used at least 150 species of plants for foods, fibers, medicines, manufactures, and dyes. They also made use of almost every available animal.

The Cahuilla of Coachella Valley also grew agricultural crops, and this adaptation has been of considerable interest to scholars because of the near-absence of agriculture in prehistoric California. They irrigated from springs and apparently grew two crops annually (Wilke and Lawton 1975). Corn, beans, and squash, ultimately derived from Mexico, were the crops grown, and with the arrival of the Europeans, wheat, melons, barley, and fruit trees were added (Lawton and Bean 1968). Some of these latter crops may have spread into Cahuilla territory ahead of actual European settlement (see Bean and Mason 1962).

Cahuilla population declined dramatically in the last half of the nineteenth century as a result of disease and loss of breeding population when young men and women sought work on farms and ranches and elsewhere in the growing metropolitan areas of southern California (Harvey 1967).

Useful descriptions of Cahuilla culture have been presented by Strong (1929), Hooper (1920), Curtis (1926), and Bean (1972, 1978).

Archaeological studies of the historic Cahuilla are almost nonexistent.

History

The earliest chronicled non-Indian visits to Coachella Valley occurred in the winter of 1823-24, when José Romero led an ill-fated expedition out into the Colorado Desert in an attempt to reach the Colorado River by a new route (Bean and Mason 1962). It was this expedition that made the first observations on aboriginal agriculture, probably near the present Torres-Martinez Tribal Headquarters south of Thermal. The valley was described in detail by William P. Blake in 1853 (Blake 1856) when he chronicled the Pacific Railroad Survey expedition. Blake's account is important because it described observations on the locations of Indian villages, native agriculture in the valley, oral traditions of the Indians concerning life around Lake Cahuilla in the remote past, and the general condition of the environment. It was Blake (1856) also who correctly interpreted the lacustrine geology and described the conditions under which Lake Cahuilla formed.

Only two years later the U.S. Land Office Survey subdivided the valley into townships, and the following year into sections. This survey resulted in detailed location of most or all of the Cahuilla villages in the valley, as well as the location of agricultural fields, wells, and irrigation works (Wilke and Lawton 1975).

Smallpox and measles epidemics decimated the Cahuilla population in 1863. The Southern Pacific Railroad completed its main line through the valley and on to Yuma, Arizona, in the fall of 1877. Shortly after that time settlement of the valley began in earnest. The realization that artesian water could be obtained by drilling shallow wells brought about agricultural development, which has con-

tinued to the present. For a useful general history of the Coachella Valley, see Nordland (1978).

Classification of Archaeological Sites in Coachella Valley

In order to better estimate the role of the sites under consideration in this volume, and the function they served in the overall settlement pattern, it is necessary to define the overall functional types of sites that exist in the region. Aboriginal archaeological sites in Coachella Valley can be classified generally as follows.

Habitation sites are those indicative of actual residence by groups of people for periods of time sufficient to result in the deposition of a substantial array of debris. They usually have midden soils, varied assemblages of artifacts, and food remains, and they may yield evidence of structures such as houses. Along the shoreline of Lake Cahuilla, in the area from La Quinta to northwest of Indio, such sites formerly were common (most have now been lost to development). They occurred in the shoreline dunes among the same mesquite thickets that anchored the sand during the last stand of the lake. These sites are usually most observable on the northwest (windward) sides of dunes. In terms of their potential for yielding information on aboriginal lifeways, habitation sites on sandy soils are the most valuable because they sometimes produce coprolites, which give the best evidence of prehistoric dietary conditions. Such sites often contain cremation burials. Later, post-lake, habitation sites were very extensive and sometimes also had walk-in wells. Few of these sites remain in the Coachella Valley.

Camps are sites that display evidence of living activities, but are less extensive than the previous site type. They are usually associated with work performed on location, and often involved the exploitation of one or more resources, such as fish or mesquite beans. The previously mentioned site of Wadi Beadmaker on the east shore of Lake Cahuilla can be classified as a shoreline camp or fishing station. So can the houses that formerly existed among the fish weirs north of Travertine Point. Artifact assemblages at camps contain a narrower range of tool forms, and thus represent a narrower range of activities, than do those at habitation sites. Camps of the Desert Cahuilla who occupied Coachella Valley after the drying of Lake Cahuilla are most likely to be found in the nearby foothills and mountains, and to be related to short-term stays during activities such as bighorn sheep hunting, pine nutting, and agave collecting and roasting.

Activity loci are not places of habitation; they are places where specific activities were performed, such as rituals, resource extraction, or resource processing. They typically occupy small areas, but rows of fish weirs are best classified as activity areas. Other examples are stone-chipping or quarrying locations, agave roasting pits, isolated bedrock milling stations, isolated cremation burial sites, or rock art (petroglyph or pictograph) sites. Another kind of activity area could be aboriginal foot trails, which are well-represented in the desert area and have lasted for thousands of years in the desert pavements.

Isolates are isolated artifacts. They are typically lost objects. Such isolated occurrences as single bedrock milling slicks are not classified as isolates because they represent places of activity, and are properly termed activity areas, which are true archaeological sites. Isolates are not treated as sites per se.

References

Barrows, D. P.
1900 **The Ethno-Botany of the Coahuilla Indians of Southern California.** Chicago: University of Chicago Press.

Bean, L. J.
1972 **Mukat's People: The Cahuilla Indians of Southern California.** Berkeley: University of California Press.
1978 Cahuilla. In **Handbook of North American Indians, Vol. 8, California**, R. F. Heizer, ed., pp. 575-587. Washington: Smithsonian Institution.

Bean, L. J., and W. M. Mason
1962 **Diaries and Accounts of the Romero Expeditions in Arizona and California, 1823-1826.** Palm Springs: The Desert Museum.

Bean, L. J., and K. S. Saubel
1972 **Temalpakh: Cahuilla Indian Knowledge and Usage of Plants.** Banning, CA: Malki Museum Press.

Blake, W. P.
1856 Geological Report. *In* Reports of Explorations in California for Railroad Routes to Connect with Routes Near the 35th and 32nd Parallels of North Latitude, by Lt. R. S. Williamson, Corps of Topographical Engineers. Reports of Explorations and Surveys to Ascertain the Most Practicable and Economical Route for a Railroad from the Mississippi River to the Pacific Ocean, Made Under the Direction of the Secretary of War in 1853-1854, Vol. 5. Washington: Beverly Tucker, Printer.

Curtis, E. S.
1926 **The North American Indian**, Vol. 15. Cambridge: The University Press.

Felton, E. L.
1965 **California's Many Climates.** Palo Alto: Pacific Books.

Harvey, H. R.
1967 Population of the Cahuilla Indians: Decline and Causes. **Eugenics Quarterly** 14:185-198.

Hooper, L.
1920 The Cahuilla Indians. **University of California Publications in American Archaeology and Ethnology** 16(6).

Jaeger, E. C.
1957 **The North American Deserts** (With a Chapter by Peveril Meigs). Stanford: Stanford University Press.

Lawton, H. W., and L. J. Bean
1968 A Preliminary Reconstruction of Aboriginal Agricultural Technology Among the Cahuilla. **The Indian Historian** 1(5):18-24, 29.

Munz, P. A., and D. D. Keck
1949 California Plant Communities. **El Aliso** 2:87-105.
1950 California Plant Communities—A Supplement. **El Aliso** 2:199-202.

Nordland, O. J.
1978 **Coachella Valley's Golden Years** (2nd edition). Coachella, CA: Coachella Valley County Water District.

Ryan, R. M.
1968 **Mammals of Deep Canyon, Colorado Desert, California.** Palm Springs: Desert Museum.

Strong, W. D.
1929 Aboriginal Society in Southern California. **University of Publications in American Archaeology and Ethnology** 26.

Vasek, F. C.
1980 Creosote Bush: Long-Lived Clones in the Mojave Desert. **American Journal of Botany** 67:246-255.

Waters, M. R.
1983 Late Holocene Lacustrine Chronology and Archaeology of Ancient Lake Cahuilla, California. **Quaternary Research** 19:373-387.

Weide, D. L.
1976 Summary of Radiometric Dates for the Salton Sink Region. Appendix *in* Background to Prehistory of the Yuha Desert Region, P. J. Wilke, ed., pp. 95-97. **Ballena Press Anthropological Papers** No. 5.

Wilke, P. J.
1978 Late Prehistoric Human Ecology at Lake Cahuilla, Coachella Valley, California. Berkeley: **University of California Archaeological Research Facility Contributions** No. 38.
1980 Prehistoric Weir Fishing on Recessional Shorelines of Lake Cahuilla, Salton Basin, Southeastern California [Abstract]. **Desert Fishes Council Proceedings** 11:101-103.

Wilke, P. J., and H. W. Lawton
1975 Early Observations on the Cultural Geography of Coachella Valley. **Ballena Press Anthropological Papers** No. 3:9-43.