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The Linear Oasis: Managing Cultural Resources Along the Lower Colorado River

Connie L. Stone

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The Linear Oasis: Managing Cultural Resources Along the Lower Colorado River

by

Connie L. Stone

Cultural Resource Series

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CHAPTER 1

INTRODUCTION

During 1943, General George C. Marshall inspected Army training grounds in the desert areas bordering the lower Colorado River. The general, who later molded the course of post-war history, found that ancient people had molded the land surfaces of the river terraces. He was astounded by "gravel sculptures such as few men had ever laid eyes on, simple in design, childish in form, and yet so grandiose in scale as to take one's breath away." These were the geoglyphs of the lower Colorado region, the most intriguing examples of the diverse archaeological and historic sites within the Yuma District administered by the U.S. Bureau of Land Management (BLM).

The Yuma District encompasses a linear-shaped area of 2,658,210 acres along the lower Colorado River in western Arizona and southeastern California. Its width is consistently less than 50 miles along the 192-mile segment of river course between Davis Dam and the border between the United States and Mexico. A southeastern extension of the District stretches along the lower Gila River to the Mohawk Mountains.

The BLM manages approximately half of the land area within the Yuma District boundaries (Figure 1-1). Its nearly 1.2 million acres of public land are divided between the Havasu Resource Area headquartered in Lake Havasu City and the Yuma Resource Area administered from the District Office in Yuma. Included within the District boundaries are portions of six counties (Yuma, La Paz, and Mohave in Arizona and Imperial, Riverside, and San Bernardino in California) and the communities of Yuma, Parker, Quartzsite, Lake Havasu City, and Bullhead City. The District encompasses developed riverside lands as well as backcountry wilderness. Among other landholders are five Indian reservations (Fort Mohave, Chemehuevi, Colorado River Indian Tribes, Quechan, and Cocopah), the Havasu, Cibola, and Imperial National Wildlife Refuges and two military zones, the Yuma Proving Ground and Yuma Marine Corps Air Station. Of the total land area within the Yuma District, 45 percent is public land administered by BLM, 34 percent is administered by other Federal agencies, 16 percent is privately owned, and 5 percent is State land.

This book is a "Class I overview" of cultural resources within the Yuma District. To the uninitiated, the term "cultural resources" might suggest an art festival in Lake Havasu City, a ballet troupe in Bullhead City, or even an imported historic site, the London Bridge. The Yuma District Resource Management Plan (1985) gives the following extended definition of cultural resources:

> Those fragile and nonrenewable remains of human activity, occupation, or use reflected in sites, structures, buildings, objects, ruins, works of art, architecture, and natural features that were of importance in human events. These resources consist of (1) physical remains, (2) areas where significant human events occurred -- even though evidence of the event no longer remains, and (3) the environment immediately surrounding the resource.

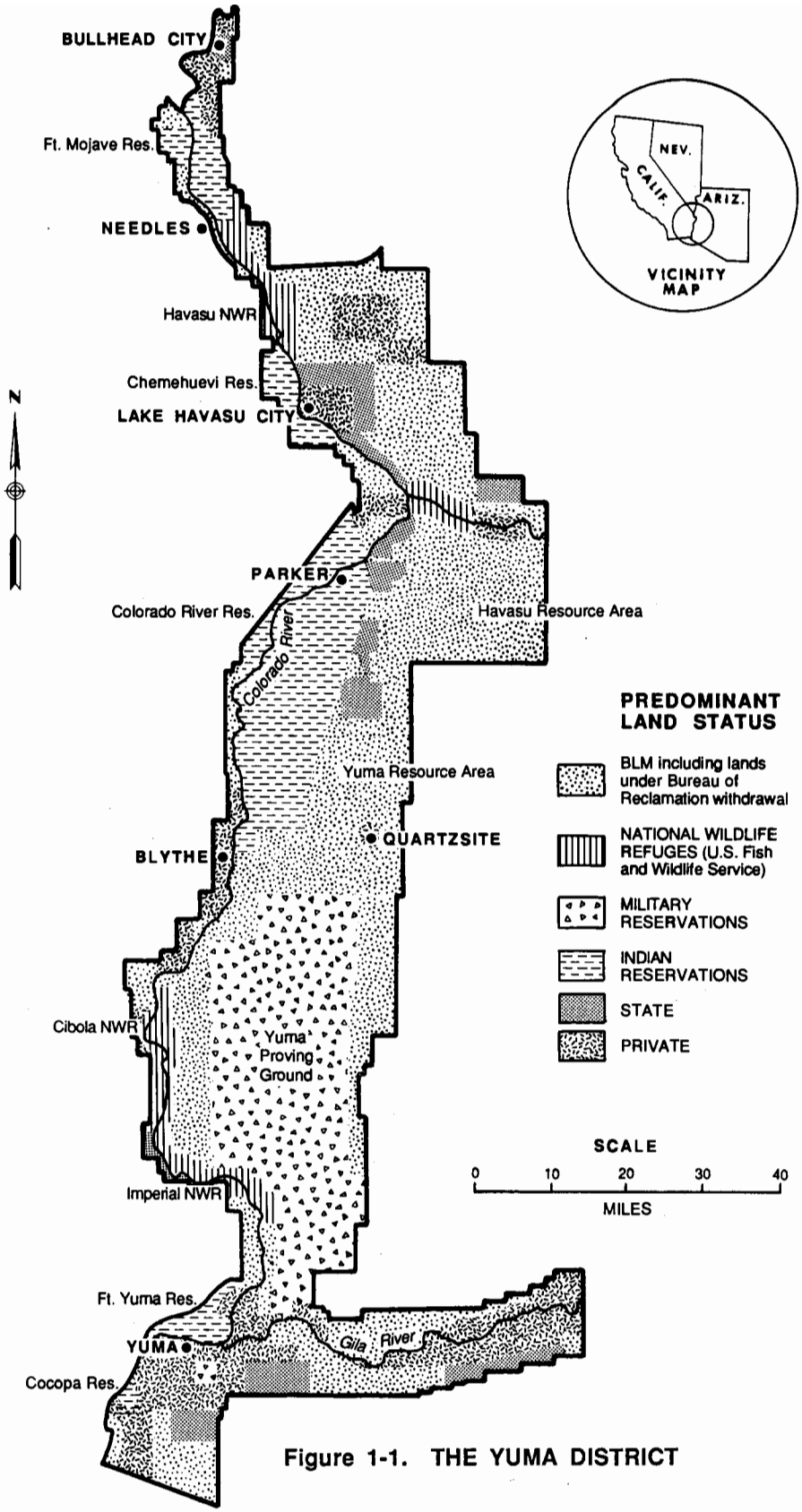


Figure 1-1. THE YUMA DISTRICT

This document focuses on prehistoric cultural resources but incorporates comments on historic resources.

The Yuma District administers a broad array of programs focused on lands, recreation, wildlife habitat, cultural resources, and minerals. Class I overview preparation is a phase of the cultural resource inventory process outlined in BLM Manual 8111. Based on a compilation and assessment of existing data, the document provides background information and guidance for future planning and management decisions regarding cultural resources.

In 1978, the BLM and Region 3 of the U.S. Forest Service signed an interagency agreement to coordinate cultural resource overviews for Arizona and New Mexico. Arizona was partitioned into nine overview areas with the BLM assuming primary responsibility for Class I inventories of four areas within western and southeastern Arizona: the West Central, Southwest, Southeast, and Arizona Strip overview units. Class I overviews summarize information concerning all lands within the study area boundaries, although management considerations focus on the public lands which constitute a large proportion of the State.

The Arizona portion of the Yuma District was incorporated into overviews of West Central Arizona (Stone 1986, 1987) and Southwest Arizona (McGuire and Schiffer 1982). Although those documents contained much background information relevant to the Yuma District, its peripheral geographic position generated less detail devoted to research and management issues. Although the U.S. Bureau of Reclamation funded an additional overview focused on the Colorado River below Davis Dam (Swarthout and Drover 1981), that document also provided insufficient direction for sensitive management of the Yuma District's cultural resources.

Thus it was apparent to cultural resource managers that the Yuma District needed its own Class I inventory that would focus on the specific nature, values, and management challenges of the District's cultural resources. Since much background information is available in the previous overviews, this one directs relatively greater attention to cultural resource management strategies and priorities in the context of multiple use management. The bibliography includes major references but is not as comprehensive or detailed as those of the previous overviews.

Chapter 2 surveys the natural environment and its transformations through prehistoric and modern times. Chapter 3 describes the historic and modern native inhabitants of the lower Colorado region, the Yuman and Chemehuevi peoples. The history of archaeological research and a summary of the regional prehistory are presented in Chapters 4 and 5. Chapter 6 describes the nature and distribution of cultural resources within the Yuma District. Chapter 7 concerns the process of cultural resource evaluation as the basis for management decisions. It specifically addresses scientific research potential and cultural heritage values. Finally, Chapter 8 discusses threats to the integrity of cultural resources, priorities for inventory and protection, and protective strategies in the form of direct measures, administrative actions, and public outreach.

CHAPTER 2

THE ENVIRONMENTAL CONTEXT

Through prehistoric, historic, and modern times, the Colorado River has supported human populations and activities over an ever-expanding area of the American West. Philip Fradkin, a chronicler of its modern transformations, quoted an early observer: "just as the River has formed the landscape so has it determined the course of human history within its basin" (Fradkin 1981:16). In the process, it has become "the most used, the most dramatic, and the most highly litigated and politicized river in this country, if not the world" (Fradkin 1981:15). Intensive use of the river and political strife apparently characterized adjacent populations for hundreds of years prior to construction of the first modern dam.

Army Lieutenant Amiel Whipple, who explored the river during the 1850s, noted that its Indian name translated as "river number one." Explorers shared one term used by the native people: the red river, a reference to the muddy waters created by its enormous load of silt. Father Garces, the Spanish missionary who died at the Yuma Crossing in 1781, provided the Spanish term, the Rio Colorado, although this term was not applied to the entire river until the U.S. Congress did so in 1921.

The Colorado River, now blue-green and calm, exists as a linear oasis in stark contrast to the extremely arid desert and mountains bordering its lower reaches. Fradkin (1981:15) noted that great rivers "have been depicted as life-giving forces that renew the fertility of a land and people, and their waters have been considered sacred while their sources were shrouded in mystery." The Colorado receives very little of its flow from its lower tributaries in nearly rainless western Arizona. The Indians could view the river's power and antiquity as revealed by the Grand Canyon, but they were less likely aware of its ultimate source in the snowpack of the Rocky Mountains. The giant earth figures scraped into the bordering terraces along the lower river were silent observers of countless fluctuations in the amounts and timing of floods from mountain snowfalls and thaws.

The Colorado River rises in Rocky Mountain National Park in north-central Colorado and flows for 1,450 miles westward and southward to the Gulf of California. The sixth longest river in the United States, its watershed incorporates 244,000 square miles within Wyoming, Colorado, Utah, New Mexico, Nevada, Arizona, and California. The average annual runoff, calculated from 1896 to 1983, is 14.8 million acre-feet. Prior to the construction of dams, the spring thaws of the Rocky Mountain snows produced extensive floods, often miles wide, during May, June, and July. Average peak flows in June carried ten times more water than December flows at Yuma (Kelly 1977:24). Floodwaters receded rapidly after July until the annual low point in December. The volume of particular annual floods was unpredictable. Floods sometimes failed to materialize or contributed only a small increase in runoff. Early or late floods sometimes occurred, and some years witnessed multiple surges (Castetter and Bell 1951:7). Figure 2-1 reveals year-to-year fluctuations in annual

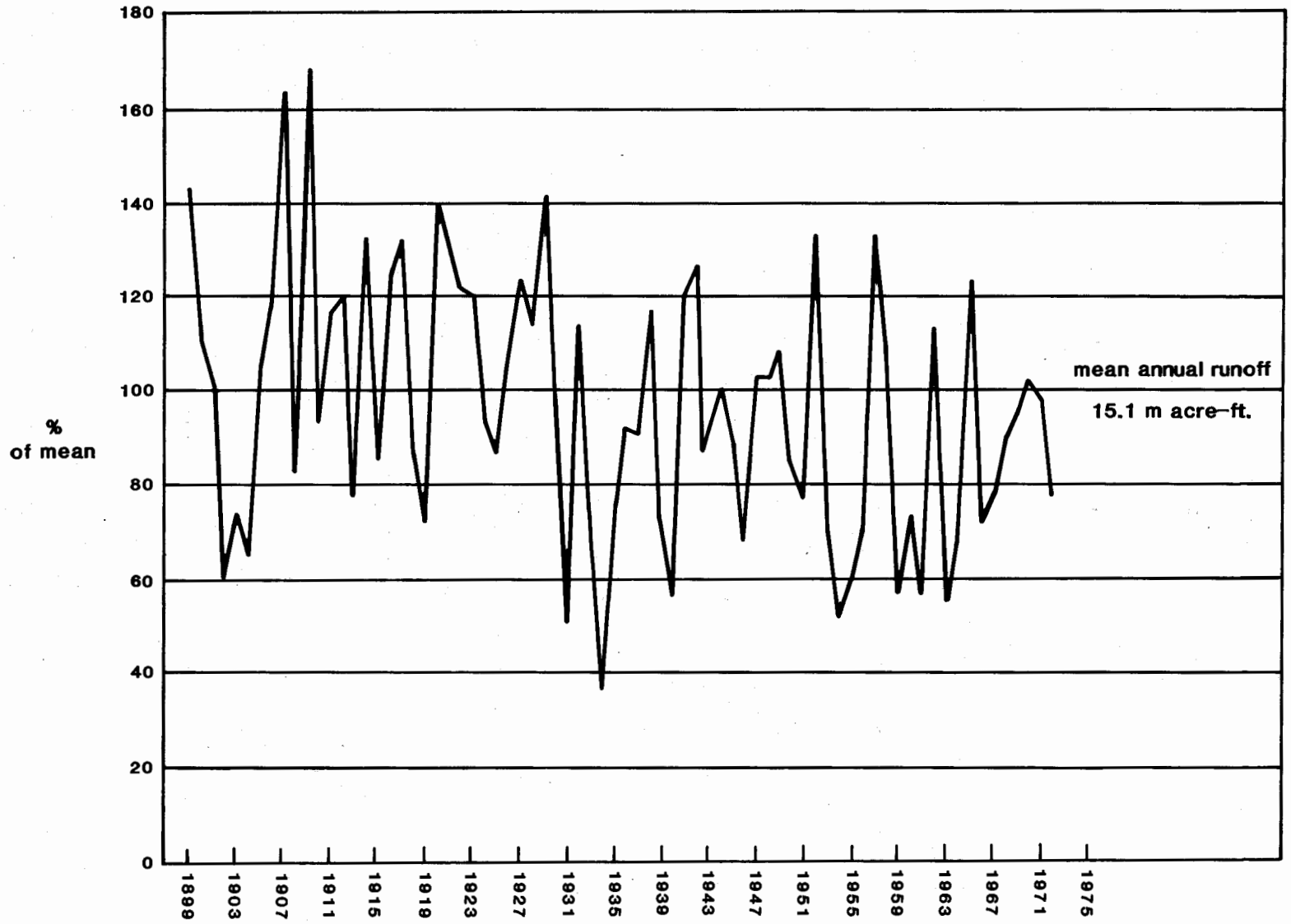


Figure 2-1. THE COLORADO RIVER: ANNUAL RUNOFF AT LEE'S FERRY, 1899-1972
(Based on Swarthout and Drover 1981: 26-27)

runoff as measured from 1899 to 1972 (Swarthout and Drover 1981:26-27). Low and high flows, defined for years gauged at over 20 percent above or below the overall mean runoff, account for over half the readings. More striking is the magnitude of changes from one year to the next. These fluctuations, difficult to predict and manage, complicated Indian farming efforts and intensified the modern drive to tame the river. Another barrier to modern use was posed by the extremely high silt load. A single day's water supply to the delta carried enough silt to build a levee 20 feet in height and width and a mile long (Trava 1986).

The rhythms of the river, its riparian and aquatic resources, and the natural resources in the adjacent desert and mountains molded the economic and cultural life of native peoples. To truly understand this environmental context, one must travel along the river. One must also contrast its present condition, "The Colorado River as Plumbing" (High Country News 1986), to the riparian situation that existed prior to its conquest by 20th century engineers. Three river trips are in order. The first downriver tour will provide an orientation to the physiography and climate of the lower Colorado River region and a description of the river's course through adjacent lands. The second tour will accompany Lieutenant Joseph Ives' steamboat trip upriver during 1857 and 1858. The final tour will be a modern drive southward along the river starting at Bullhead City. Descriptions will focus on the lower Colorado River between Davis Dam and the Mexican border, a distance of over 200 miles.

An Orientation to the Lower Colorado Region

From its headwaters, the Colorado River flows southwestward across the Colorado Plateau slashing through deep canyons including the spectacular Grand Canyon of Arizona (Figure 2-2). At the Grand Wash Cliffs, the western edge of the Colorado Plateau, the river enters the Basin and Range Physiographic Province. Within this region, roughly parallel elongated mountain ranges rise abruptly above vast, relatively flat desert valleys. Ranges closest to the lower Colorado River tend to be oriented to north-south or northwest-southeast directional trends. From over 2 billion to 0.5 billion years ago, these ranges were created by faulting, intrusive volcanic activity, and erosion. During the more recent Tertiary and Quaternary periods, from about 70 million to 1 million years ago, volcanic eruptions and lava flows from vents and dikes produced extensive areas of basalt and other volcanic rocks. In addition to geomorphic processes of faulting and volcanism, wind and water erosion have shaped the Basin and Range landscape. Intermontane basins or valleys encompass landforms known as pediments and bajada slopes, formed by series of coalescing alluvial fans radiating from the bases of mountain ranges. Basins thus are bowl-shaped in cross-section.

West of the Grand Wash Cliffs, the river passes through steep canyons, bending southward at Black Canyon, 2,000 feet deep and over 20 miles long, now the site of Hoover Dam and Lake Mead. It emerges from Black Canyon into the Cottonwood Valley, now constricted at its lower end by Davis Dam which backs Lake Mohave up into the valley.

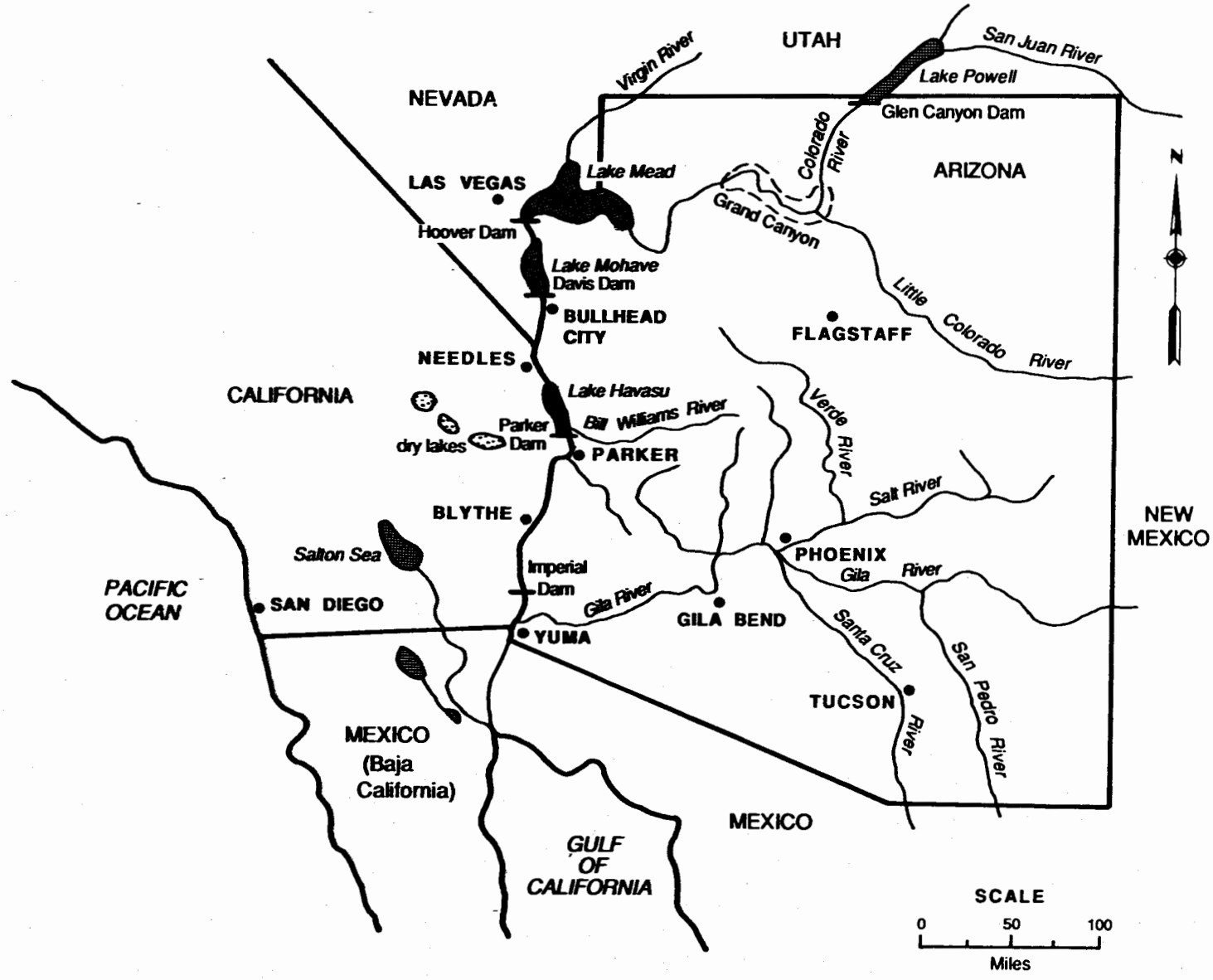


Figure 2-2. THE LOWER BASIN OF THE COLORADO RIVER

From Davis Dam to its delta, the lower Colorado River traverses a series of broad valleys separated by narrow canyons where it dissects particular mountain ranges (Figure 2-3). Its elevation at Davis Dam is 597 feet above sea level, dropping gradually to sea level at the delta in Mexico. Adjacent mountain ranges rise up to 5,000 feet. Floodplain bottomlands are bordered by terraces or "mesas" which merge with bajada slopes. Massive entrenched washes drain the mountain slopes, normally dry streamcourses that carry tremendous flash floods for short periods. Between the washes are relatively flat ridges consisting of alluvium and gravel, frequently capped by desert pavement. "Desert pavement" is a relatively stable surface of highly compacted pebbles and cobbles. Various processes apparently contribute to its formation. Soils containing clay particles swell and contract in response to wetting and drying, forcing stones toward the surface. Deflation removes soil and exposes an impervious layer of cobbles and gravel (Cooke and Warren 1973; Howard, Cowan, and Inouye 1977). Pavements often carry a layer of "desert varnish" composed of clay and oxides of iron and manganese. Chemical processes involving soil accretion to rock, as well as organic processes involving the action of microorganisms, have been studied as mechanisms of varnish formation (Elvidge 1979). Desert varnish patina forms most quickly in arid zones of alkaline soils experiencing occasional storms. Microenvironmental factors affect rates of formation and the relative thickness of varnish layers (Dorn et al. 1986).

The lower Colorado River passes through one of the hottest and driest regions of the United States, lands along the lower Gila River and the Colorado River to Davis Dam (Sellers and Hill 1974). Average temperatures exceed 50° F in January and 90° F in July. In the central area where Parker and Blythe are located, the average length of the growing season is 260 days. To the north and south, the vicinities of Needles and Yuma, annual frost-free periods generally exceed 300 days (Castetter and Bell 1951:16). Bullhead City gains consistent publicity as the hottest spot in the nation. The highest temperatures ever recorded in Arizona reached 127° F at Fort Mohave in 1896 and Parker in 1905. Since temperatures tend to decline at higher elevations above 1,000 feet, the mountains are comparatively cooler furnaces.

Annual rainfall rarely exceeds 5 inches, although it can range up to 10 inches in the higher mountain ranges. Even at these low levels, local conditions are unpredictable from year to year. In 1989, Yuma received over 5 inches of rain from two summer storms within a period of 3 weeks, nearly double its average annual precipitation. A biseasonal pattern of winter and summer rains is matched by periods of relative drought during spring and fall. Widespread downpours occur in December through March as the westerlies move moist Pacific air masses eastward. Summer monsoon thunderstorms, more intense and localized, originate when moist air masses from the Gulfs of California and Mexico move northward. Rapid cooling and condensation generate thunderheads as moist superheated air rises over mountainous terrain. As one moves westward across Arizona into the California desert, summer rainfall declines as a proportion of

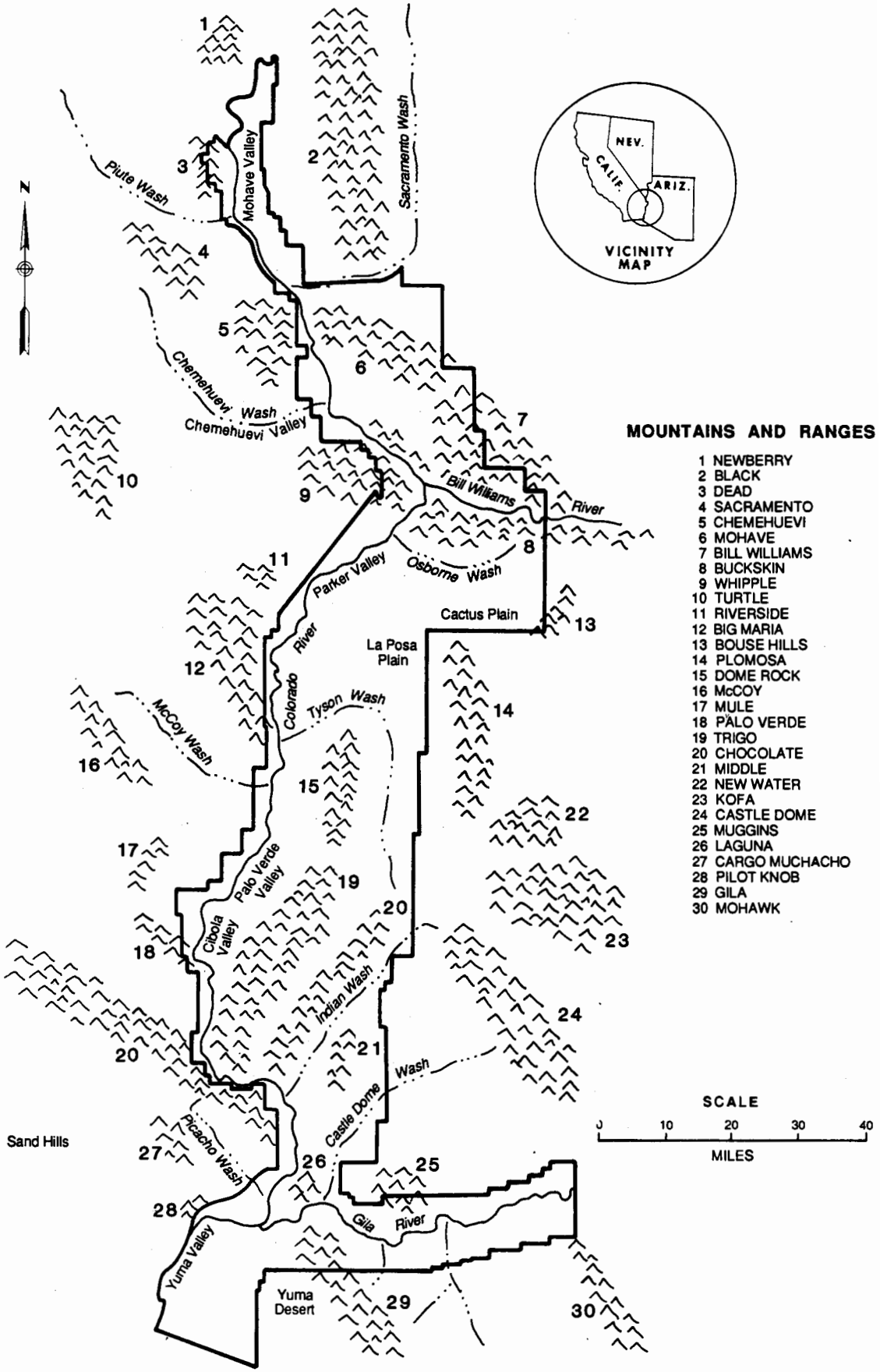


Figure 2-3. PHYSIOGRAPHIC MAP OF THE LOWER COLORADO REGION

the total annual precipitation. Winter rains generally account for over 60 percent of the annual rainfall in the lower Colorado River region (Hendricks 1985: Plate 6).

Traveling southward from Davis Dam, the Colorado River negotiates the Big Bend and enters the broad Mohave Valley. Avikwame, a mountain sacred to all Yuman tribes along the Colorado and Gila Rivers, looms in the Newberry Mountains of Nevada. Bajadas slope downward toward the river from adjacent mountain ranges, the Black Mountains to the east and the Dead and Sacramento ranges to the west. The Black Mountains, negotiable through a limited number of passes, contain numerous springs. Large washes, such as Silver Creek Wash, dissect the bajadas as they pursue parallel courses toward the river. Sacramento Wash, which drains the Sacramento Valley east of the Black Mountains, skirts the southern end of the range and meets the Colorado at the lower end of the Mohave Valley, where the Mohave Canyon cuts through the Mohave and Chemehuevi ranges.

At the heads and outlets of canyons, and in other areas where mountain ranges are most proximate to the river within its valleys, bajada ridges offer a panoramic view of the river and its environs. Such areas often encompass complex archaeological sites incorporating "geoglyphs," giant rock alignments or figures scraped into the desert pavement. The "Mystic Maze," an extensive series of parallel ridges of raked gravel, exists at the base of mountains near the entrance to Mohave Canyon, now better known as the Topock Gorge. This scenic canyon is bordered to the east by sand dunes and The Needles, a series of sharp distinctive peaks.

The river emerges from the Topock Gorge into the Chemehuevi Valley, relatively short and constricted in comparison to the other valleys along the lower Colorado. To the east, steep bajada slopes descend from the Mohave Mountains. West of the river, beyond the bordering Chemehuevi Mountains, the valley extends into a broad desert basin.

At the southern end of the Chemehuevi Valley, the Colorado River enters a spectacular canyon reminiscent of the Plateau country. The canyon is formed by the exceedingly rugged Whipple Mountains to the west, punctuated by a distinctive vertical monument, and by the Aubrey Hills, Bill Williams Mountains, and Buckskin Mountains to the east. A series of massive mesas extending from the Buckskin range border the Bill Williams River, a major western Arizona tributary that meets the Colorado where it bends eastward.

The river exits the mountainous area flowing southwestward into the Parker Valley. The Parker Valley, Palo Verde Valley, and Cibola Valley constitute the Great Colorado Valley which extends for approximately 75 miles along the central section of the lower Colorado River. To the west, the lower portion of the Parker Valley is bounded by the Riverside and Big Maria mountain ranges. To the east is a vast area of sand and stabilized dunes known as the Cactus Plain. Bouse Wash and Osborne Wash are the only major washes that traverse this area.

As is the case east of the Parker Valley, mountain ranges are relatively far west of the river in the Palo Verde Valley. To its east is the Dome Rock range, beyond which a long north-south oriented basin, the La Posa Plain, is drained by Tyson Wash. Mountain ranges more closely hem in the Cibola Valley, the Palo Verde range to its west and the Trigo Mountains to the east.

South of the Cibola Valley, the Colorado River bends eastward through a mountainous zone of the Trigo and Chocolate ranges. The flow then passes by the Laguna Mountains, joins the Gila River, and returns westward through the Yuma Valley. To the east are the barren Yuma Desert and the Gila Mountains. To the west are the Cargo Muchacho Mountains and the huge Algodones Sand Dunes that evoke the Sahara rather than the Sonoran Desert.

At Pilot Knob just north of the Mexican border, the Colorado River turns southward and enters its delta. On the delta, the undammed river frequently shifted course as it deposited large quantities of silt. The delta plain incorporated "meandering channels, lakes, natural levees, and the somewhat specialized network of channels in secondary deltas" (Kelly 1977:18). This dynamic environment retained ancient channels which periodically diverted the river northward to the Imperial Valley, a sub-sea level basin where the flows formed a fluctuating inland lake known as prehistoric Lake Cahuilla, the Blake Sea, and the Salton Sea. The geologist William Blake first recognized the ancient lake's shoreline while conducting a railroad survey during 1853. During the late 19th and early 20th centuries, other explorers, surveyors, and natural scientists documented the environment along the untamed Colorado River.

The Pristine Colorado: A Voyage with Ives

Lieutenant Joseph Ives was charged with determining the navigability of the Colorado River as a potential supply route for western settlements and forts. Ives and his colleagues recorded observations concerning the river, the flora, fauna, and geology, and the native peoples encountered during the voyage upriver from December 1857 to February 1858 (Ives 1861).

On the delta, the red river, opaque from suspended silt, challenged the pilot's skills at negotiating sand bars, shoals, and sharp turns. Mesquite, willow, and cottonwood trees were chopped to fuel the steamboat; mesquite burned particularly hot. While Ives' men explored the delta, they were visited by Cocopa Indians. After finding it "impossible to satisfy their hunger," the cook threw them out of the camp (Ives 1861:31).

Ives noted the presence of Quechan villages within 15 miles north and south of Fort Yuma, "the Botany Bay of military stations" (Ives 1861:43). The river then entered the Chocolate Mountains, a canyon route bordered by purple hills and "desert mesas." As the river bended sharply

westward then northward through the Chocolate and Trigo Mountain ranges, the boat steamed through "Cane Brake Canyon," bounded by thick tall reeds, "Red Rock Gate," and "Hazard Pass." J.S. Newberry, the geologist for the expedition, noted that purple and dark brownish-purple volcanic rocks dominated the geological features. The Chocolate, Trigo, and Dome Rock ranges consist of Mesozoic schist and gneiss, the host rocks of gold-bearing quartz veins, and primarily of Middle Tertiary igneous rocks, andesitic to rhyolitic volcanic flows. The Chocolate and Trigo ranges represent the western end of a series of mountain ranges formed by a major episode of volcanic activity within west central Arizona (Reynolds 1980). Mountains of similar composition, extending northeastward from the river, include the Castle Dome, Kofa, Eagletail, Big Horn, and Vulture ranges, sources for fine-grained volcanic rocks valued as raw materials for aboriginal chipped stone tools (Stone 1986).

After negotiating numerous bends, Ives' steamboat passed through a last series of porphyry cliffs into the Great Colorado Valley. Similar to the area just north of Fort Yuma, the wide floodplain incorporated numerous channels, sloughs, and sand bars. The bottomlands, bordered by alluvial bluffs, contained fertile areas, but much of the valley was "so charged with alkali as to be unproductive" (Ives 1861:53). Less alkaline areas were farmed by Quechan Indians who were "constantly encountered" south of the Riverside Mountains. Ives had seen no natives in the rugged canyon zone south of the Great Valley. Within the valley, thick vegetation obscured the view of Indian villages and fields. Indian observers were always numerous near the most treacherous sand bars. At first, Ives surmised that villages were located near good fords, until he realized that the boat's navigational troubles were a great source of amusement to the Quechan. From then on, the pilot slowed the engine whenever Indians appeared on the riverbank.

A rocky bottom and snags challenged the crew as the river passed by the "Half Way Mountains," now known as the Big Maria Mountains, a granitic range west of the Parker Valley. Chemehuevi Indians were encountered north of the Riverside Mountains, a range composed of granite, gneiss, quartzite, and limestone.

At the northern end of the Parker Valley, Ives entered the "Monument Canyon" area bounded by the "Monument Mountains" now known as the Whipple and Buckskin ranges, composed primarily of granitic and metamorphic rocks. Ives was impressed by the canyon's "romantic scenery." At the confluence of the Bill Williams Fork, thickets of willow surrounded a narrow shallow stream. Four years earlier, when Ives had accompanied Whipple's expedition down the Bill Williams River during the same season, the Williams had measured 30 feet wide and several feet deep (Ives 1861:58). As the Indians informed him, Ives was traveling during a drought year, a time of relatively low flows.

Ives was unimpressed by the Chemehuevi Valley, a "basin of the desert" which "scarcely deserves the name of valley" (Ives 1861:59). He noted a paucity of alluvial land and vegetation except for an area of fields and

mesquite groves extending along Chemehuevi Wash west of the river. Although "the amount of cultivatable land in their valley is so inconsiderable," the Chemehuevi traded corn and beans to the explorers.

The Mohave Canyon or Topock Gorge cuts through the Chemehuevi and Mohave ranges, primarily granitic zones that also sustained some mid-Tertiary volcanic activity. Within this canyon, "turrets, spires, jagged statue-like peaks, and grotesque pinnacles overlooked the deep abyss" (Ives 1861:64). To its north was the "broad and noble" Mohave Valley. Within this "glistening expanse of emerald hue," the "tortuous course of the river could be traced through a belt of alluvial land, varying from 1 or 2 to 6 or 7 miles in width, and garnished with inviting meadows, with broad groves of willow and mezquite, and promising fields of grain" (Ives 1861:65). The steep bordering bajadas of the Dead, Sacramento, and Black Mountain ranges terminated in distinct multiple terraces that appeared as gravelly "mesas."

Ives' map reveals a more sinuous river course than the modern channel through the Mohave Valley. Multiple channels, oxbows, and turns likely promoted the formation of temporary lagoons. According to Ives, "the rapidity and extent of the changes in the position of the Colorado can scarcely be imagined by one who has not witnessed them" (Ives 1861:73).

Ives traveled the 30-mile length of the Mohave Valley and visited Mohave Indian villages on both sides of the river. The large native population had ample stores of beans and corn; Ives noted eight varieties of cultivated beans. The Mohaves were "as fine a race of men, physically, as can anywhere be found" (Ives 1861:19). No villages were located above the bend where the valley constricts at present-day Riviera, although Mohave Indians were seen as far north as the Cottonwood Valley. Ives found that Black Canyon represented the navigational limit of the Colorado River, but several rapids rendered it a rough trip for steamboats north of the Cottonwood Valley. Returning to the Mohave Valley, Ives left the river and traversed the "Gravel Desert" on the Beale Wagon Road eastward to Sitgreaves Pass in the Black Mountains, an area of dark gray surfaces littered with volcanic andesite, rhyolite, and basalt rocks and boulders eroded from the mountain range. Ives (1861:5) considered it "doubtful whether any party will ever again pursue the same line of travel." On the other hand, the river was considered navigable even during the season of minimum flow within a relatively dry year. Steamboats plied the river and supported military forts, mining towns, and new settlements through the remainder of the 19th century.

Ives described lush arboreal vegetation along the Colorado River, consisting of mesquite, cottonwood, and willow trees. The bordering terraces, bajadas, and mountains were relatively barren, "quite destitute of vegetation." Game and fish also seemed rare, but Ives observed the river during the season when native fish were typically scarce (Castetter and Bell 1951). Other historical observers provided similar but more detailed descriptions of the riparian and regional flora and fauna.

Riparian vegetation existed along the Colorado, Bill Williams, and Gila Rivers. Plants immediately adjacent to the water included reeds (Phragmites spp.), willows (Salix spp.), and cottonwood trees (Populus fremonti). Periodic floods, shifting channels, and rapid evaporation limited the development of permanent marshes, although reeds and cattails (Typha domingensis) grew along seeps and backwaters. Arrowweed (Pluchea sericea) stands formed dense bands, generally only several feet wide, along the outer margin of the willows and cottonwoods. Further back from the river, on soils less frequently flooded, grew screwbean trees (Prosopis pubescens), wolfberry bushes (Lycium spp.), and on saline soils, halophytic plants such as saltbush (Atriplex spp.). At the floodplain margins and wash-river confluence zones, mesquite (Prosopis spp.) trees grew in dense stands called mesquite bosques. Mesquite thickets were extremely dense at the confluence of the Colorado and Gila Rivers near Fort Yuma. Many native grasses grew on the bottomlands, and the delta supported extensive mesquite "forests" and arrowweed "jungles" (Ohmart 1982).

The apparent barrenness of the terraces, bajadas, and mountains presented a stark contrast to the lush riparian vegetation. The pioneer botanist of the Sonoran Desert, Forrest Shreve, described its hottest, driest region: "The plains and mountains which border the lower course of the Colorado River and the head of the Gulf of California have the smallest flora and the most scanty vegetation of any part of the North American Desert" (Shreve 1936:15-7). Most of the Yuma District falls within the Lower Colorado Valley Province of the Sonoran Desert (Figure 2-4). Upper terraces, lower bajadas, and basin flats support a relatively sparse growth of creosote bushes (Larrea divaricata), ocotillo (Fouqueria splendens), and bursage (Franseria dumosa). Vegetation is particularly sparse on desert pavement surfaces. Desert riparian zones bordering major washes support a relatively lush growth of annuals and arboreal legumes: palo verde (Cercidium floridum), ironwood (Olneya tesota), acacia (Acacia spp.), and mesquite (Prosopis spp.) trees. The Lower Colorado Valley Province extends northward along the Colorado River into the Mohave Valley, where there is a transition between the Sonoran and Mohave deserts (Brown and Lowe 1980; Lowe 1964; Shreve and Wiggins 1964). Creosote is also the dominant plant on the basin flats and lower bajadas of the Mohave Desert, with Mohave yucca (Yucca schidigera) and Joshua trees (Yucca brevifolia) interspersed at somewhat higher elevations, nearer the bases of mountain ranges. Few desert riparian trees exist in the Mohave Desert; small catclaw trees (Acacia greggi) and desert willows (Chilopsis linearis) line the washes. Mohave desertscrub covers the bajada zone between the Mohave Valley and the Black Mountains, as well as the flats east of the Mohave Mountains.

Differences in soils and drainage patterns have fostered subregional variations in vegetation within desert basins. Pure stands of creosote exist on the sands of the Yuma Desert. Extremely sandy soils also exist on the northern La Posa Plain and Cactus Plain, in the latter area as stabilized and partially stabilized dunes. These areas, which contain relatively few washes, retain moisture and support an unusual association

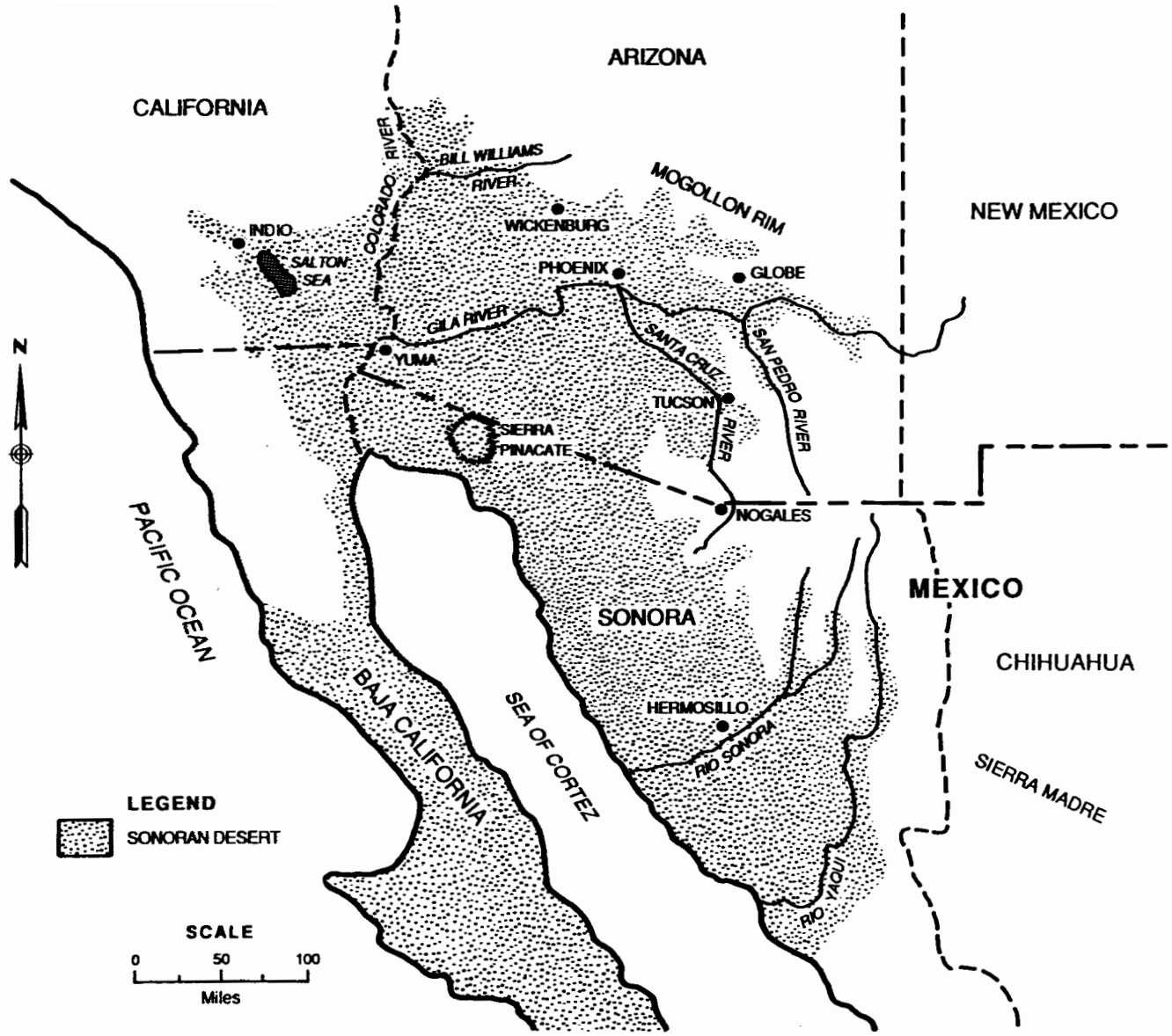


Figure 2-4. THE SONORAN DESERT
(Based on Nabhan 1985: 2)

of creosote, big galleta grass (Hilaria rigida), bursage, small cacti (Cylindropuntia spp.), and annuals including sand verbena (Abronia villosa) and desert primrose (Oerothera brevipes). The central portion of the La Posa Plain, constricted between the Dome Rock and Plomosa Mountain ranges, contains a coarser substrate and numerous washes which drain into Tyson Wash, a major intermittent tributary of the Colorado River. This area surrounding present-day Quartzsite supports relatively lush stands of desert riparian vegetation.

The mountain slopes nearest the river are quite rugged and barren, dotted with ocotillo and brittlebush (Encelia farinosa). In general, upper bajada slopes and mountainous zones over 1,500 feet in elevation support plants characteristic of the Arizona Upland Province of the Sonoran Desert (Shreve and Wiggins 1964). These include palo verde trees (Cercidium microphyllum), creosote, ocotillo, brittlebush, cholla cacti (Cylindropuntia spp.), prickly pear cacti (Opuntia spp.) barrel cacti (Ferocactus spp.) and saguaro cacti (Cereus giganteus). Saguaros are relatively sparse in this western section of the Sonoran Desert. West of the Colorado River, saguaro cacti grow in the Chocolate and Whipple mountain ranges (Warren et al. 1981). Since ranges nearest the river rarely exceed elevations of 4,000 feet, yucca and agave species are rare. However, the upper elevations of the Mohave Mountains support a limited area of pinyon (Pinus spp.) and juniper (Juniperus monosperma) forest.

Creosote has persisted as the dominant nonriparian plant in the Lower Colorado Valley for the past 12 to 20 millennia, the period encompassing its human occupation. During that time span, the once dominant Mohave Desert retreated northward as the Sonoran Desert species expanded into western Arizona. The contents of fossilized packrat (Neotoma spp.) nests, sorted and radiocarbon dated, provided a general picture of paleoenvironmental trends. Among areas sampled in the Lower Colorado region were the Whipple Mountains, the New Water Mountains, Artillery Mountain near the Bill Williams River, and the lower Grand Canyon (Cole and Van Devender 1984; Van Devender and Spaulding 1979). The nest contents revealed that during the late Pleistocene period (Ice Age) between 20,000 and 10,000 B.C., many modern plant species extended to 3,000 feet below their present elevational distribution. Van Devender and Spaulding (1979) inferred a late Pleistocene climate of cool summers, mild winters, and winter-dominant precipitation. Woodlands incorporating juniper, scrub oak (Quercus turbinella), buckbrush (Ceanothus greggi), and yucca (Yucca spp.) existed down to 1,500 feet. A xeric open woodland of juniper and Joshua trees (Yucca brevifolia) grew between 1,500 and 1,000 feet. Creosote and Joshua trees existed in the Colorado River Valley below 1,000 feet.

The slow glacial retreat during the early Holocene period, from about 10,000 to 6000 B.C., inhibited the expansion northward of Sonoran Desert species adapted to a warmer climate. Juniper and Joshua trees persisted, but creosote increased its range. Evidence from the Trigo Mountains indicates dense mesquite along the river (Shelley and Altschul 1988).

After 6000 B.C., the retreat of the early Holocene woodlands and Mohave desert species appears to have been relatively widespread, synchronous, and rapid. Sonoran Desert species, such as palo verde, ironwood, and certain cacti, spread northward possibly in response to a new pattern of biseasonal rainfall incorporating summer monsoon rains. After approximately 3000 B.C., "later fluctuations in the Sonoran and Mohave deserts were of small magnitude and were relatively minor events within the present vegetational regime" (Van Devender and Spaulding 1979:707). Human populations still needed to cope with cyclical and smaller scale environmental shifts and climatic unpredictability.

Native fauna included bighorn sheep (Ovis canadensis) in the arid and rugged mountain ranges. Mule deer (Odocoileus hemionus) ranged into the mountains and cottonwood groves but were more common near mountain springs and in the chaparral and woodland zones of higher ranges to the east. Predators included mountain lions (Felis concolor) and coyotes (Canis latrans). Raccoons (Procyon lotor) frequented riparian zones. Small mammals included desert cottontail rabbits (Sylvilagrus audubonii), black-tailed jack rabbits (Lepus californicus), and kangaroo rats (Dipodomys merriami). Numerous species of migratory birds, upland birds, raptors, reptiles, and amphibians inhabited the river valley and adjacent desert. Historical records described beavers (Castor canadensis), muskrats (Ondatra zibethica), and ducks along the rivers (Davis 1973). Native fish included the large Colorado River salmon or squawfish (Ptychocheilus leicius), the humpbacked sucker (Xyrauchen texanus), and the Gila chub (Gila robusta). Smaller fishes, such as the longfin dace (Agosia chrysogaster) and desert pupfish (Cyrinodon macularius), tolerated the fluctuating water levels of small desert pools and streams.

For thousands of years, the dynamic Colorado River sustained a riparian environment that gave life to humans and native fauna. To live with the river, the Indians responded to its fluctuations and occasionally retreated to the surrounding desert and mountains. The balance of power shifted during the 20th century. Now the river responds to the needs of its human users, both near and far, and Ives would be astonished at its modern transformation.

The Conquered River and Its Modern Users

Modern engineering of the Colorado River has caused environmental changes that obscure the former ecological relationships of Indian cultures to the natural environment. Modern intensive use of the river and its margins threatens fragile archaeological sites and presents land management challenges and opportunities unlike any encountered within other districts overseen by the Bureau of Land Management.

Except for travelers, explorers, and trappers, the Native Americans had the river to themselves until gold miners and prospectors settled there, first at La Paz during the 1860s. Military forts had been established during the 1850s, at Fort Yuma and Fort Mohave, to protect travelers.

Additional military camps were later established as miners, settlers, ranchers, and travelers came into conflict with the natives. The Colorado River Indian Reservation was created in 1865 to settle Indians of "the Colorado River and its tributaries" within the Parker Valley. The smaller Fort Mohave, Fort Yuma, Chemehuevi, and Cocopa reservations were established between 1870 and 1917.

The Colorado River Reservation was the site of the first modern attempt at canal irrigation along the river. The Agent desired that "irrigation work be completed soon so Indians can raise a good crop in early spring before high floods and hot weather start . . . only by a canal in operation can the wandering tribes be induced to settle permanently on the reservation" (Annual Report of the Commissioner of Indian Affairs 1868). A canal was completed by Indian laborers in 1873, but it did not work well. Low floods bypassed the canal head, and high floods filled the canal with silt. It became evident, after several failures, that a workable irrigation system required pumps (Annual Report of the Commissioner of Indian Affairs 1892).

By the 1890s, irrigation was viewed as the key to economic development in the West, despite John Wesley Powell's warning that "you are piling up a heritage of conflict and litigation of water rights, for there is not sufficient water to supply the land" (Fradkin 1981:24). Irrigation was the crusade of the reclamation movement of the 1890s, which culminated in the establishment of the U.S. Bureau of Reclamation. The Bureau built Laguna Dam north of Yuma in 1909, a small structure designed to serve as a pool and sediment trap from which water could be drawn for irrigation. The river's tremendous silt load quickly filled the settling basin (Fradkin 1981:243).

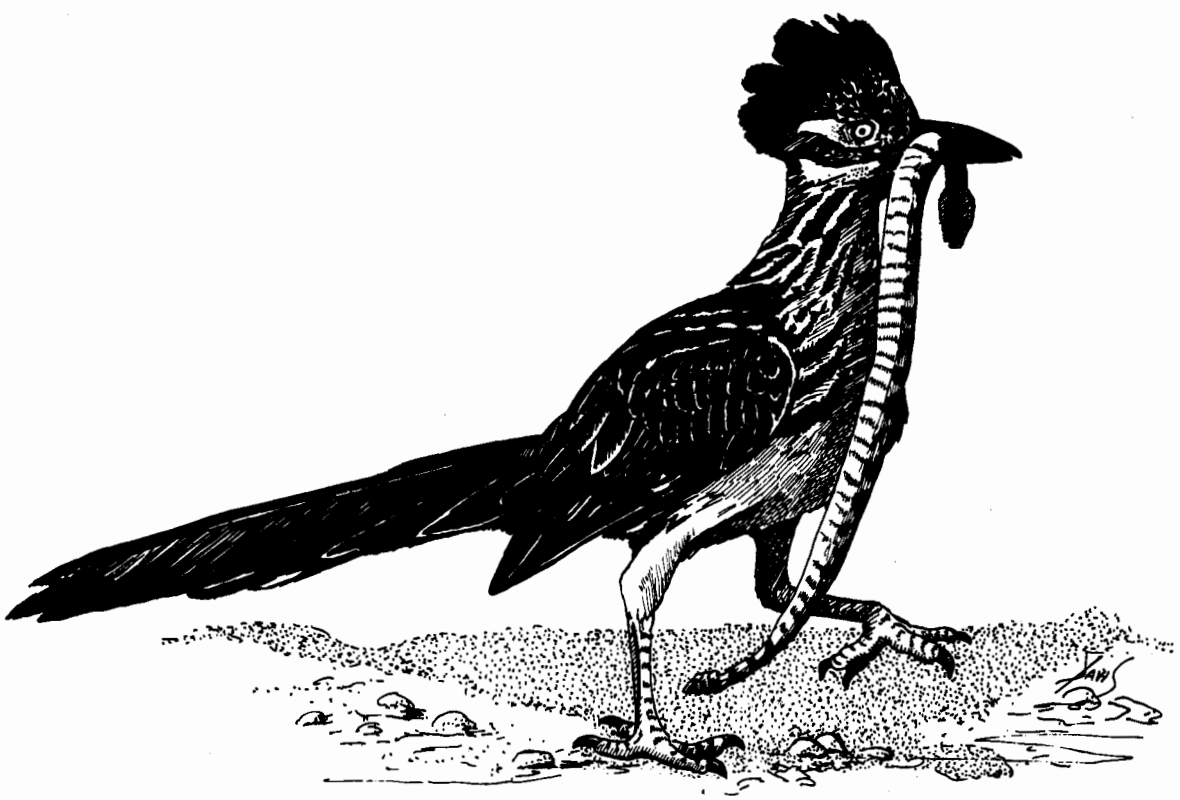
The construction of Laguna Dam followed a far more disastrous attempt to divert water from the river. Soon after the geologist Blake defined the ancient bed of Lake Cahuilla in the Salton Sink, he warned that canal construction could redivert the river from its delta and refill the ancient lake. In 1896, the California Development Company was created to divert irrigation water to the "Imperial Valley" through a delta overflow channel, the Alamo River. In 1901, a canal was constructed through Mexico, and a real estate boom enveloped the Imperial Valley. In 1905, the entire summer flood of the Colorado breached the canal intake and settled in the old lakebed, the Salton Sea. Persuaded by Teddy Roosevelt, the Southern Pacific Railroad plugged the flow by dumping 3,000 carloads of rocks into the river from railroad trestles (Trava 1986).

Although the Colorado River was obviously a powerful foe, the Imperial Valley developers refused to yield. The Imperial Valley Irrigation District, formed in 1911, demanded an "All-American Canal" that would start from Laguna Dam and bypass the demands that Mexicans had made on the first ill-fated canal. However, the Bureau of Reclamation considered such a canal impractical in the absence of a larger dam for flood and silt control. The Irrigation District allied with Los Angeles, a growing

Agricultural fields now dominate the Parker Valley, home to the Colorado River Indian Tribes. The reservation has leased land for recreational as well as agricultural uses. Lake Moovalya, a narrow deep lake extending north of Headgate Rock Dam near Parker, is superb for skiing and motorboat racing.

The Palo Verde and Cibola Valleys, from the town of Blythe south to the Cibola National Wildlife Refuge, support vast irrigated agricultural fields. In the mountainous area between the Cibola and Imperial Wildlife Refuges, the scenery is still spectacular and the river relatively unhindered. This area likely resembles the scene viewed by Ives, save for the remains of old mines (Fradkin 1981:265).

Irrigated agriculture dominates the scene along the lower Gila River and its confluence with the Colorado, although upstream flood control and diversion dams have virtually eliminated the flow of the Gila. The town of Yuma now overlooks a narrow stream rather than a wide, wild river poised to emerge on its delta. By the time the Colorado River reaches Yuma, the All-American Canal has intercepted much of its remaining flow. The delta below Morelos Dam is a dry plain through which water rarely passes to join the Gulf of California.



CHAPTER 3

THE CULTURAL CONTEXT: NATIVE AMERICAN TRIBES

The earliest Spanish explorers to reach the lower Colorado River encountered Indians who fought frequently among themselves, ate Spanish horses, and delighted in recounting outrageous tales. According to the storyteller Otata, the natives of California, the Spaniards' destination, slept under water or while standing with burdens on their heads. They were also bald and had ears several feet long. The Spaniards were skeptical but ready for surprises in this new land (Hammond and Rey 1953).

The Spanish explorers recorded many tribal or ethnic names assigned to groups that seemed to shift their positions frequently along the river. Researchers have attempted to correlate historic tribes with those named groups (Forbes 1965). The task is complicated by the few brief Spanish visits which precluded continued observations and by the native practice of naming groups by generic "people" terms or locational designations such as "people to the south" (Hicks 1963). Recent researchers have emphasized the kinship and cultural similarity among the Yuman groups along the lower Colorado and lower Gila Rivers (Bean et al. 1978; Harwell and Kelly 1983).

Speakers of Yuman languages of the Hokan language family inhabited much of western Arizona, southern California, and Baja California. Kroeber (1943) divided the Yuman speakers into four branches: the Colorado delta groups (Cocopa, Kohuana, and Halyikwamai); the river groups along the Colorado and Gila Rivers (Quechan, Mohave, Halchidhoma, Kaveltcadom, and Maricopa); the upland groups of western Arizona (Hualapai, Havasupai, and Yavapai); and the California or western groups (Diegueno, Kamia, Kiliwa, and Paipai). The river and delta groups lived a relatively sedentary life based on floodwater farming supplemented by fishing, hunting, and wild plant gathering. The more mobile upland groups focused on hunting and seasonal gathering of desert and mountain resources, although they also farmed to a limited extent and often visited the river groups. Some historical linguists believe that the Yuman languages emerged as a separate classification at about A.D. 1 and that Yuman groups migrated outward from the Colorado delta region (Hale and Harris 1979). The native creation story, however, emphasizes a southward migration from Avikwame, Mount Newberry. Many of the Yuman languages and dialects are mutually intelligible. The Maricopa and Quechan languages exhibit many similarities, and the Mohave language seems to be a "linguistic bridge" between the river and Pai (upland Arizona) languages (Kendall 1983).

The Chemehuevi, closely related to the Southern Paiute, inhabited much of the California desert immediately west of the Colorado River. They also settled in areas along the river, and their culture was strongly influenced by that of the Mohave (Kelly and Fowler 1986). The Yuman groups interacted with a wide-ranging network of tribes within California, the Southwest, and northern Mexico.

A considerable number of ethnographic studies, primarily conducted between 1900 and 1960, described the economies and cultures of the river and Pai groups. Although major changes had occurred since the establishment of reservations, in response to the economic and social pressures faced by the subjugated natives, elderly individuals remembered the old lifeways and oral history, and many cultural practices persisted.

Ethnographic studies among the Yuman groups were conducted by anthropologists of national and international eminence. Alfred L. Kroeber and his colleagues worked in the Boasian tradition of salvage ethnography, seeking to reconstruct aboriginal cultures as they existed prior to the establishment of reservations. Kroeber (1902, 1920, 1925) studied the Mohave, and C. Daryll Forde (1931) conducted fieldwork among the Quechan. They produced comprehensive reports addressing subsistence, social organization, religious practices, and folklore. Leslie Spier (1933) wrote the basic ethnographic description of the Gila River Yumans. Philip Drucker (1941) of the University of California published Yuman economic and social trait lists collected for the university's culture element distribution survey.

Kroeber (1935) edited the standard reference on the Hualapai, and E.W. Gifford (1931, 1936) described the Yavapai and Kamia groups. Carobeth Laird (1976), who left her anthropologist husband to marry a Chemehuevi, authored a book on the riverine Chemehuevi.

Later researchers produced both general and specialized studies. William H. Kelly (1977) wrote an ethnography of the Cocopa based on fieldwork conducted during the 1940s. George Devereux, a French anthropologist, reported on Mohave ethno-psychiatry, manners, and religion based on fieldwork between 1930 and 1950 (Devereux 1937, 1950, 1951, 1961). Kenneth M. Stewart, William J. Wallace, and George Fathauer worked among the Mohave during the 1940s and 1950s and published articles on subsistence, warfare, and religion (Fathauer 1954; Stewart 1947a, b, c, 1957, 1965, 1966, 1969a, b, 1970, 1974, 1977, 1983; Wallace 1947, 1955). Specialized works by archaeologists included studies of Yuman pottery manufacture (Kroeber and Harner 1955; Rogers 1936). The eminent ethnobotanists Edward Castetter and Willis Bell co-authored a book on Yuman agriculture and subsistence (Castetter and Bell 1951). Numerous linguistic studies included an analysis of changes within the Quechan language over a period of 40 years (Kendall 1983).

Recent studies include Robert Bee's doctoral research among the Quechan during the 1960s and 1970s. Bee (1981) described the history and consequences of changing Federal policies on the Quechan. Recent studies of Maricopa social organization and ethnohistory by Henry Harwell (1979) have questioned the validity of the tribal concept and stressed the unity among the river Yumans of the Gila and the Colorado. Bean et al. (1978) summarized the ethnographic literature and recorded Indian reactions to the construction of the Palo Verde to Devers transmission line and its potential impacts on modern reservations and aboriginal use areas.

Tribal Territories and Settlements

The 19th century geographic ranges of lower Colorado area tribes are depicted in Figure 3-1. The Mohave Valley, Gila confluence area (Yuma Valley), and Colorado delta were the core homelands of the Mohave, Quechan, and Cocopa respectively. The Great Colorado Valley and the Chemehuevi Valley were periodically occupied by other groups, and the Mohave and Quechan extended their ranges southward and northward into those valleys. In the early 1800s, the Great Colorado Valley was inhabited by the Halchidhoma, Kohuana, and Halyikwamai, some of whom were former residents of the delta. Constantly under attack by the Mohave and Quechan, they were ousted from the river between 1827 and 1829. After initially retreating to northern Mexico, they eventually joined the Maricopa and Kaveltcadom along the Gila River. Those groups may have resided along the lower Colorado River, possibly in the Great Valley, hundreds of years earlier. Labeled together as the Maricopa, the five groups lived along the Gila River from Pima Butte, near the Salt-Gila confluence, as far west as the Mohawk Mountains (Spier 1933). In language, subsistence, social organization, and religion, they were similar to the Colorado River tribes. Local environmental conditions and close interaction with the Pima Indians generated differences in subsistence scheduling and material culture (Stone 1986:38-39).

River Yuman settlements were dispersed "rancherias" consisting of sets of related families who occupied houses situated 50 to 100 meters apart, over areas up to 2 miles (3.2 kilometers) long (Spier 1933:18-25). Major rancherias were defined as "villages" by travelers and ethnographers. Yet as Bee (1981:4) described the situation, "strictly speaking, these settlements were not villages in that their arrangement, composition, and location shifted from year to year, and even from season to season." At least three factors contributed to residential instability: shifts in the river channel and the volume of annual floods, which affected the distribution of livable and farmable areas; temporary moves to higher ground during the annual floods; and the temporary abandonment of farm plots and destruction of dwellings after the owner's death. Nevertheless within tribal territories, certain favorable areas, occupied more frequently, were recognized as the areas of tribal subgroups.

Near the mouth of the Colorado River, four distinct groups of Cocopa occupied different areas of the delta. The two westernmost groups, the Wi Ahwir and Kwakwarsh along the "Hardy River" secondary channel at the base of the Cocopa Mountains, also incorporated some permanent and seasonal residents from the Diegueno and Paipai tribes. The Hwanyak and Mat Skrui groups lived along the major modern channels between Andrade Mesa and present-day San Luis. The Mat Skrui, among themselves and other Cocopa, were known as the "real Cocopa" (Kelly 1977:11-13).

The Quechan consistently occupied the Colorado-Gila confluence area. They were also known as the Yuma Indians, a Spanish designation evidently taken from the Piman word Yumi. Quechan or Kwacan meant "those who

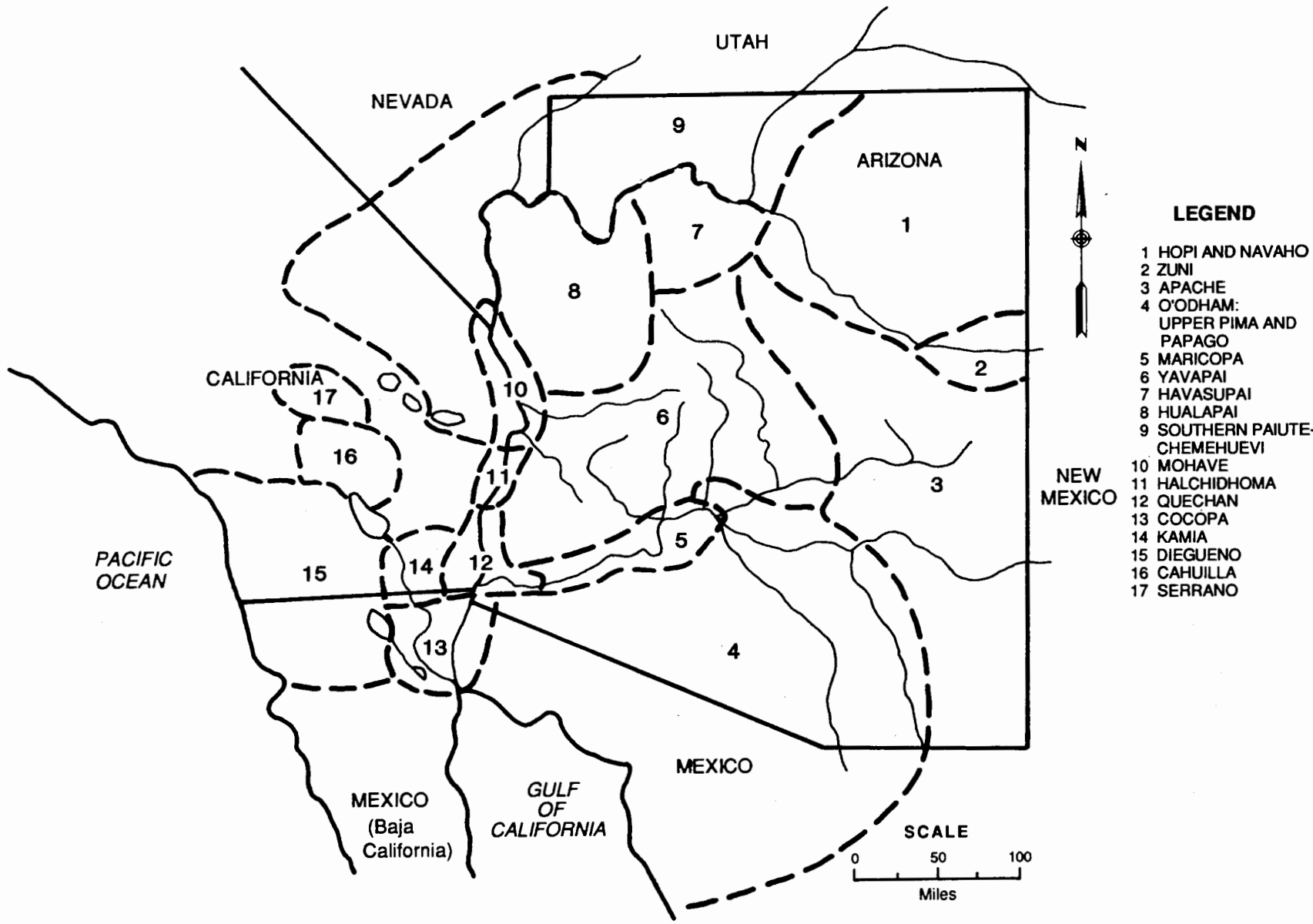


Figure 3-1. HISTORIC TRIBAL AREAS

descended" southward from the sacred mountain Avikwame north of the Mohave Valley (Bee 1983:97). Major rancherias were situated along the western side of the river between the modern locations of San Luis and Laguna Dam. The four to six rancherias recorded by ethnographers included Xuksil near Pilot Knob; villages near Winterhaven and Yuma; and the homes of the "Sunflowerseed Eaters" along the Gila River southwest of the Laguna Mountains. The "Blythe group" had once occupied a rancheria about 60 miles to the north in the Palo Verde Valley (Bee 1983:87).

According to Kroeber (1974), who reviewed historic documents and oral histories in order to prepare legal testimony supporting Indian land claims, the Quechan periodically occupied and used the Cibola and Palo Verde Valleys as far north as the Big Maria and Riverside Mountain ranges. When cultivated crops failed, they gathered mesquite there, and some Quechan retreated there to avoid the U.S. Army. Kroeber concluded that river Yuman territories encompassed the valley from crest to crest of adjacent mountain ranges.

After its abandonment by the Halchidhoma, the Chemehuevi and Mohave apparently shared use of the Parker Valley. No major rancherias were recorded there by ethnographers. Although the Chemehuevi utilized the Whipple, Chemehuevi, Turtle, and Old Woman Mountain ranges and intervening basins west of the river, they also hunted game in areas further south and east (Kelly and Fowler 1986; Warren et al. 1981:82). By the mid-1800s, the Chemehuevi were farming in the Chemehuevi and Parker Valleys, with their major settlements concentrated west of the river along Chemehuevi Wash. In 1865, the year that the Colorado River Reservation was established in the Parker Valley, the southward shift of Mohave groups initiated a period of conflict with the Chemehuevi. The Chemehuevi temporarily retreated into the California desert. Some took refuge with the Cahuilla and Serrano in the Coachella Valley area north of the Salton Sink. The Chemehuevi Reservation was established in 1907 in Chemehuevi Valley, and tribal members also lived on the Colorado River Reservation.

Mohave territory encompassed the river margins from the Cottonwood Valley (now Lake Mohave) to the southern end of the Parker Valley in the vicinity of the Big Maria Mountains (Kroeber 1974). The Mohave Valley was the traditional homeland of the Hamakhav, or Amacava as translated by the Spaniards. In the Yuman languages, the syllable "ha" is often associated with water, so that some translate the native term as "people who live along the water" (Stewart 1983:69). Spanish explorers encountered the Mohave in the Parker Valley, later occupied by the Halchidhoma before they were driven out. Some Mohave reoccupied the area after the abandonment, and larger numbers moved south from the Mohave Valley in the 1850s and 1860s.

Kroeber (1951) recorded Mohave myths and songs that described migrations, intergroup conflicts, and mythical events within a detailed landscape. The Mohave, known as inveterate travelers, "had an endless interest in topography, and a constant reflection of this in their myths and song

cycles, which are almost invariably localized in detail" (Kroeber 1951:137). Kroeber drew maps that described the locations of named settlements and landmarks. He was confident of their existence and general locations but acknowledged a high potential for error in specific locations.

Within the Mohave Valley, most settlements were located east of the river where there was more bottomland. East of the Colorado River, Kroeber documented at least 20 rancherias from Silver Creek Wash to Sacramento Wash, generally located at the outer edge of the bottomland. West of the river were at least nine settlements, all north of present-day Needles, concentrated near the mouths of washes draining the Dead Mountains. From Topock Gorge south to Palo Verde, named places included at least 50 settlements, natural features, or other significant locations. Further south, geographic information "thinned out," and the Mohave apparently had little detailed knowledge of the delta. Kroeber's maps and mythical tales indicate a considerable volume of travel up and down the river, in conjunction with conflicts as well as friendly interaction. Kroeber suggested that most travel routes lay on the east side, with western bypasses in the vicinities of the Picacho and Whipple Mountains. Desert areas used by the Mohave incorporated much of Western Yavapai territory east of the Parker Valley. Travel camps, seasonal camps, and refuge settlements were said to be located within the Harcuvar and Date Creek Mountain ranges along the Bill Williams River, and near the present locations of Bouse, Salome, and Quartzsite. Kroeber found it interesting that so much mythical activity took place within this region rather than the Hualapai country due east of the Mohave Valley.

Eastern neighbors of the river Yuman tribes included the Hualapai north of the Bill Williams River and the Western Yavapai between the Bill Williams and Gila Rivers. These relatively mobile desert groups hunted and gathered wild foods available at different seasons within the mountains and desert basins. The Hualapai frequently visited and traded with the Mohave. The Cerbat Mountain regional band inhabited an area incorporating the eastern face of the Black Mountains. The Hualapai Mountain band utilized the Mohave and Rawhide ranges north of the Bill Williams River (McGuire 1983:26).

Western Yavapai regional bands were centered in the Harcuvar-Harquahala ranges and the Castle Dome-Kofa ranges. Both areas received relatively high rainfall and contained springs and productive edible resources. The Haka-Whatapa group of the Kofa and Castle Dome Mountains became known as the "red water people" in reference to their frequent visits to the Colorado River, where they often traveled to farm during the summer (Gifford 1936). According to Kroeber, they occupied the east bank opposite Picacho Peak, between the major areas of Quechan occupation. That area, now the Imperial National Wildlife Refuge, was readily accessible to the Castle Dome Mountains.

The Sand Papago people (Hiach-ed O'odham) were nomadic hunter-gatherers who ranged over the exceedingly arid western Papagueria south of the Gila River. They subsisted on small game, bighorn sheep, wild legumes, greens, and tubers, and the "desert sand root" (Ammobroma sonorae), a plant found only in the sandy desert areas bordering the Gulf of California. They traveled to the Gulf for fish and shellfish (Crosswhite 1981).

West of the Colorado River, the mountains and basins south of the Chemehuevi territory were used intermittently by the Cahuilla, Serrano, and Colorado River tribes. The Kamia, a small Yuman group who spoke a subdialect of Diegueno, periodically lived along the Alamo and New Rivers, delta overflow channels south of the Salton Sea. When overflows occurred, they practiced floodwater farming and fished. They traded salt and crops to the Diegueno in exchange for agave and acorns. Friends of the Quechan, the Kamia settled at Algodones near Pilot Knob after a decline in spring flooding reduced the feasibility of agriculture along the delta overflow channels (Gifford 1931; Warren et al. 1981).

River Yuman Subsistence

Castetter and Bell (1951) summarized a considerable amount of information concerning the use of wild plants, fish, and game as well as the practice of agriculture along the lower Colorado River. Agriculture was based on floodwater farming rather than canal irrigation. As soon as the annual flood receded, "planting was done on the level tracts of moist soil of the sloughs, lagoons, and former river beds intersecting the wide riverbottoms which thereby had been drenched and coated with soft mud" (Castetter and Bell 1951:132). Digging sticks thrust into the mud created depressions for seed planting. The crops matured from the retained soil moisture rather than the small amount of summer rain. Families planted up to 5 acres which were sometimes dispersed since all floodplain areas were not equally suitable for farming. Preferred planting areas were those over which 1 to 2 feet of water had moved rapidly enough to deposit a relatively coarse sediment (Castetter and Bell 1951:140; Kelly 1977:28). These areas were fairly close to the main floodstream, and areas around major sloughs were suitable farmland. Areas flooded by relatively slow or standing water were poor for farming, since fine deposited silts and clay formed heavy soils subject to cracking. Saline soils were also avoided. Although there were no large-scale irrigation systems, the Indians sometimes constructed small dams, dikes, and ditches to divert water into swales or to prevent further flooding of fields.

Planted crops included multicolored varieties of flour, sweet, and flint corn that matured in 80 to 95 days. Other pre-Spanish crops were tepary beans (Phaseolus acutifolias), pumpkins (Cucurbita pepo), squash (Cucurbita moschata) and gourds (Lagenaria siceraria). Wheat, black-eyed peas, watermelons, and muskmelons were adopted from the Spaniards.

Constant monitoring was required to protect plants from birds and animals. No fertilizing was needed, as the annual silt deposits renewed soil fertility. Harvested crops were stored in elevated basket granaries, and much of the harvest was consumed at feasts.

Gathered resources were extremely important dietary components. Staple foods included mesquite beans and screw beans (both Prosopis spp.), foods abundant on the bottomlands. Nutritious, dependable, and abundant mesquite pods were "more important than maize . . . and virtually supplied the living through the winter and until the next cultivated crop was ready" (Castetter and Bell 1951:180). Other wild plant foods included at least 37 seed varieties, 16 types of greens, 16 varieties of berries and cactus fruits, and 7 types of roots and tubers (Castetter and Bell 1951:179-209). Most greens and grass or annual seeds grew on the river bottomlands, and some seeds were intentionally broadcast or "semicultivated." Amaranth (Amaranthus palmeri), a major source of greens and seeds, was the only wild food stored in addition to mesquite, screw beans, and a few semicultivated seeds. Some groups planted sunflowers for their seeds (Helianthus annuus). The Cocopa harvested "wild rice" (Uniola palmeri), unrelated to the wild rice of the Great Lakes region, a grass that covered large sloughs of brackish water on the delta. Other plant foods available along the river and adjacent terraces were wolfberries (Lycium spp.) and the young shoots and pollen of cattails (Typha spp.). After the construction of dams, the failure of seasonal floods caused the disappearance of many native foods.

Food resources along desert washes included greens, grasses, wolfberries, and legumes from mesquite, palo verde, and ironweed trees. Palo verde, regarded as a famine food, was more common along the larger washes west of the river. Further from the river, fruits of cholla and prickly pear cacti and yucca were gathered from upper bajadas and canyons of the mountain ranges. Particularly after poor harvests or when stored foods ran out, groups intensified their use of mesquite and ranged into the desert to exploit wild resources. The relatively low arid ranges bordering the river valley offered fewer and less productive wild foods than higher mountain ranges generally 50 miles or more from major settlements along the river. The river Yumans thus obtained some mountain resources through expeditions and trade.

Fish were more important than hunted game as a source of animal protein. Traditionally desert-based groups, such as the Pai and Chemehuevi, disdained fish (Gifford 1936; Laird 1976). The river groups fished for Colorado salmon or squawfish, humpbacked sucker, Gila chub, and other native species. Colorado salmon (Ptychocheilus lucius) grew up to a meter long. Fish stranded in temporary lagoons and sloughs were harvested after floodwaters receded. They were rarely caught directly from the river. Fish were caught using a variety of nets, traps (weirs), and scoops that were often employed by teams of men. The Cocopa harvested shellfish from the Gulf of California, but molluscan fauna were absent further north along the river (Castetter and Bell 1951:223).

Rabbits were the most abundant and important game. Rabbits and pack rats were trapped in snares or deadfalls. Organized communal rabbit drives combined the efforts of beaters and archers aided by deliberately set brush fires. Quail, ducks, and gophers were also hunted along the river.

Large game was rare along the Colorado River, although deer were hunted during the summer when they ranged into the valley to eat screw beans. Deer and mountain sheep were hunted in the mountain ranges by Akwak Konik, warrior hunting specialists who did not farm or fish but instead exchanged meat for fish and produce. Animals were usually ambushed at springs by single men or small groups of hunters. Stone hunting blinds offset the limited shooting range of the weak bows manufactured by the river Yumans (Stewart 1947c). The Chemehuevi hunted desert tortoises and chuckwalla lizards in addition to deer and bighorn sheep in the mountain ranges west of the river. To the east, they hunted deer in the Mohave Mountains as well as pronghorn antelope that were once abundant on desert grasslands adjacent to the Cerbat Mountains (Davis 1973; Kelly and Fowler 1986:369).

The schedule of subsistence tasks and the availability of different resources varied through the year. Table 3-1 describes the typical annual subsistence schedule. An annual lean period of short supplies occurred in the spring, particularly during April, May, and early June. The duration and severity of this lean time depended on the amount and rate of consumption of stored foods from the previous seasons.

Among the river Yuman tribes, Castetter and Bell (1951:74) suggested an increasing dependence on agriculture as one moved northward along the Colorado River. They estimated that cultivated foods provided up to 50 percent of the Mohave diet. The exact meaning of that estimate is difficult to interpret, although it indicates that farming was a significant contributor to the aboriginal economy. The overall proportion of cultivated foods varied from year to year in response to river fluctuations that affected harvests, or other factors such as seed shortages. Differences in the subsistence strategies of tribes or subtribes may have been related to several factors: the diversity and accessibility of specific wild resources within the surrounding territory (for example, "wild rice" and shellfish for the Cocopa and Mohave yucca for the Mohave); differences in soils or other conditions affecting farming success; or trade relations with surrounding groups.

Despite the significant contribution of farming to the native economy, ethnographers and ethnobotanists commented on the apparent lack of effort devoted to increasing agricultural production (Castetter and Bell 1951:66; Kelly 1977:23). Crops were regularly given away rather than stored, and spring food shortages were an annual occurrence. The Spaniards also commented on the failure to devote greater time and effort to agriculture. Escobar wrote in 1604 that "it did not seem to me that they had a great abundance of maize, and I attribute this to their laziness, for the very spacious bottoms appeared to offer opportunity to plant much more" (Hammond and Rey 1953:1017).

TABLE 3-1

LOWER COLORADO RIVER
ANNUAL SUBSISTENCE SCHEDULE

Month	Agriculture	Wild Plants	Animals
January	Available stored crops	Stored mesquite, wild tubers	Rabbits, rats, birds, fish
February	Available stored crops	Stored mesquite, wild tubers; Few available	Rabbits, rats, birds, fish; Low fish supply
March	New farm plots cleared	Few available	Dependence on hunting
April	Old plots cleared, flood begins	Few available	Rabbits, birds; Game scarce
May	Annual flood	Cocopa gather "wild rice" of delta	Increase in fish supply as river rises
June	Peak flood	Few available	Fish, rabbits, birds
July	Planting	Mesquite beans, amaranth greens	Fish, rabbits
August	Weeding	Mesquite beans, screw beans	Fish, rabbits
September	Green corn	Screw beans	Fish, rabbits
October	Harvest	Greens, grass seeds	Fish, rabbits; Fish supply diminishing
November	Storage	Greens, grass seeds	Fish, rabbits; Fish supply diminishing
December	Stored crops	Relative inactivity	Ducks, quail

Castetter and Bell (1951:69) rejected the value judgment of indolence in favor of environmental and economic factors that may have limited the economic role of farming. The risk of failure was probably the most important factor inhibiting a greater dependence on agriculture. The annual floods were variable and unpredictable in their course, volume, and timing. Floods sometimes failed to materialize, or flows were too low to inundate cleared fields. Late floods necessitated late plantings which produced poor harvests. Late surges washed out seeds or waterlogged the soil, causing seeds to rot. It is difficult to determine the frequency of poor harvests. Between 1850 and 1900, less than half of Mohave and Quechan harvests were successful (Castetter and Bell 1951:9). This period may not have been typical of earlier times, yet unpredictability and failure were facts of life, and poor harvests often resulted in famine particularly during successive years of drought (Hicks 1963; Stratton 1857).

Mesquite beans, a more dependable resource, provided a more secure subsistence than did agriculture (Nabhan, Weber, and Berry 1979; Stone 1981). It is interesting to note the difference in consumption patterns between corn and mesquite. Corn was a feast food and a medium of local informal exchange and river-upland trade. Much of the supply was consumed or redistributed at harvest time. Mesquite was diligently stored each year, with consumption spread over several months.

Observers may well have overestimated the amount of arable land available to farmers at any one time given flooding conditions and soil characteristics. The Indians often planted test plots to determine whether an adequate crop could be expected from a given field. Yet planting decisions were necessarily rushed, since crops were planted quickly in order to take maximum advantage of retained moisture. The planting season was a short period of peak labor demand, the busiest time of the year. It would have been difficult for many families to plant additional acres. The Quechan sometimes planted fields to take advantage of late winter Gila River floods, but the early fields were endangered by the later Colorado River floods.

Historic failures at canal irrigation indicate why large-scale systems were not a feasible strategy for sustained agricultural production, as they were for prehistoric Indians along the Salt and Gila Rivers in central Arizona. Unpredictable massive floods washed out canal heads and deposited large quantities of silt in the ditches, while low floods bypassed the canals. Canal irrigation depended on the taming of the Colorado.

Material Culture

Implements, rarely decorated, were crudely fashioned "to meet only minimum requirements of utility" (Stewart 1983:59). Although painted simple geometric designs were common on Yuman red-on-buff pottery, aesthetic expression reached its apex in personal adornment through body

painting, tattooing, and hairstyling. After the railroad traversed Mohave territory in the late 1800s, beaded necklaces and painted pottery figurines were sold to tourists at Needles.

Subsistence implements included wooden digging sticks, throwing sticks, fiber nets, and fish traps and scoops fashioned from willow branches and fiber. Unbacked willow shooting bows had limited power, and arrows were made of cane or wooden shafts with sharpened and fire-hardened points. Stone arrow points, infrequently used, were small triangular side-notched forms. Household implements included paddle-and-anvil manufactured pottery vessels, woven "bird's nest" storage baskets, woven nets, stone manos and metates, and mesquite log mortars with stone or wooden pestles.

Loincloths and willow bark skirts were the major items of clothing. Personal decoration incorporated ear and nasal septum piercing, body painting, and facial tattooing. Men proudly rolled their hair into numerous pencil-thin braids, plastered with reddish mud or boiled mesquite sap.

People traveled primarily by foot but used willow log rafts to cross the river or travel downstream. Excellent swimmers, they ferried children across the river in pots or baskets.

Storage facilities included subterranean pits and elevated granaries. Pots and large willow stem baskets rested on elevated platforms that protected stores from floods and animals. Structures included small thatched summer shelters near fields, ramadas, and winter houses. The latter were rectangular pithouses approximately 15 feet (4.5 meters) on a side. Four upright posts supported roof beams overlaid by smaller branches and dirt, with walls of similar construction. Cottonwood logs and arrowweed were favored materials. For warmth, live coals were placed in a central floor depression.

The Chemehuevi adopted much of Mohave material culture. They used similar structures, storage platforms, and rafts, although their winter houses lacked front walls. They manufactured similar pottery and grinding implements. Like other Paiute people of the Great Basin, they were proficient at basketry. Agave rope production was a Chemehuevi specialty (Kelly and Fowler 1986).

The Yuman neglect of craftsmanship was consistent with the practice of destruction of property at the owner's death, although some items were distributed outside the family. There was minimal accumulation of property or wealth by particular individuals or families. An ethic of generosity prevailed. Local variations in crop yields were leveled through the informal redistribution of food at harvest feasts. Ritual practices also inhibited the accumulation of wealth. Families capable of marshaling the necessary resources sponsored commemorative mourning ceremonies at which were distributed food and property. These practices impeded the inheritance of goods, maintained a relatively egalitarian social system, and reinforced the status of the household as the primary unit of production and consumption.

Although land was loosely inherited through male relatives, there were no formalized rules of ownership. Due to the presence of irregular patches of land unsuitable for cultivation, farmland consisted of numerous small and dispersed plots for which boundaries were difficult to define. Boundary markers or field contours were sometimes destroyed by floods, and the resulting disputes were resolved through conciliation or regulated combat that might involve shoving matches or tugs of war. Local groups claimed exclusive gathering rights to mesquite groves.

Social and Political Organization

Local autonomy and tribal solidarity characterized river Yuman society. Local groups generally consisted of kin related through male relatives, but flexibility prevailed in residential choices. Patrilineal clans, larger kin groups, were linked symbolically to certain plants, animals, or natural phenomena. These clans were exogamous; marriage partners could not be members of the same clan. Otherwise, ethnographers were unable to determine clear social functions for clans. Bee (1983:91) suggested that clans were once autonomous subtribal groups that lost social significance as tribal solidarity gained importance.

Rancherias had one or more headmen who were important leaders within the tribe as well as their local groups. Leaders were competent men who could successfully handle practical problems. Leadership was conferred rather than inherited, although leaders tended to emerge from particular families. Oratorical ability was important, since decisions were reached by debate and consensus at both local and tribal levels.

The river Yumans had a strong sense of tribal identity, reinforced by cooperation in tribal activities such as warfare, harvest celebrations, and mourning ceremonies. Tribes had limited formal political organization. Chiefs and subchiefs had limited coercive authority but were men of influence. Traditional tribal leaders were Kwanami, war leaders, and the Kwaxot or Kohota, civil leaders who served as speakers, religious leaders, and festival chiefs.

Religion and Ceremonies

Concern with the supernatural was expressed through the concept of dreaming. Individuals acquired power, skills, and talents from dreams, and some dreams were said to foretell future events. Oratorical abilities were given expression through dream recitation and interpretation, the singing of song cycles, and the verbalization of detailed myths which described the journeys of mythical people who were often transformed into animals or landmarks. The culture hero, Mastamho, created the river and the sacred mountain Avikwame. Shamans, believed to have received their powers from Mastamho, dreamed the power to cure particular illnesses.

Harvest festivals and victory celebrations were public social events, but the river people conducted few types of public religious ceremonies and none specifically related to agricultural productivity. Rituals and ceremonies primarily were related to healing and curing, warfare-related purification, initiation at puberty, and death. Public ceremonies focused on funerals and the commemoration of previous deaths. Funeral rites incorporated cremation, property destruction, and oratory. The ashes of wooden funeral pyres were buried in underlying pits. The Karuk, a commemorative mourning ceremony, included a sham battle, copious wailing, and the destruction of property and ritual paraphernalia. It was an elaborately organized tribal event sponsored by particular families. After cremation, ghosts traveled to the land of the dead near The Needles, a pleasant place with plenty of watermelons. Following a series of soul deaths and ghost cremations, ghosts ultimately ceased to exist and ended up as charcoal on the desert (Stewart 1983:67).

Intertribal Relations

The Yuman tribes participated in wide-ranging trade networks incorporating numerous groups in Arizona, southern California, and northern Mexico (Davis 1961; Forbes 1965; Gifford 1936). The Mohave were avid traders and middlemen, traveling as far east as Zuni Pueblo in New Mexico and as far west as the California coast. An established trail across the Mohave Desert linked the Mohave Valley, the Serrano territory in the California uplands, and the Santa Barbara area coastal region occupied by the Chumash tribe (Bolton 1930; Coues 1900; Davis 1961: Map 1; Forbes 1965; Hammond and Rey 1940). The long-distance trade networks moved such exotic and valued goods as marine shell, cotton cloth, and woven blankets. Shell obtained in California passed eastward via the Hualapai and Havasupai to the Pueblo villages. Goods that moved westward toward California included pottery, gourd rattles, and Hopi and Navajo blankets.

Adjacent tribes routinely exchanged subsistence goods, raw materials, and manufactured items. Exchanges between river and upland groups typified a generalized pattern of farmer/hunter-gatherer trade, the exchange of cultivated foods and manufactured goods for raw materials, wild foods, and items produced from wild resources (Davis 1961; Kroeber 1935; Peterson 1978). To the Hualapai and Yavapai, the Mohave offered corn, mesquite, screw beans, dried pumpkin, pottery, shells, and beads of shell and glass. The Pai reciprocated with deer, antelope, and rabbit meat, animal skins, eagle feathers, agave, and mineral pigments. To the Diegueno and other tribes in the mountains of southern California, the river tribes offered pottery, seeds, and gourd rattles in exchange for acorns and pinyon pine nuts.

Extensive travel brought renown to river Yuman and Chemehuevi men. It is said that they could traverse 100 miles a day, although trips usually were more leisurely and involved visiting as well as trade. Success in warfare also gained renown. Friendly and unfriendly interaction were

structured by two extensive tribal alliances. These were loosely organized social networks which promoted visiting and sharing of food surpluses, freedom of movement, intermarriage, and cooperation in warfare (Forbes 1965; Kroeber 1953; Spier 1933; White 1974). Figure 3-2, adapted from White (1974:128), depicts the two alliances linking tribes in Arizona, southern California, and Baja California.

Members of each alliance were enemies of those belonging to the other alliance. White (1974) argued that inimical relationships were grounded in competition for resources between groups which utilized the same environmental zones. This was undoubtedly a factor in intertribal conflict. However, it would not seem to account for the intense intertribal warfare of the 18th and 19th centuries, which involved long-distance travel by intertribal war parties, a considerable degree of planning, and large fierce battles as well as ambushes (Gifford 1936:304; Spier 1933). Prior to that period, Spanish accounts and Mohave tales indicate frequent conflict among river groups, perhaps related to competition for resources or the migration of groups to the river from desiccated Lake Cahuilla (Stone 1981). Conflict along the Colorado caused the Halchidhoma, and possibly the original Maricopa, to migrate eastward along the Gila River. The lucrative Spanish-instigated trade in horses and native slaves, which spread northward from Mexico during the 1700s, probably intensified conflicts, strengthened alliances, and increased the geographic range of warfare (Dobyns et al. 1957). To the historic river Yuman tribes, warfare was a source of tribal unity, spiritual power, and individual prestige. It was a highly organized activity that involved battle formations, prescribed plans, special equipment, and scalp-taking. The Mohave, Quechan, and Yavapai frequently allied against the Cocopa, Maricopa, and Pima. The Quechan suffered a final disastrous defeat, the loss of at least 100 men, when they attacked the Maricopa near present-day Phoenix in 1857. According to Bee (1983:93), Yuman warfare "seemed atypical of the almost nonchalant organization and execution of other community activities." It ceased when the U.S. Army assumed the role of cultural opponent, a shift that eventually led to the establishment of reservations.

Historic Disruption and Changes

The remote rugged region occupied by the Yuman groups provided respite from early Spanish contact. Prior to the 1700s, there was little direct interaction and little apparent disruption of native economic and social systems. Spaniards estimated that up to 10,000 Indians lived along the lower Colorado River. Their estimates, based on sporadic visits, cannot be regarded as accurate. Population densities were particularly high in the Mohave Valley and south of the Colorado-Gila confluence.

Father Garces, a Franciscan priest and explorer, visited the river and Pai groups during the late 1700s. Garces was involved in Spanish plans to establish an overland route between Sonora and California. A crossing at the confluence of the Colorado and Gila Rivers was a key feature of

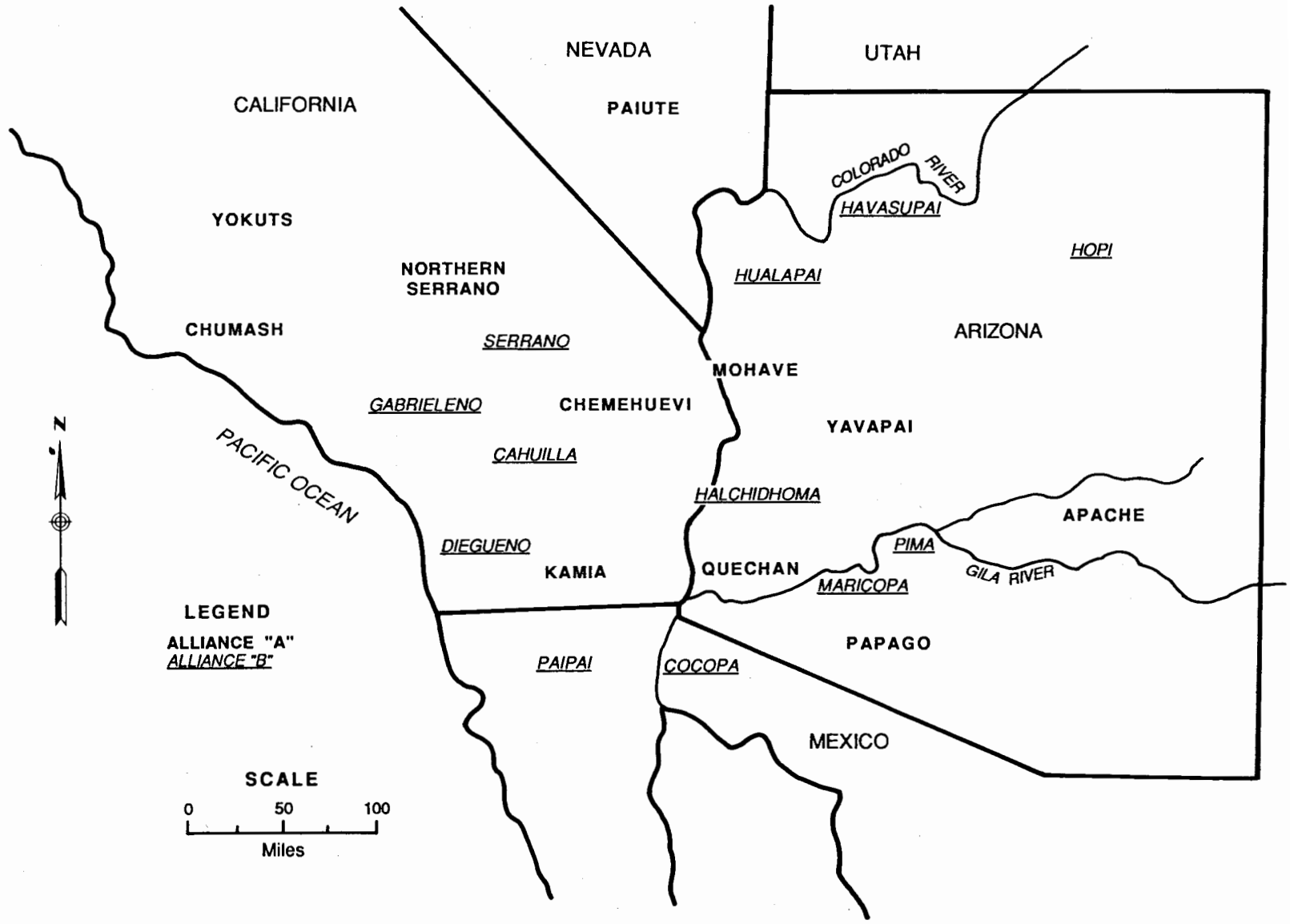


Figure 3-2. HISTORIC TRIBAL ALLIANCE SYSTEMS
(From White 1974:128)

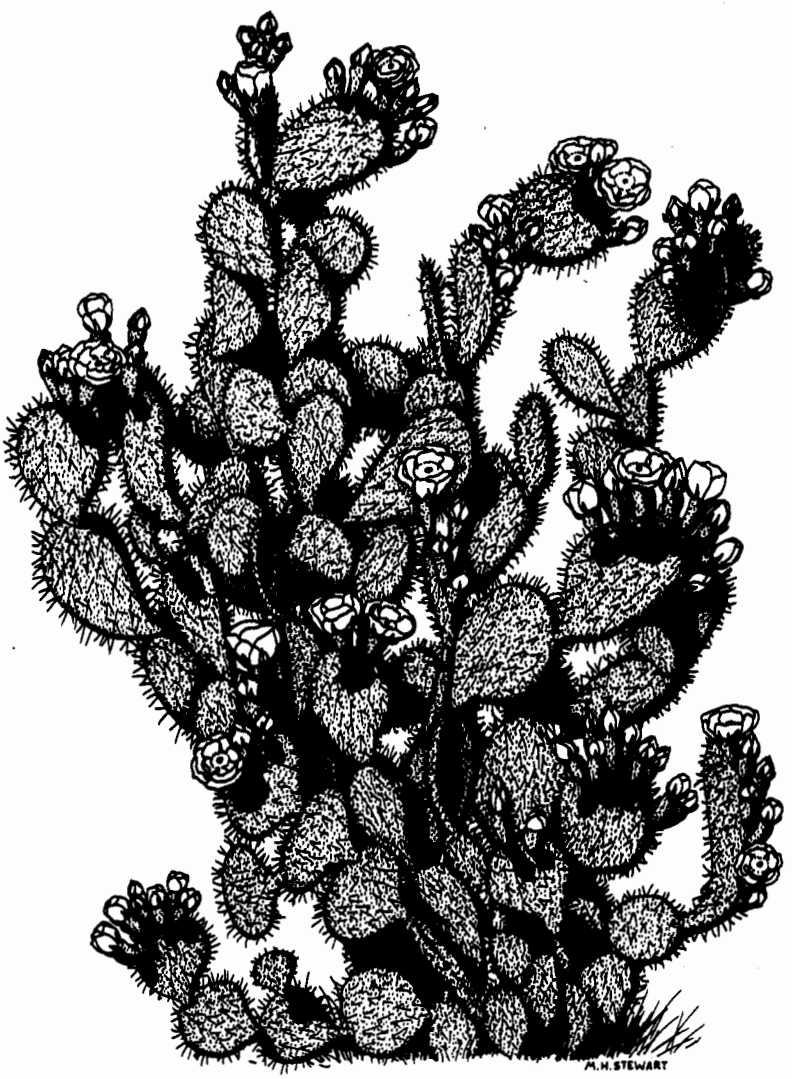
the proposed route. In conjunction with the plans, Garces proposed a grand plan for the missionization of the Colorado River tribes (Forbes 1965:179). In 1781, the Spaniards established two small colonies, Concepcion and Bicuner, near the Colorado-Gila confluence. Supply shortages prompted the settlers to expropriate Quechan stores, and their livestock destroyed native agricultural plots and mesquite groves. In addition, the Spaniards attempted to restrain such cultural traditions as shamanism (Bee 1981:12). The Quechan revolted and destroyed the settlements. Garces and most of the settlers were killed. The Spaniards, who had even bigger problems coping with the Apache, subsequently deemphasized the importance of the land route to California. However, they did attempt to restrain Yuman trade with the coastal tribes of southern California (Forbes 1965:240).

The Spaniards were followed by mountain men, trappers, army explorers, and miners. In the 1850s, the aftermath of the California Gold Rush led to increased travel and settlement in western Arizona. By the 1860s, miners realized the region's vast potential for marketable ore deposits. Mines and settlements were quickly established along the Colorado River and in the areas surrounding present-day Prescott and Kingman. The United States Army set up forts for the protection of settlers and travelers from Indian attacks. In 1858, the Army mounted a campaign against the Quechan and Mohave, eventually defeating them in large-scale battles. The Colorado River Indian Reservation was established in 1865 in the Parker Valley. Many Mohave remained in the Mohave Valley, their ancestral homeland. The Fort Mohave Military Reserve, established in response to Indian attacks on wagon trains, was later designated as a reservation for the Mohave (Stewart 1983). Reservations for the Chemehuevi, Quechan, and Cocopa were established respectively in 1907, 1884, and 1917.

In contrast to many other native Indian tribes, the reservations designated for the lower Colorado River peoples incorporated portions of their prime farming and gathering lands. However, low river levels during the 1880s and 1890s led to crop failures and famine among the river groups and resettled Pai, yet the Indians were not permitted to range into the desert to exploit wild resources (Schroeder 1959). Economic difficulties, meager rations, introduced diseases, and the eventual damming of the Colorado River stressed the native cultural system. The loss of economic self-sufficiency and the government's policy of assimilation imposed further pressures on native traditions (Bee 1981).

As native economic strategies and material culture declined, economic support was augmented by wage labor and woodcutting for steamship fuel. The Cocopa used their knowledge of the delta channels as steamboat pilots and navigators. Native languages, religious beliefs, funeral practices, and mourning ceremonies persisted despite the establishment of Anglo-American schools, churches, and political institutions. The tribes currently receive income from the leasing of lands for agriculture, recreational facilities, and real estate development. Quoting from a

1969 real estate brochure, "the Colorado River Tribes at Parker, Arizona, are in a fortunate position. Unlike other American Indians whose oil pools or precious metals will some day be exhausted, their natural resources are more lasting, and indeed, should become even more valuable as time goes on. Their greatest resource, the Colorado River, the only permanent stream of any size in the Southwest, has only improved with age and 20th Century engineering" (Parker Chamber of Commerce 1969). A continuing pride in tribal identity is perhaps an even greater resource.



CHAPTER 4

HISTORY OF ARCHAEOLOGICAL RESEARCH

Despite the historic and economic significance of the Colorado River and the extensive ethnographic research among its native users, the lower river was relatively neglected by early Southwestern archaeologists. In 1945, Harold Colton, a founder of the Museum of Northern Arizona, wrote that "upon comparing the archaeology of the Valley of the Colorado River, between Lake Mead and the Gulf of California, to the rest of the Southwest, we are impressed with how little is known" (Colton 1945:114). Colton attributed the lack of attention to the river culture's "seeming poverty when compared with the Anasazi and Sinagua cultures of the Plateau and the Hohokam of the desert." The loss of perishable artifacts and the burial of sites by flood-borne silt obscured the region's archaeological heritage. What remained indicated few differences between prehistoric and recorded native lifeways (Colton 1945:116). Thus ethnographic analogy, bolstered by an assumption of long-term cultural stability, dominated the interpretation of Colorado River area prehistory.

Unfortunately, the era of dam construction along the lower Colorado River largely pre-dated a post-war emphasis on reservoir "salvage archaeology." The Historic Sites Act of 1935 authorized the National Park Service to make surveys and investigate archaeological and historical sites on lands outside the National Park system. After World War II, American archaeologists expressed concerns regarding the impacts of extensive dam construction by the U.S. Army Corps of Engineers and Bureau of Reclamation. The National Park Service established an Inter-Agency Archaeological Salvage Program, and much archaeological research during the 1950s and 1960s was carried out in conjunction with reservoir construction (McGimsey 1972:104-105).

The rush to tame and develop the lower Colorado River meant that its archaeological resources escaped the careful professional attention accorded to later construction projects in other areas of the country. The reservoirs probably inundated many sites. Nevertheless, some early work was conducted during the 1930s and 1940s in the vicinities of Lake Mead (behind Hoover Dam) and Lake Mohave (behind Davis Dam), north of the present boundary of the BLM's Yuma District.

The anthropologist Mark Harrington, affiliated with the Southwest Museum in Los Angeles, first worked in southern Nevada where he described the Virgin (River) Branch of the Anasazi, a western extension of the cultural tradition based on the Colorado Plateau. Harrington's work along the Colorado River took place between 1928 and 1935 when he directed Civilian Conservation Corps (CCC) excavations at sites to be flooded by Lake Mead. Archaeological field studies were among the many CCC projects undertaken in northern Arizona. Harrington (1937) tested the Willow Beach site, a stratified campsite later excavated by Albert Schroeder (1961). Harrington's published reports were short and insubstantial, reflecting the character of museum publications at that time (McClellan, Phillips, and Belshaw 1978:33).

Water literally lapped at the heels of the CCC excavators as Lake Mead filled for the first time during the late 1930s. Among the sites they excavated were the Muav Caves, dry caves near Pierce's Ferry which yielded many perishable artifacts. Edward Schenk (1937) explored the Grand Wash confluence area, where numerous sites included dry caves and rockshelters with stratified deposits, camps near springs, and large roasting pits presumably used for the processing of agave. Unfortunately, much of the CCC work was "not technically controlled or properly reported," and collections and notes have been lost (McClellan, Phillips, and Belshaw 1978:34).

Gordon Baldwin directed surveys of the Lake Mohave basin (Cottonwood Valley) in the early 1940s in conjunction with the construction of Davis Dam. Although the survey base maps are lost, site descriptions and manuscripts are on file at the Western Archaeological Center of the National Park Service in Tucson (Baldwin 1943, 1948). Baldwin found 155 prehistoric and historic sites, primarily surface artifact scatters on the first terrace. Archaeological materials appeared to be ubiquitous if not dense. They contained diverse artifacts including chipped and ground stone implements, shell, and pottery. McClellan, Phillips, and Belshaw (1978:36) noted that with the time and resources at his disposal, Baldwin's survey coverage must have been very light. His work included additional test excavations at the Willow Beach site previously investigated by Harrington. The site contained clay-lined and rock-lined hearths and such exotic trade items as shell beads and 3/4 grooved axes.

Carl Tuthill of the San Diego Museum of Man surveyed the Lake Mohave basin downstream from Cottonwood Island. An "inadequate" report with no specific site descriptions listed seven site types: lithic scatters, sherd and lithic scatters, rock rings, "sand dune camps," caves and rockshelters, "alluviated hearths," and trail shrines (cairns) (McClellan, Phillips, and Belshaw 1978:36; Tuthill 1949).

In 1950, Albert Schroeder excavated several trenches and recovered artifacts to a depth of 1.5 meters at the Willow Beach site. At this locality 15 miles south of Hoover Dam, sands containing artifacts, features, and charcoal were separated by culturally sterile silts deposited during floods. In this case, the river was an agent of preservation rather than destruction. Dated pottery types and radiocarbon dates indicated that the camp was used between 250 B.C. and A.D. 1150, with later sporadic use by Paiute groups. Trade items, a variety of pottery types, and the topographic situation supported the site's proposed role as a camp on a major trade route. Carbonized fragments of cordage and cotton textiles, the latter a probable trade item, were an unusual find since perishable remains are rarely recovered from open sites. In the published report (Schroeder 1961), previous CCC work was summarized, and Schroeder defined a cultural sequence of five phases. His summary compared the Willow Beach materials with archaeological collections from southern Utah, the California desert, and other sites in northern Arizona.

For his master's thesis, Barton Wright (1954) excavated Catclaw Cave, located 5 miles south of the Willow Beach site. The meter-thick cultural deposits had little visible stratigraphy. In general, the occupational span and cultural sequence paralleled that at Willow Beach. Catclaw Cave yielded a variety of interesting features and artifacts. There were several types of hearths as well as grass-lined pits, one of which contained a cache of red ochre. Wright also defined an oval structure with rock-lined postholes. There were diverse bone tools, clay figurines, and unfired "pseudo-pottery" similar to materials from southern Nevada and southern Utah (Wright 1954:47). The assemblage of perishable items, labeled as "a disappointment," did not merit that disparaging remark (Wright 1954:54). It included yucca and willow cordage, a whole coiled basket, fragments of baskets and sandals, fragments of sewn skins, wooden tool pieces, a painted hide belt, and dyed cotton string. Paul Mangelsdorf, an expert on prehistoric cultivars, noted that corn fragments were similar to specimens from sites in central Arizona (Wright 1954:64). Unfortunately, other botanical remains were not described in the published report. Numerous charred fish bones from native river species included the remains of a Colorado squawfish nearly 2 meters long. The cave also contained bones of bighorn sheep, beaver, and rabbits.

South of the site of Davis Dam, Malcolm Rogers explored the Colorado River margins during the 1930s and 1940s. Rogers, working out of the San Diego Museum of Man, spent decades exploring the archaeology of the Colorado River and its adjacent deserts. In southern California, he defined site types, artifact types, and a cultural historical sequence later applied to the archaeology of western Arizona (Rogers 1939, 1945). He also developed a ceramic typology for Lower Colorado Buffware, the pottery manufactured in the Salton Basin and along the lower Colorado and lower Gila Rivers.

Much of Rogers' work remained unpublished (Rogers n.d.). The exact locations and areal extent of his surveys are uncertain. His reconnaissance activities evidently focused on sites pinpointed by local informants; areas near springs, mountain passes, and major washes; and river terraces covered by desert pavement. Rogers employed a flexible approach to site definition. His "sites," located only generally on maps, often incorporated vast areas of scattered features and artifacts. He also mapped extensive prehistoric trail networks. Rogers recorded over a hundred prehistoric sites within the Yuma District, mostly adjacent to the river. Along the river, sites were dominated by lithic scatters, trails, geoglyphs, and cleared circles. The Laguna Dam area appeared to host a dense concentration of sites. Rogers believed that erosion had destroyed many sites along the Gila River in the Dome area further to the south. The northern end of the Gila Mountains was apparently a caching area which yielded whole pots and baskets now in private collections. Away from the rivers, Rogers mapped major trails through the Kofa and Castle Dome ranges, linking the Colorado River to eastward destinations. Along Tyson Wash on the La Posa Plain, he found numerous grinding implements and cleared circles, as well as indications of buried deposits in dunes along the channel. He suggested that

prehistoric folk used local mesquite and water available in sand tanks or occasionally flowing streams. The San Diego Museum of Man houses Rogers' notes, maps, and collections. Waters (1982) analyzed the ceramic collections and expressed support for the original classification scheme developed by Rogers for Lower Colorado pottery.

The National Park Service sponsored a reconnaissance survey of the Colorado River and lower Gila River conducted by Albert Schroeder (1952). This survey of areas south of Davis Dam took less than a month, obviously characterized by the quick selective coverage of a general reconnaissance. As was the case with the Rogers survey, the exact survey areas and extent of coverage are uncertain. Schroeder recorded 69 sites within the present Yuma District. "Villages" and "farm camps," presumably associated with long-term habitation and floodwater farming, were concentrated within the three major valleys: the Mohave Valley, the Great Valley, and the Yuma Valley below the Colorado-Gila confluence. "Trail camps," geoglyphs, petroglyphs, and small artifact scatters were located in the areas of Topock, the Bill Williams confluence, the Cibola Valley, and Imperial Dam. Along the Gila River, sites were concentrated in the area of Antelope Hill. In a few cases - Antelope Hill, the area above Imperial Dam, and the Cibola and Palo Verde Valleys - the site concentrations recorded by Rogers and Schroeder coincided. Otherwise, there were clear divergences in mapped site concentrations, shown on Figure 4-1. It appears likely that given their research interests, Rogers focused on desert pavement terraces and tributary washes, while Schroeder combed the valleys in search of remaining floodplain villages, a discouraging task. At the few village or rancheria sites along the river, he recorded assemblages of pottery, grinding implements, hammerstones, and trade items. Intrusive pottery from the Prescott area was found in the Chemehuevi and Parker Valleys, and shell and Hohokam sherds found in the Blythe area indicated contact with central Arizona groups. Schroeder presented a revised description of Lower Colorado Buffware, a source of controversy since he stressed differences in temper and clay composition rather than forms, rim types, and decorative variables as Rogers had done (Waters 1982). Schroeder attributed certain pottery types to groups residing along different reaches of the Colorado and lower Gila Rivers.

Gwinn Vivian of the University of Arizona conducted a general reconnaissance survey of the lower Gila River. Petroglyph sites and artifact scatters were found near Antelope Hill and Wellton, and native-manufactured clay figurines of cows, horses, and cowboys were discovered at a refuse dump near the mining town site of Gila City, located at the north end of the Gila Mountains. Vivian (1965) suggested that many archaeological sites along the river west of the Mohawk Mountains had been destroyed by modern agricultural activities.

In 1932, a pilot named George Palmer discovered the intriguing Blythe Intaglios, giant human and animal figures scraped into the desert pavement at the base of the Big Maria Mountains. This discovery sparked interest in the "ground figures" of the lower Colorado River region and southern California deserts, enigmatic images of figures and geometric

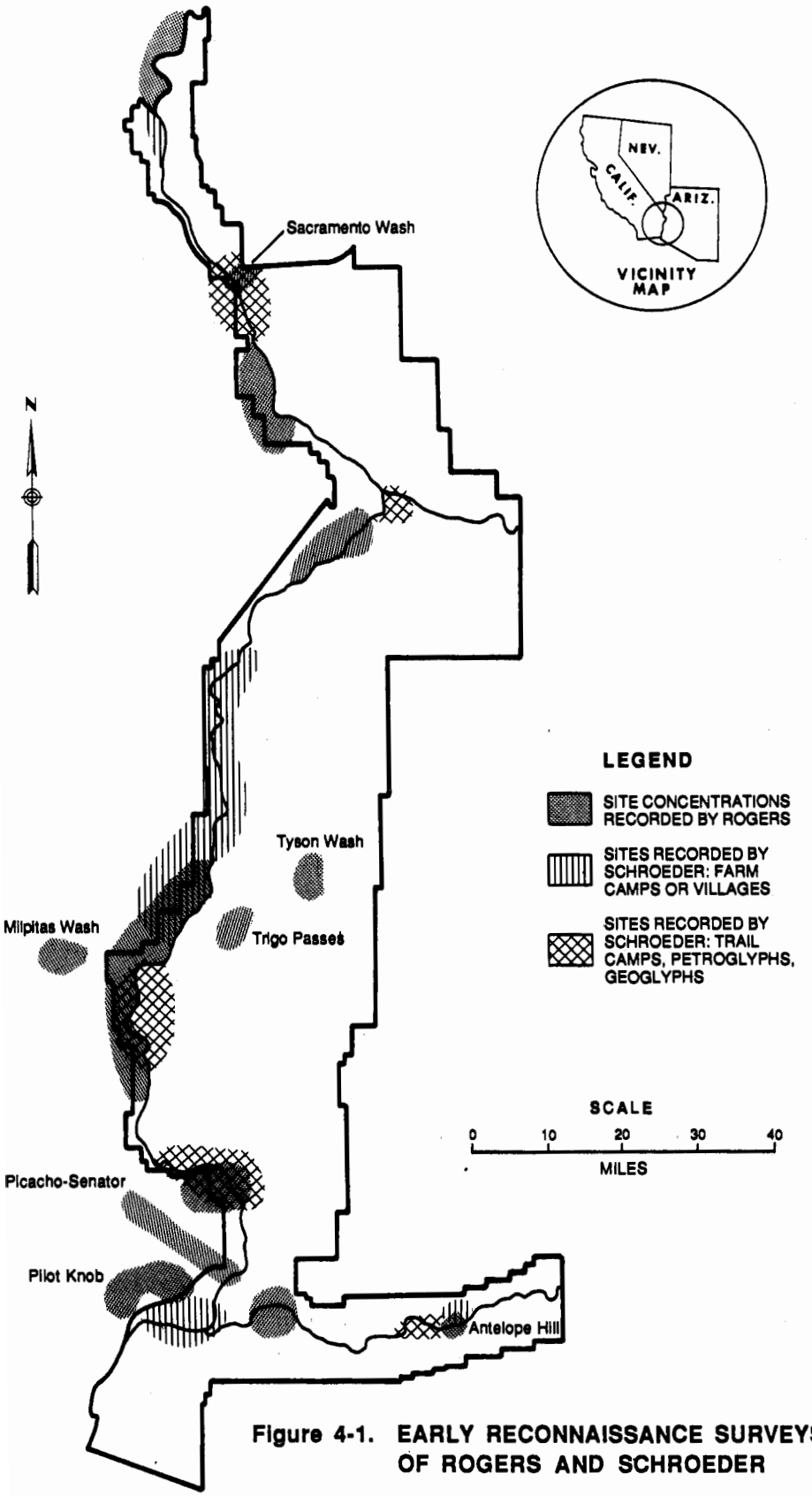


Figure 4-1. EARLY RECONNAISSANCE SURVEYS OF ROGERS AND SCHROEDER

designs formed from desert pavement displacement or rock alignments. U.S. Army generals were among the early aerial viewers. General George C. Marshall and Frank Setzler, then anthropology curator at the Smithsonian Institution, discovered the Ripley Group of intaglios south of Ehrenberg, Arizona, and published an article in the National Geographic (Setzler and Marshall 1952). Since then, numerous researchers have recorded, by air and ground, over 200 geoglyph figures in the deserts of California, western Arizona, and northern Mexico. Since 1976, wide-ranging surveys have been carried out by Harry Casey, a pilot and avocational archaeologist, and Jay von Werlhof of the Imperial Valley College Museum. Boma Johnson, Yuma District Archaeologist for the Bureau of Land Management, has recorded and mapped newly discovered and previously known geoglyph sites. His efforts at recording, interpreting, and managing these sites have culminated in publications summarizing site characteristics, functional aspects, Native American connections, and management strategies (Johnson 1985; Solari and Johnson 1982).

The Bureau of Reclamation funded a reconnaissance survey conducted by the University of Nevada, Las Vegas, during 1969 and 1970 (Brooks, Alexander, and Crabtree 1970). Discontinuous areas close to the river were surveyed from Needles southward, but the focus concentrated on two areas: Parker Dam to the Cibola Valley and Laguna Dam to the international border. Approximately 200 recorded sites included sherd and lithic scatters (small terrace camps?), lithic chipping stations, rock rings, cleared circles, and petroglyphs as well as historic sites. Unfortunately, cursory unpublished reports were inadequate for assessing survey techniques and intensity, research values of sites, or broader scientific and management issues (McGuire and Schiffer 1982:458).

Also during 1969, Oswald and Euler (1970) excavated the Reef Site, a historical aboriginal camp occupied sometime between 1860 and 1910. This small site, located 13 miles south of Ehrenberg, was one of the few sites with subsurface deposits excavated along the lower Colorado River. In addition to the work at Willow Beach and Catclaw Cave, Rogers (n.d.) excavated mounded "shrines" of discarded artifacts, and Harner (1958) excavated trash fill within a prehistoric well near Bouse, just outside the Yuma District boundary about 30 miles east of Parker. Rogers and Harner used their work to establish initial regional chronologies based on sequences of ceramic types associated with dated intrusive sherds.

Passage of the National Historic Preservation Act of 1966, as well as other environmental and antiquities legislation of the following decade, mandated the identification and management of archaeological sites on Federal lands. Laws also required the evaluation and, if necessary, mitigation of adverse impacts to cultural resources caused by Federally sponsored or funded construction projects, or by Federal undertakings. The legislative basis, along with increasing sophistication and precision in archaeological survey procedures, promoted more systematic, intensive, areally focused surveys that yielded a higher quality of data. In the lower Colorado region, this benefit was offset by the small areas covered by corridor, sample, and clearance surveys. To date, no major research project has focused on a relatively large block of land within the Yuma

District. Yet although intensive survey coverage has been confined to limited areas, these areas have been dispersed over many zones. The least amount of coverage has been accorded to the national wildlife refuges, the mountainous area surrounding Lake Havasu City, and the Yuma Desert.

Several corridor surveys traversed the Yuma District. Few archaeological sites were found along the Granite Reef Aqueduct on the Cactus Plain, but the survey revealed the presence of fossilized tortoise shell of paleontological significance. Substantial lithic scatters were located along the Bill Williams River near The Mesa (Brown and Stone 1982). Further south, a survey along Highway 95 north of Quartzsite, the northern sandy area of the La Posa Plain, located only a few isolated artifacts (Nissley 1977).

In the area between Blythe and Quartzsite, survey corridors paralleled prehistoric and historic trails connecting mountain passes. Surveys of pipeline routes (Hoffman 1977a, b; Lensink 1976) and the Palo Verde-Devers electric transmission line (Carrico and Quillen 1982) recorded trails, lithic scatters, and rock rings. The Palo Verde-Devers investigators noted a relatively high site density along Tyson Wash. They concluded that the central La Posa Plain was not only a major travel corridor but also a relatively lush area where short-term camping was based on the use of dense stands of mesquite, palo verde, and ironwood. To the east of the Yuma District boundary, more substantial camps at the bases of the Plomosa, New Water, and Kofa ranges were occupied by Archaic and later Patayan groups who possibly harvested agave and saguaro. The Palo Verde-Devers survey results matched earlier observations by Rogers.

The Yuma 500 kV transmission line, running parallel to the north of the Gila River, cut through sites dominated by lithic scatters and cleared circles. Several sites, including possible base camps, were collected and investigated in detail (Effland, Green, and Robinson 1982; Schilz, Carrico, and Thesken 1984).

Prior to a commissioned overview of the Yuma Proving Ground (Hoffman 1984), the BLM conducted limited surveys within that area. Boma Johnson surveyed small parcels, and Tim Mann (1983) revisited sites recorded by Rogers and surveyed dispersed sample units in order to develop a preliminary predictive model of site locations. Hoffman (1984) summarized the database for the military reserve, where less than 1 percent of the land had been surveyed intensively. The 208 recorded sites were diverse in size, artifact density, and composition. They incorporated varying numbers and combinations of rock rings, cleared circles, trails, artifacts, lithic chipping stations, cairns, hearths, petroglyphs, and bedrock mortars. There were several caves or rockshelters, trail systems, and a possible base camp. Sites were distributed over a variety of landforms, although the largest and most diverse areas were close to water sources. Half the recorded sites were either of unknown age or cultural affiliation or were apparently reoccupied or reused over a long period of time, perhaps by both Archaic and Patayan populations.

The Yuma Proving Ground later contracted local studies to private archaeological consultants. WESTEC Inc. surveyed over 800 acres along Indian Wash, where numerous small lithic chipping areas were dispersed with associated trail segments, rock rings, pot breaks, and cleared circles (Schilz and Clevinger 1985). Subsequent data recovery incorporated a geomorphological investigation of Pleistocene and Holocene surfaces and associated sites (Effland, Schilz, and Jertberg 1987).

West of the Yuma Proving Ground, the Bureau of Reclamation funded an intensive survey of the proposed Hart Mine quarries, an area of over 1,100 acres at the western flank of the Trigo Mountains. The 23 recorded sites included small artifact scatters, lithic chipping areas, trails, cleared circles, a rhyolite quarry, a rockshelter, and two sites consisting of cached pottery jars (Schaefer and Elling 1987). Remains of seeds and maize pollen indicated that the ceramic ollas were used for storing food. The cached containers may have secured emergency stores in the event of raids as suggested by ethnographic evidence, or the supplies could have been used by hunters or travelers (Shelley and Altschul 1988).

Several archaeological studies were carried out just west of the Yuma District boundary in California. Whalen (1976) sample surveyed areas of the Picacho Basin between the Quechan Reservation and the Cargo Muchacho Mountains. The survey was later supplemented by work associated with the Southwest Powerlink Project, a transmission line survey for San Diego Gas and Electric. Pendleton (1986) investigated the Picacho Basin segment. Lithic scatters, cleared circles, and trails were attributed primarily to travel and lithic quarrying activities by groups from the Colorado River, as the basin contained no substantial camps. "Macroflaking" areas, possibly for the production of pestles, were discovered at the base of the Chocolate Mountains. Pendleton's final report presented a detailed summary of research issues and relevant ethnographic information.

Also in conjunction with the Southwest Powerlink Project, Woods (1986) discussed archaeological and ethnographic data concerning Pilot Knob, a very significant area in both respects. Over 100 recorded sites included many lithic scatters and a major concentration of geoglyphs. The co-occurrence of dense lithic debitage and geoglyphs suggested an unusual combination of economic and ceremonial functions, "an intensity and diversity of prehistoric activity unprecedented in southeastern California." Woods, an ethnologist, offered a detailed assessment of Native American concerns relevant to Pilot Knob and other sacred areas.

Recent inventories have been carried out by BLM archaeologists or as BLM-sponsored research. Surveys have focused on areas subject to potential exchange or leased for public use; areas prone to imminent or ongoing disturbance by mining, recreational uses, or other activities; and areas likely to contain particularly fragile sites such as geoglyphs. Within the Yuma Resource Area, Johnson has surveyed in the vicinity of the Muggins Mountains, North Gila Mountains, and the Imperial Long-Term Visitor Area. East of the river above Imperial Dam, the BLM conducted an intensive survey of a parcel transferred to the State and the U.S. Fish and Wildlife Service. Many geoglyph sites have been

documented on Federal land between the Cibola Valley and Blythe, and an area of intensive off-highway vehicle (OHV) use was surveyed along Ehrenberg Wash. Other BLM projects included a survey of the Cyprus Mine and an ongoing inventory of the La Posa Long-Term Visitor Area, a zone of intensive use during both prehistoric and modern times.

Due to the presence of the Blythe Intaglios and numerous other prehistoric sites, the narrow strip of Yuma District land between the Big Maria Mountains and the Colorado River has received much attention. Among numerous researchers, Jay Von Werlhof and Boma Johnson have covered the most ground, over 5,000 acres altogether. Von Werlhof (1982) considered the area a major ceremonial center on high ground above an occupational and farming zone largely obliterated by floods, although remnants of villages may remain. The BLM (1984) prepared a cultural resource management plan for the Big Maria area, a significant cultural resource zone threatened by its proximity to a highway and recreational developments.

Within the Havasu Resource Area, the extreme southern and northern zones have been the focus of intensive surveys. Many sites were recorded along Osborne Wash during surveys of spectator areas along the course of the annual SCORE 400 OHV race along washes and existing roads. Along the Parker Strip, surveyed areas subject to recreational disturbance yielded lithic scatters, rock rings, and trails. The Lake Havasu City area, where much BLM land consists of rugged backcountry, has sustained a lower level of survey. Nevertheless, caves and possible Archaic sites have been documented in the Mohave Mountains, and petroglyph sites exist within canyons.

In the vicinity of Topock and Needles, archaeologists documented the famous "Mystic Maze" and lesser-known geoglyphs. BLM survey projects were generated by potential land exchanges. The Golden Shores survey covered approximately 4,500 acres above Topock east of the river. Dispersed lithic artifacts, lithic chipping areas, rock rings, and cleared areas were common, linked by trail segments. One relatively substantial concentration of features, a possible camp or major resource area, was associated with a trail network (Green 1987). Across the river, a survey of several hundred acres south of Needles revealed a pestle manufacturing area and an unusual pottery vessel perhaps left from the tourist trade along the Santa Fe railroad line.

Rapid urban development in the Bullhead City area threatened the cultural resources located on scattered parcels of BLM land. On lands dedicated to public use in the Riviera area, the BLM surveyed, fenced, and placed an interpretive sign along the historic Hardyville Wagon Road. The Beale Wagon Road ran from Fort Mohave eastward through a pass in the Black Mountains. On the bajada of the Black Mountains, the historic road passed through areas of petroglyphs and "macroflaking." During surveys in the Big Bend area east and southeast of Bullhead City, BLM archaeologists were among the first researchers to recognize clusters of broken boulders and huge flakes as the remnants of metate, pestle, and mano manufacturing. Manufacturing loci were extremely abundant and

widely distributed over several sections of land. In view of their large numbers and redundant nature, a sample of ten loci were selected for detailed investigation. The BLM awarded a data recovery contract to the Arizona State Museum, with the work directed by Bruce Huckell. Data recovery strategies were generated from a series of explicit research questions concerning grinding tool production, exchange, and utilization by the Mohave and their ancestors. Detailed artifact analyses and experimental production revealed the technology used to transform andesite boulders into usable implements. Huckell (1986:54-55) concluded that the quarrying activity produced metates, mortars, and pestles for intra-Mohave Valley consumption over a period of perhaps a few hundred years.

The above summary does not account for all work conducted within the region, but it does describe the major projects and efforts. Figure 4-2 describes the extent and locations of archaeological survey projects. Those most familiar with the lower Colorado River region are the BLM archaeologists dedicated to discovering and protecting its cultural resources. In many cases with the help of volunteers, they have conducted numerous small-scale surveys and site inspections. Vast areas remain unsurveyed except for unsystematic reconnaissance, particularly in mountainous zones, and many sites have not been documented in sufficient detail for adequate research or evaluation of significance. The region's archaeological record is an assemblage of dispersed local studies brought together only in one specialized synthesis on geoglyph sites (Johnson 1985) and a small number of overviews.

Cultural resource overviews relevant to the lower Colorado River region, authored by Swarthout and Drover (1981) and McGuire and Schiffer (1982), contain useful information on the history of research, prehistoric cultural sequence, and ethnography of the region. However, they fail to provide sufficient detail to generate sensitive evaluation of archaeological sites or appropriate management strategies given specific site distributions and land use patterns. No previous overviews have focused specifically on the entire Yuma District.

Swarthout and Drover's study was commissioned by the Bureau of Reclamation for areas along the lower Virgin River and the Colorado River south of Glen Canyon Dam at the northern Arizona border. They emphasized the poor quality of archaeological data, particularly from the older surveys, for the area south of Davis Dam. Distributional summaries and management directions were addressed in general terms. The volume by McGuire and Schiffer (1982), a very useful overview funded by the BLM, incorporated much of the Yuma Resource Area and the Papagueria, but it excluded the Havasu Resource Area of the Yuma District. The overview focused predominantly on areas south of the Gila River, although it incorporated chapters and appendices on Lower Colorado Buffware pottery (Waters 1982) and intaglio sites (Solari and Johnson 1982).

Class I overviews for the BLM's Phoenix District contain background information, research considerations, and descriptions of archaeological resource types relevant to the lower Colorado River region (Stone 1986,

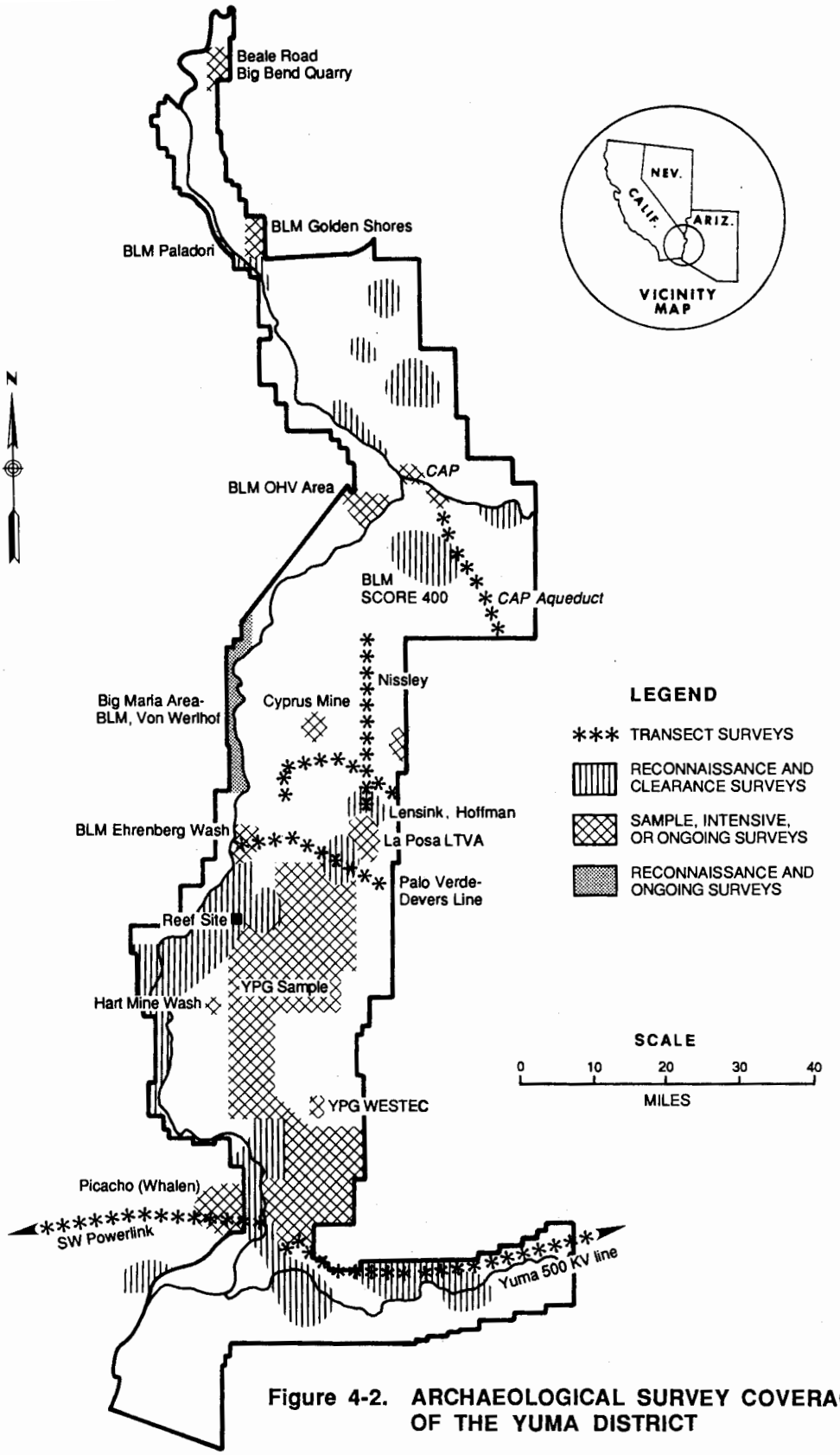
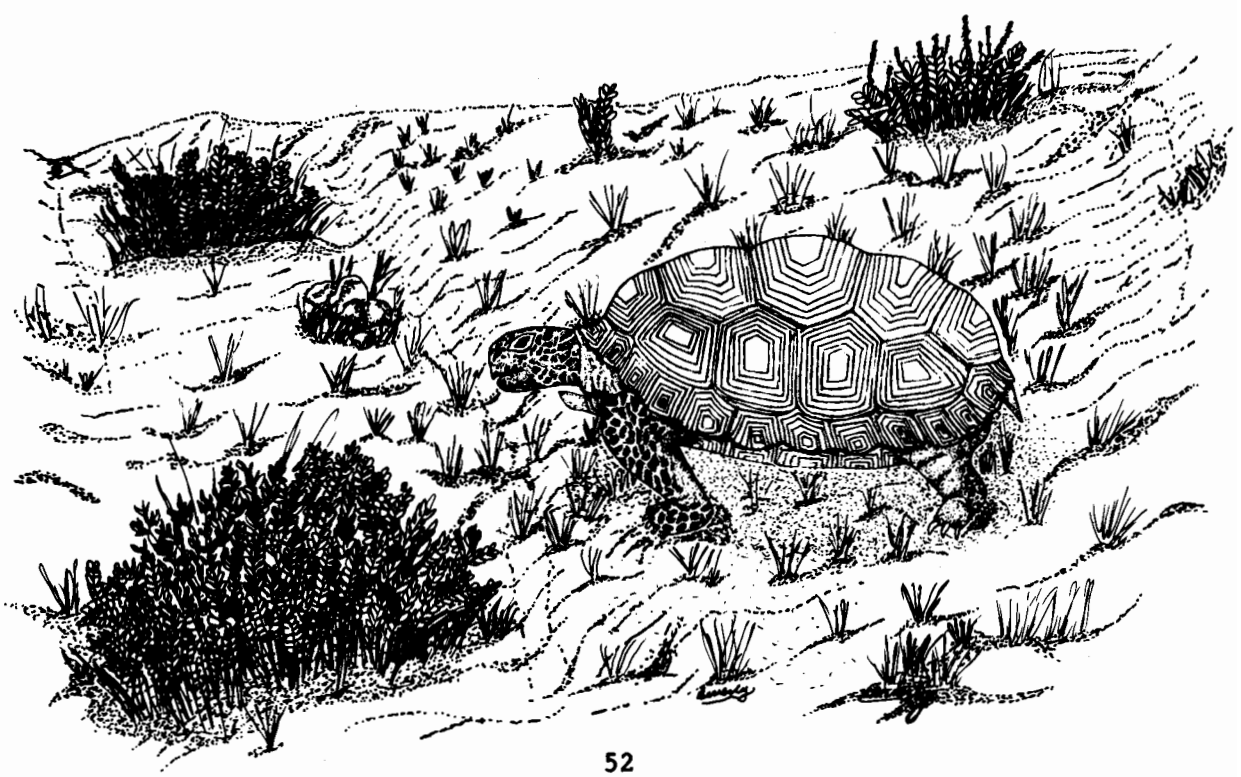


Figure 4-2. ARCHAEOLOGICAL SURVEY COVERAGE OF THE YUMA DISTRICT

1987). McClellan, Phillips, and Belshaw (1978) published an archaeological overview of the Lake Mead National Recreation Area north of Davis Dam. To the west of the Yuma District, Warren et al. (1981) summarized the environment, prehistory, ethnology, and history of the Colorado Desert planning units of the BLM. Much of the information relates directly to cultures of the Colorado River. That overview did not incorporate the Salton Basin, an area significant to lower Colorado prehistory as the location of prehistoric Lake Cahuilla, a major settlement area for Patayan groups. Wilke et al. (1976) addressed the prehistoric use of the delta overflow channels and the lake in an overview of the cultural history and native groups of the Yuha Desert region.

Detailed information on lower Colorado River prehistory, as it is currently understood, exists in the cited overviews and research reports, in additional references listed in their bibliographies, and in filed but unpublished archaeological and ethnographic reports. It is a prehistory based largely on unpublished data of varying quality, the assumptions and cultural sequences of Rogers and Schroeder, and a plausible yet unproven reliance on ethnographic analogy.



CHAPTER 5

PREHISTORY OF THE LOWER COLORADO RIVER REGION

Given its position as a ribbon of relative abundance within a region of more scarce resources, great antiquity is generally assumed for human occupation along the lower Colorado River. This assumption is plausible, particularly when considered in relation to thousands of years of human occupation of the Great Basin and southern California, from which the Colorado may have drawn migrants. To the southeast, Ventana Cave was occupied by 9000 B.C., possibly by groups with western ties (Haury 1950), and the Sierra Pinacate, believed to have been occupied by similarly ancient peoples, contains archaeological sites very similar to those along the river (Hayden 1982). Unfortunately, hard evidence for the oldest periods of occupation is scarce due to the lack of excavated, stratified deposits yielding remains datable by such chronometric techniques as radiocarbon and archaeomagnetic dating. The ubiquitous surface features of the region, possibly used by different groups over time, have too often been attributed subjectively to ancient pre-ceramic peoples.

Before Pottery and Farming: The Earliest Occupational Periods

The presence of continental ice sheets prior to 9000 B.C. created a profoundly different environment than that of the present. Studies of geomorphology, Great Basin lake levels, pollen profiles, fossil pack rat nests, and global temperature fluctuations have indicated the nature of environmental changes since that time (Davis 1982; Van Devender and Spaulding 1979; Weide 1982). These changes influenced the timing and character of human occupations.

Near the end of the Pleistocene period or Ice Age, conditions were relatively cool and moist with a dominant pattern of winter precipitation. Plant species extended to relatively lower elevations, and western Arizona was covered by open juniper-scrub oak woodlands mixed with species now characteristic of the chaparral and Mohave Desert. Lakes existed over much of the Great Basin but were relatively rare in Arizona (Meinzer 1922). In what are now the deserts of southern California, these pluvial lakes were focal points for human occupation along their margins. Within 50 to 100 miles of the Colorado River, several ancient lakes existed in basins west of the Big Maria, Whipple, and Chemehuevi Mountain ranges (Warren et al. 1981:54).

Some researchers have argued that the Mohave and Sonoran deserts were inhabited prior to 10,000 B.C., but as yet there is little strong evidence to support the position. A recent controversy centered on the antiquity of the "Yuha Man" skeletal remains found west of El Centro, California. Caliche (calcium carbonate) surrounding the bones yielded a radiocarbon date exceeding 20,000 years (Bischoff et al. 1976). Critics charged that caliche is unreliable for radiocarbon dating of associated cultural materials, since it may be dissolved and redeposited after its

initial formation. They also noted that the geological context was inconsistent with the reported age (Payen et al. 1978). In 1980, the Yuha skeleton mysteriously disappeared from its storeroom, but remnant fragments were radiocarbon dated to an age not exceeding 5,000 years (Science 84 (4):11).

Desert lithic scatters often contain crudely made, heavily varnished artifacts embedded in desert pavements. These sites appear extremely old and may well be so. Degrees of embedding and varnish thicknesses can indicate relative ages of artifacts at particular locations. However, artifacts on desert pavement may be recent as well as ancient, and crudeness is a poor indicator of antiquity. Desert varnish formation occurs at different rates in different localities depending on local climatic and geologic conditions. Optimal conditions for varnish coating occur on basalt surfaces in arid regions with summer thunderstorms. Thus in many areas of the lower Colorado region, varnish may form relatively rapidly (Moore and Elvidge 1982:527).

In the Mohave Desert, radiocarbon dates from the organic component of desert varnish were recently used to calibrate cation-ratio dates. Cation-ratio dating is an experimental method based on the rates at which minor chemical elements are leached out of rock varnish. Dates on over 100 artifacts from six surface lithic scatters indicated the distinct possibility of an occupation predating 10,000 B.C. However, scientists concluded that most sites were quarries used over long timespans extending to late prehistoric times (Dorn et al. 1986:832). Until better evidence is obtained from stratified contexts or reliable chronometric techniques, "claims for extreme human antiquity in southern California will remain statements of faith rather than fact" (Aikens 1983:661). That statement also applies to western Arizona, where the earliest occupations have been interpreted from a California perspective.

The term "Paleo-Indian" refers to the earliest generally accepted occupation of the American continents by people whose ancestors had crossed the exposed Bering Strait land bridge sometime during the late Pleistocene period. The most reliably dated sites post-date 10,000 B.C. The Clovis complex, the earliest recognized Paleo-Indian tradition, is characterized by a set of distinctive artifacts widely distributed over North America. Clovis projectile points are large lanceolate "fluted" points having a long channel flake removed from the point face. Dates from Clovis sites cluster between 9500 and 9000 B.C. (Haynes 1970). The association of Clovis materials with now extinct Pleistocene fauna indicates a focus on the hunting of large game such as mammoth and bison. According to Cordell (1984:138):

> The wide geographic distributions . . . suggest hunting strategies that could have spread because of particularly favorable environmental circumstances. Alternatively, the distributions may indicate economic strategies that were flexible enough to have been appropriate across a range of environmental conditions.

Initially abundant natural resources, population growth, and a highly mobile lifestyle may have promoted the rapid colonization of new areas.

Clovis and similar point types occur as isolated surface finds in the Great Basin. In Arizona, Clovis points tend to be found in the eastern part of the State where lush grasslands supported Pleistocene game herds. Only one Clovis point, found in the Arizona Strip country north of the Colorado River, has been reported from western Arizona (McClellan, Phillips, and Belshaw 1978:51).

Contemporaneous complexes of the "western lithic co-tradition" have been proposed for the Great Basin (Davis et al. 1969; Elston 1982; Warren and True 1961). They share a presumed emphasis on hunting and the use of lakeside marsh resources by highly mobile small groups. Little archaeological evidence exists to substantiate the nature of economic and social systems. Interpretive problems reflect the dominance of isolated surface finds and the presence of presumably early artifact assemblages as small components within later sites.

In western Arizona and southern California, the western lithic co-tradition incorporates the San Dieguito complex defined by Malcolm Rogers (1939, 1958, 1966). He originally defined the earliest desert occupants as the "scrapermaker people" in reference to their most common artifact type. In 1939, he introduced the San Dieguito term and defined three phases: Malpais, Playa I, and Playa II. These were eventually renamed as San Dieguito I, II, and III.

San Dieguito I assemblages included a variety of percussion-flaked chopping, scraping, and pounding tools. Projectile points and blades were rare, and implements were crude in appearance. According to Rogers, these earliest tools were heavily patinated and weathered, with flake scars dulled by "sand blasting."

San Dieguito II assemblages incorporated elongated, leaf-shaped points, more finely worked bifaces, and a greater variety of scrapers. San Dieguito III artifacts included smaller pressure-flaked specimens such as points, slender blades, amulets, crescents, and new knife and scraper forms. Grinding implements were generally absent in all phases.

Features assigned to the San Dieguito complex include intaglios, circles cleared on desert pavement, rock rings, and trails. Realizing that these features were not exclusive to San Dieguito, Rogers distinguished relative ages on the basis of topographic contexts, differential weathering, and associated artifact types.

Rogers' phase sequence was based primarily on his studies of surface artifact scatters. Chronometric dates are rare, and nowhere have all three phases been recovered in stratigraphic context (Warren 1967). Charcoal from the C.W. Harris site near San Diego yielded radiocarbon dates in the range of 7000 to 6000 B.C. for San Dieguito III materials (Warren 1967:179). At Ventana Cave, similarities were noted between the Ventana Complex, dated to 9300 B.C., and San Dieguito I artifacts (Haury 1950).

The lack of stratified sites and secure dates, as well as the wide geographic distribution of San Dieguito I in comparison to later phase materials, led researchers to question the validity of the phase sequence. Rogers' sequence was based on questionable assumptions regarding topographic associations, variations in weathering and patination of artifacts, and an increase in technological sophistication through time. For example, artifacts on upper bajada desert pavements seem to have been automatically assigned to the San Dieguito I phase regardless of possible associations with later sites. Researchers questioned the link between the early and later phases as well as the validity of the San Dieguito I phase (Irwin-Williams 1979:34; McGuire and Schiffer 1982:169; Warren 1967:171). According to Warren (1967:170):

> Malpais (San Dieguito I) is thus defined by a series of artifacts which show little stylistic patterning, have wide temporal and areal distribution, are from widely scattered sites which were often occupied or utilized by peoples of other cultures, and which are temporally placed on the basis of high degree of chemical alteration on the flake scars. These criteria hardly seem sufficient for the definition of a cultural unit.

It is possible that the choppers, scrapers, and crude bifaces assigned to San Dieguito I represent a basic multiple purpose tool kit that could be quickly and easily produced from local raw materials. Such a technological tradition could have persisted over a long period of time in a variety of topographic settings.

For the later Paleo-Indian period, Warren and True (1961:267) noted similarities between San Dieguito II and III materials and artifacts characteristic of the Lake Mohave complex (Campbell et al. 1937). Lake Mohave was a pluvial lake in the California desert, not to be confused with the lake currently impounded behind Davis Dam on the Colorado River. The complex, generally dated from 8000 to 5000 B.C., incorporated the distinctive Lake Mohave and Silver Lake projectile point types. The former were slender leaf-shaped points with long contracting convex-based stems.

According to Rogers, numerous San Dieguito I sites were situated on the upper terraces of water sources that were more reliable during the early Holocene period. The Colorado River terraces were a major occupational zone. San Dieguito II and III artifacts were occasional finds near the river and rare in the adjacent desert of Arizona. Lake Mohave points have been found in the Mohave Mountains and along Bouse Wash east of the Yuma District boundary. If the San Dieguito I phenomenon represented an early occupation, yet to be demonstrated, the archaeological problem lies in separating and recognizing it in the midst of quarrying activities and later occupations.

The Paleo-Indian period may have extended to approximately 5500 B.C. in the Southwest (Cordell 1984). During this early Holocene period following the retreat of the glaciers, there was a gradual warming and drying trend, although the pattern of winter-dominant precipitation

persisted. In the Great Basin, there was a gradual dessication of lakes. Juniper, chaparral, and yucca species persisted in western Arizona, and creosote extended its range. As conditions became warmer and drier, some groups may have abandoned areas that were previously occupied. During this period at Ventana Cave, the Ventana Complex materials were separated from later occupational levels by an "erosional disconformity" (Haury 1950). As the California lakes diminished near the end of the Paleo-Indian period, groups may have moved to the Colorado River and penetrated eastward along major drainage systems.

By the middle Holocene period, which began at about 5000 B.C., post-Pleistocene environmental changes are generally believed to have been accompanied by shifts in human subsistence strategies in the western United States. The subsistence base apparently became more diversified, incorporating a broader range of plants and fauna with less emphasis on the hunting of large game. Following excavations at Danger Cave in the Great Basin, Jennings and Norbeck (1955) introduced the Desert Culture concept to represent this foraging lifeway. As originally defined, the Desert Culture was a widespread cultural pattern distinguished by seasonal mobility, a reliance on wild grasses and small game, and the conspicuous presence of grinding implements and basketry. It was ancestral to later farming traditions but persisted to historic times in portions of the Great Basin. Later the Desert Culture was linked to the concept of a continentwide Archaic developmental stage characterized by technological versatility and the efficient exploitation of a wide variety of wild, seasonally available resources. In the North American deserts, the Archaic stage incorporated numerous regional variants linked by the challenge of survival in an arid environment.

The period from 6000 to 2000 B.C. was one of profound environmental changes. Global temperatures were elevated, and lake levels were low in the Great Basin. It is difficult to determine whether the major climatic change entailed greater aridity or a shift in the seasonality of rainfall. The pattern of summer monsoon rains developed during this period, generating a biseasonal rainfall regime in western Arizona. There was a fairly rapid northward and upward retreat of juniper, chaparral, and Mohave Desert species and an expansion of Sonoran Desert species such as palo verde, ironwood, saguaro, and various cacti. By the end of the middle Holocene period, essentially modern environmental conditions were established (Madsen and O'Connell 1982; Van Devender and Spaulding 1979).

Rogers (1939) defined the Amargosa tradition as the Archaic successor to the San Dieguito complex in southern California and western Arizona. The Amargosa tradition incorporated the addition of grinding implements and distinctive projectile point types to the San Dieguito lithic assemblage. Rogers originally defined a sequence of Pinto-Gypsum, Amargosa I, and Amargosa II phases. He later revised this sequence after collaborating with Emil Haury in the interpretation of Archaic materials from Ventana Cave. The later version designated the original Playa (Lake Mohave) complex as Amargosa I. Pinto-Gypsum became Amargosa II, and the

original Amargosa I phase became Amargosa III. Finally, the initial Amargosa II phase was likened to Late Archaic Basketmaker and San Pedro Cochise materials in Arizona.

The Lake Mohave complex may have persisted to about 4000 B.C. According to Huckell (1984:198), "tapering-stemmed" projectile points characterized an "Early Archaic" period lasting to 4800 B.C. This was Rogers' Amargosa I phase. Artifacts included percussion-flaked scrapers and choppers, and grinding implements consisted of thin flat slabs (Rogers 1939:52). Settlements were associated with water sources.

After 4000 B.C., there was an apparent expansion of populations into such areas as western Arizona and the central Great Basin. The dessication of the Great Basin lakes, as well as possible increases in population, may have led to eastward migrations. During the Amargosa II phase from about 4000 to 1500 B.C., Pinto and later Gypsum projectile point styles were dominant. This was Huckell's (1984) "Middle Archaic" phase. Pinto and similar point types included a variety of stemmed forms with indented bases (Rogers 1939). Gypsum points, named for the Gypsum Cave site in southern Nevada, had sharply contracting stems. Grinding implements such as basin metates appeared in artifact assemblages.

During the Middle Archaic period, small mobile groups apparently occupied seasonal base camps concentrated near watercourses on valley floors, although a variety of microenvironments were utilized (Lyneis 1982). The Pinto Basin, for which Middle Archaic manifestations were named, was located only 50 miles west of the Big Maria Mountains. However, only sporadic surface occurrences of Pinto-style points have been found in western Arizona. One controversial hypothesis holds that this was an extremely arid period, known as the Altithermal, during which only limited areas were occupied (Antevs 1948). The lack of evidence could reflect a low incidence of regional land use or a very low population density during the Amargosa II period, a failure to discover sites of that period, or a combination of factors.

The Late Archaic period began at roughly 2000-1500 B.C. and may have continued until A.D. 700 in western Arizona. This period incorporated the archaeological phenomena originally labeled as Amargosa I and II by Rogers (1939) and later revised to Amargosa III and late pre-ceramic designations. The Gypsum projectile point style carried over into the early part of this period, and other characteristic point styles were stemmed, notched points with convex or straight bases assigned to the Elko and San Pedro styles (Huckell 1984). There was a general elaboration of lithic technology incorporating refined biface production, pressure flaking, an increase in the diversity of formal artifact types, and the use of superior raw materials. The material culture also incorporated a greater variety of grinding implements and perishable artifacts.

Paleoenvironmental information indicates that the period from approximately 2000 B.C. to A.D. 1 was relatively cool and moist, with a possible depression of the summer monsoons in favor of winter rains.

Lake levels increased in the Great Basin (Bayham et al. 1986; Madsen and O'Connell 1982). More favorable environmental conditions, increasing population densities, or a combination of factors apparently affected economic and settlement strategies. Larger base camps, reoccupied more frequently or for longer intervals, were located near watercourses and playa margins on valley floors. Evidence indicates a greater emphasis on upland resources and big game hunting. Some desert areas were utilized more intensively than at any other time (Lyneis 1982).

Continued population growth and favorable environmental conditions may have promoted an expansion of populations into western Arizona. Late Archaic sites are abundant relative to those of earlier periods. Rogers (n.d.) recorded many Late Archaic sites in western Arizona mountain ranges, particularly in the Castle Dome, Kofa, and Tank ranges. Relatively substantial camps contained numerous grinding implements, roasting pits, and charred animal bones indicative of hunting and use of agave or other plant resources. Archaic camps were also located along washes in the basins. Rogers (1939:68) described unusual broad-stemmed dart points common in western Arizona but "atypical" in California and the Great Basin. Similarities to Basketmaker as well as San Pedro projectile point styles may indicate a peripheral westward expansion of Uto-Aztecan groups. Historical linguists believe that Uto-Aztecan populations began to expand their geographic range at about 3000 B.C. (Hale and Harris 1979). They may have been ancestors of the modern Pimans and Hopi, speakers of Uto-Aztecan languages. At Ventana Cave, a dominance of San Pedro projectile points indicated an incursion from the east (Haury 1950). At Willow Beach, Schroeder (1961) noted similarities between materials of the Price Butte phase, radiocarbon dated to ca. 250 B.C., and Basketmaker II assemblages from the Colorado Plateau. The Price Butte phase appeared to be a western variant of Basketmaker II, a phase of the Archaic sequence defined for the Plateau.

Increasing population densities may have eventually reduced the efficiency of mobile hunting and gathering. There was a continued use of diverse wild resources during the Late Archaic period. However, in some areas of the Southwest and Great Basin, there was a more intensive use of particular food resources or an adoption and increasing use of new resources. Corn and squash were cultivated at least sporadically in many areas of the Southwest by 1000 B.C. (Cordell 1984:168-173).

The period from approximately A.D. 1 to 700 is one of poorly understood transitions. From A.D. 1 to 500, warmer global climatic conditions may have been accompanied by increased aridity or a return to a higher annual proportion of summer rainfall. In many areas of the Great Basin, including the Mohave Desert, small groups reverted to a highly mobile pattern of hunting and gathering apparently similar to the lifeway of Middle Archaic groups. There was a shift away from big game hunting and refined lithic production. In much of the Southwest, the social and economic processes that began in the Late Archaic period culminated in the establishment of small farming villages. Population growth, resulting restrictions on mobility, and increased summer rainfall may have hastened the settlement of sedentary villages and an increasing

reliance on crop cultivation. These developments were probably enhanced by the introduction of drought-resistant crops and the adoption of pottery. Cordell (1984) summarized the original derivation of agriculture and ceramics from Mesoamerican sources.

In western Arizona, where greater aridity, a lower proportion of summer rainfall, and rugged topography limited the extent of reliance on farming, the use of upland resources may have persisted. By A.D. 700, pottery appeared along the lower Colorado River, and large stemmed dart points had been succeeded by small corner-notched points, indicating the replacement of the atlatl or spear-thrower by the bow and arrow.

The Willow Beach site was used only sporadically during the Nelson phase between roughly A.D. 250-450. Artifact assemblages of the Eldorado and Roaring Rapids phases between A.D. 450 and 700 were similar to those of Basketmaker III and later pueblo sites along the Virgin and Muddy Rivers in southern Nevada. The earliest pottery types were graywares characteristic of the Virgin Branch, a western variant of the Colorado Plateau Anasazi. However, Schroeder (1961) also noted the presence of artifact types more commonly found at late Amargosa sites in the California desert, including "striated" scratched stones. He suggested that groups began to migrate eastward to the Colorado River during this period. According to historical linguists, a geographic expansion of Yuman speakers began at about A.D. 1 (Hale and Harris 1979). Relatively arid conditions in the Mohave Desert, with its lack of summer rainfall, may have contributed to an eastward migration. By A.D. 700, a type of Tizon Brownware known as Cerbat Brown, possibly produced by ancestral Yuman groups, replaced Virgin Branch Lino and Boulder types as the dominant pottery at Willow Beach (Schroeder 1961).

Recent test excavations at Bighorn Cave, a stratified site yielding organic and perishable remains, revealed changes in the use of the site over a long period of time (Geib and Keller 1987). The National Register-listed site is situated within a canyon in the Black Mountains east of Bullhead City-Riviera. Radiocarbon dates indicated sporadic use prior to 3000 B.C. followed by an occupational hiatus between 3000-1500 B.C. Abundant and diverse artifacts and features indicated Late Archaic use as a base camp between 1500 B.C. and A.D. 1. An emphasis on hunting was suggested by a lack of grinding implements, a relatively high frequency of projectile points and bifaces, and knotted cordage indicating the production or use of hunting nets. The presence of split-twig figurines, representations of animals, indicated a relationship to Colorado Plateau Archaic groups (Schroedl 1977). An occupational hiatus between A.D. 1 and 600 was followed by a period of intensive use between A.D. 600 and 900, a relatively cool mesic period as indicated by pollen analysis. Organic and artifactual evidence indicated that the cave served as a winter-spring base camp where wild plants were used as foods, medicines, and raw material for cordage and basketry. The presence of maize suggested a transhumant settlement pattern involving farming and wild resource use along the Colorado River during the summer and fall, perhaps by ancestral Patayan groups. By A.D. 900, river Patayan culture, based on relatively sedentary farming, became

established along the Colorado River. After that time, Bighorn Cave was used sporadically, possibly as a temporary travel or hunting camp. The loss of status as a seasonal base camp may have been a response to the enhanced importance of floodwater farming or the establishment of exchange relations between river and upland groups.

The River Patayan

By A.D. 900, perhaps as early as A.D. 700, the Colorado River margins were occupied by people who apparently lived in a manner similar to ethnographically recorded river Yuman groups. Various cultural labels have been assigned to the prehistoric producers of Lower Colorado Buffware pottery, probable ancestors to the historic Yuman tribes. Rogers (1945) labeled the prehistoric people as "Yuman." Colton (1945) objected to the term since it implied an undemonstrated continuity between prehistoric and historic groups. The substitute was the term "Patayan," a Yuman word for "old people," selected because "it was easy to say" (Colton 1945:119). The term was intended to designate a lower Colorado Basin culture as a phenomenon separate from the Anasazi, Mogollon, and Hohokam traditions of the Southwest (Figure 5-1). The Patayan area incorporated deserts east and west of the lower Colorado River. The "Laquish Branch" was situated along the southern reach of the river, while the "Cerbat Branch" incorporated the river and uplands to the north of the Bill Williams River. Schroeder (1957, 1979) replaced the term "Patayan" with "Hakataya," a controversial label since it incorporated many prehistoric groups in central Arizona which may have been affiliated with other major cultural traditions. Both terms remained in use. In their regional overview, McGuire and Schiffer (1982) favored the Patayan designation.

Rogers (1945) defined a series of three phases, labeled as Yuman I, II, and III, later converted to Patayan I, II, and III by Waters (1982). The chronology was based on the analysis of Lower Colorado Buffware ceramics, "produced and used along the Colorado River from the southern tip of Nevada to the Gulf of California, along the drainage of the lower Gila River, and in the peripheral deserts of western Arizona and southern California" (Waters 1982:275). In defining ceramic types, Rogers and Waters focused on differences in surface treatments and vessel and rim forms (Waters 1982:277). Schroeder (1952) revised type definitions to incorporate a greater emphasis on tempering materials. Waters (1982) argued that temper should be a secondary consideration rather than the primary factor in classification, since distinct differences in paste and temper composition were often difficult to define.

Rogers assigned relative dates to ceramic types on the basis of test excavations and "horizontal trail stratigraphy" (Waters 1982:276-277). He reasoned that prehistoric trails intersected by headcutting arroyos were older than adjacent intact trail segments and that their associated artifacts were also older. Chronometric dates for Patayan phases were derived from a small number of associated radiocarbon dates, dated intrusive ceramics, and the association of ceramic types with dated

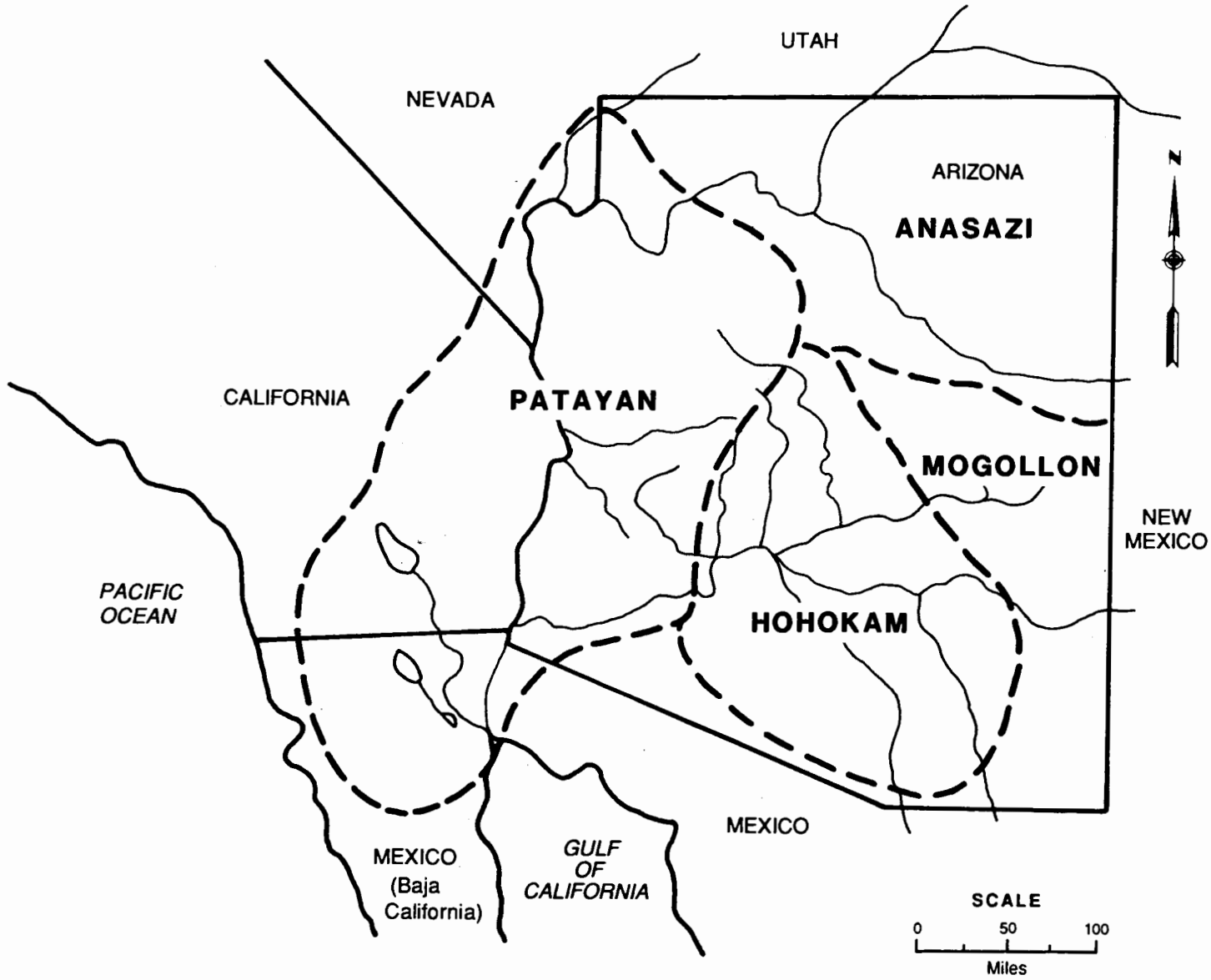


Figure 5-1. PREHISTORIC SOUTHWESTERN CULTURAL TRADITIONS (Based on Cordell 1984)

shorelines of freshwater Lake Cahuilla, a prehistoric lake created by the natural and periodic diversion of the Colorado River from its delta into the Salton Basin of California (Waters 1982).

The Patayan I phase dated from A.D. 700 to 1000. Rogers (1945:196) postulated an influx of immigrants, sometime prior to A.D. 900, from southern California or northern Mexico. Historical linguists believe that the Yuman languages emerged as a separate language family at about A.D. 1 and that Yuman groups migrated outward from the Colorado delta region (Hale and Harris 1979). According to Rogers' distributional maps (Waters 1982:286), Patayan I ceramics were confined to the lower Colorado margins below present-day Parker. Schroeder concurred that Lower Colorado Buffware initially developed in the south but noted that local gray and brown wares were manufactured further north by A.D. 700, as indicated by the pottery at Willow Beach. Buffware appeared in that area after A.D. 900, when the Mohave Valley became home to the "Amacava Branch," possibly immigrants from the Mohave Desert.

Patayan I ceramic types were distributed south of the Bill Williams confluence, along the lower Gila River, in the adjacent desert areas, and along the eastern shore of Lake Cahuilla. Major types were Black Mesa Buff, Colorado Beige, and Colorado Red. Characteristic traits were rim notching, lug and loop handles, the "Colorado shoulder," incised decoration, burnishing, and a red clay slip (Waters 1982:282). Schroeder (1952) argued that redwares were a later development. Harner's (1958) excavations at the Bouse site supported an early date for Patayan redware, but recent radiocarbon dates from the Gila Bend region suggested that several Patayan I types continued to be manufactured beyond A.D. 1000 (Bruder and Spain 1986).

The earliest river Patayan were apparently avid travelers and traders. At the Bouse site, possibly an outpost on a major travel route to central Arizona, Harner found intrusive Hohokam sherds and axes, as well as marine shell. At the Willow Beach site, also a camp on a probable trade route, locally produced Pyramid Gray pottery was associated with shell, steatite, asphaltum, and turtle shell rattles from California. To Schroeder, this indicated that the Amacava were taking over the trading position of the Virgin Anasazi, the Pueblo people who abandoned their southern Nevada villages by A.D. 1150.

The Patayan II period, between A.D. 1000 and 1500, witnessed the territorial expansion of ceramic types, and presumably their makers, up the lower Gila River and into the California desert. In the north, the distribution of Lower Colorado Buffware extended into southern Nevada. There were five major ceramic types: Tumco Buff, Parker Buff, and Topoc Buff along the Colorado River; Palomas Buff along the Gila River; and Salton Buff along the shoreline of Lake Cahuilla. Discarded traits were the "Colorado shoulder," incised decoration, and certain vessel forms. New forms were introduced, as were recurved rims and stucco finishes.

A major stand of Lake Cahuilla supported a population that manufactured Salton Buff and imported Tumco Buff from the Cibola Valley area. These people apparently subsisted on fish, shellfish, and aquatic avifauna to a large degree (Wilke 1978).

In western Arizona, Patayan II sherds were found along numerous trails. Based on the presence of Lower Colorado Buffware at Hohokam sites in the Gila Bend area, Wasley and Johnson (1965) postulated an increasing level of interaction between the Patayan and the Gila Bend area Hohokam. Pottery also was traded northward into Nevada and southward to the Sierra Pinacate in northern Mexico.

The Patayan III period incorporated protohistoric and historic times following A.D. 1500. The manufacture of Tumco Buff and Salton Buff ceased, and there were technical refinements in the symmetry, thinness, and painted decoration of other types, continuing into historic times. A new type, Colorado Buff, was manufactured primarily in the north. Throughout the Patayan sequence, red paint was the color of choice, but the Chemehuevi decorated Colorado Buff vessels with black paint (Waters 1982:570). Patayan ceramics reached their greatest geographic range, as far west as the Pacific coast and as far east as Phoenix, indicative of participation in historic alliances and trade networks.

The dessication of Lake Cahuilla after A.D. 1400 probably caused eastern shoreline residents to migrate to the lower Colorado River, while occupants of the western shore may have joined ancestral Diegueno groups in the coastal range. A population influx along the river may have contributed to intergroup strife documented by the first Spanish explorers (Forbes 1965). Apparently prior to A.D. 1600, ancestors of the Maricopa migrated to the Gila Bend area (Spier 1933). Wasley and Johnson (1965) argued in favor of a gradual replacement of Hohokam populations by Patayan groups after A.D. 1200 in the vicinity of Gila Bend. Archaeological evidence from the Las Colinas Hohokam site in Phoenix and from areas west of Phoenix indicates that Patayan and Hohokam groups may have co-existed as early as A.D. 900 (Sires 1988; Stone 1986:69). Schroeder (1979) would interpret this as evidence of the antiquity of the wide-ranging Hakataya tradition, perhaps derived from preceding Amargosa groups. Table 5-1 summarizes the culture history of the lower Colorado River region.

On the basis of geographic associations, Schroeder (1979) tentatively linked particular ceramic types and prehistoric branches of the Hakataya to historic tribes. Parker Buff was linked to the Amacava Branch and the Mohave. Parker Buff was most common between the Bill Williams River and Palo Verde. In the Mohave Valley, the Fort Mohave Variant was manufactured in the 1800s (Waters 1982). Topoc Buff, common in the California desert west of the Mohave and Chemehuevi Valleys, was linked by Schroeder to the Salton Branch, a general term applied to the California Hakataya. Waters argued that it was manufactured in the Mohave Valley and imported into the desert. He viewed it as an oxidized form of Pyramid Gray. According to Schroeder, the Halchidhoma were the descendants of the La Paz Branch in the Cibola and Palo Verde Valleys

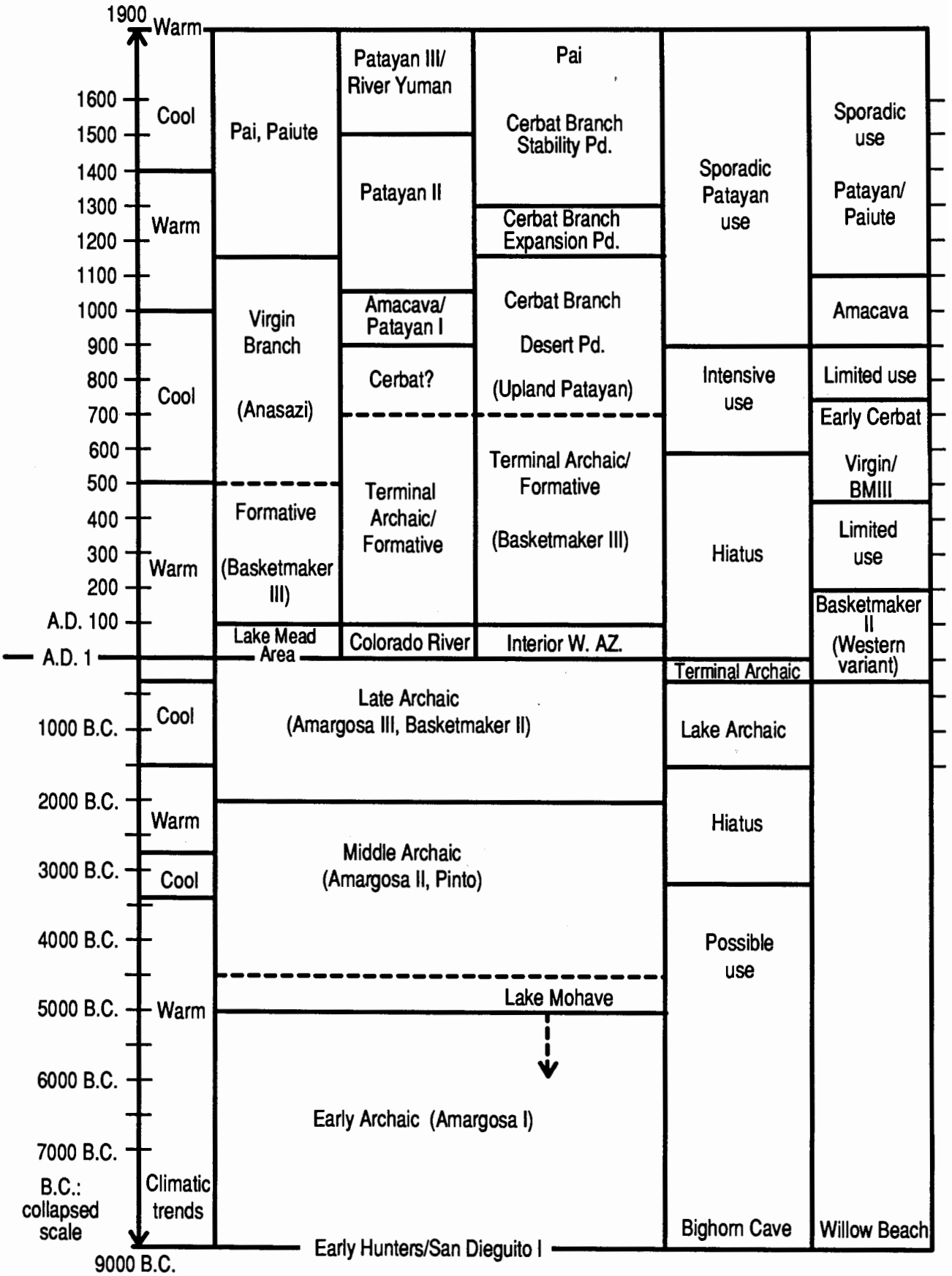
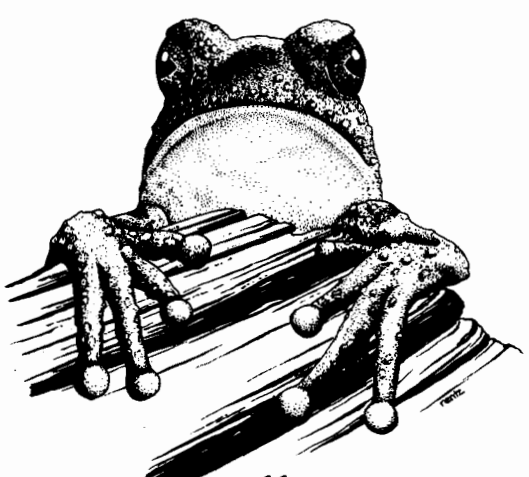


Table 5-1. Sequence of Cultural Phases, Lower Colorado Region.

south of Blythe. They produced Needles Buff, a type not described by Waters. Further south, the Quechan were linked to the Palo Verde Branch in the Yuma area where Tumco Buff was produced. According to Waters, Tumco Buff was manufactured from Blythe southward, but its origin was near Yuma. Schroeder associated Palomas Buff, produced along the lower Gila River and confined to Arizona, to Lower Gila Branch ancestors of the Kaveltcadom. The Maricopa were viewed as descendants of the Gila Bend Branch, producers of Gila Bend Beige. Little direct archaeological evidence exists to support these hypothesized connections, and the Schroeder and Waters ceramic typologies conflict in many respects. More detailed references on ceramics include Colton (1958), Rogers (1936), Schroeder (1982), and Waters (1982).

River Patayan settlement, subsistence, and organizational patterns are generally interpreted by analogy to the historic river Yumans. The paucity of archaeological evidence reflects preservation conditions and poorly documented early work. Small dispersed settlements and farm plots have probably been inundated by reservoirs, buried by silt deposition, or eroded by floods and the lateral shifting of channels (Swarthout and Drover 1981). Although it is meager, evidence on material culture and settlement patterns indicates Patayan-Yuman continuity (Colton 1945; Huckell 1986).

Ethnographic analogy indicates reliance on river floodwater farming, fishing, wild plant gathering, and the hunting of small game (Castetter and Bell 1951). Among the river Yuman tribes, the historic Mohave relied to the greatest degree on cultivated crops. However, periodic crop failures, as well as the combined occurrence of massive spring floods and a minimal level of stored and wild resources, probably induced the river groups to utilize the resources of the adjacent mountain ranges and bajadas. Swarthout and Drover (1981:66) suggested that winter base camps were located on the bajadas and lower slopes of mountains east of the Colorado River. Rogers (n.d.) also stressed the economic significance of the desert to the groups residing along the rivers. Trade with upland groups may have provided an additional measure of economic security to the river Patayan.



CHAPTER 6

TYPES AND DISTRIBUTION OF CULTURAL RESOURCES

Archaeological site descriptions can take many forms at varying levels of detail. Descriptive typologies incorporate relative or quantitative information on the size and content of artifact scatters and the types, numbers, densities, and physical associations of features and artifacts within bounded areas defined as sites. The more precise the description, the better the understanding of differences indicative of how many times areas were visited or used for particular purposes. Sites along the Colorado River contain many ubiquitous types of features and artifacts that recur in varying numbers, densities, and combinations at different locations. Except for information from more recent surveys, many of the descriptions of existing sites are not precise enough to gain a meaningful understanding of differences and related behavioral implications. More detailed mapping of recorded sites would contribute to the refinement of descriptive typologies and more effective research. In many cases, mapping would constitute the primary means of data recovery and preservation, since many regional sites consist of surface scatters and features.

The early surveyors tended to classify archaeological sites in terms of functional categories such as "trail camp," "farm camp," and "village." No detailed descriptions supported those assignments. Even for sites mapped in relative detail, there has been little detailed study of artifact assemblages except for ceramics collected by Rogers (Waters 1982), grinding implement manufacturing areas (Huckell 1986), and a few recent small projects. Functional classifications have been based on ethnographic analogy placing residential, farming, and fishing areas on the floodplain and lower terraces; and ceremonial areas, temporary camps used during floods or travel, and limited activity areas on upper terraces and bajadas. Such classifications should be based on site-specific analyses as well as interpretations derived from ethnographic analogy. The information in the site files renders it difficult to determine the similarities and differences among many sites assigned certain functional labels.

Along the Colorado and Gila Rivers and their margins, archaeological manifestations do appear to fall into certain broad functional categories. Some researchers have drawn a distinction between residential and ceremonial areas, the former concentrated on the lower terraces and the latter on higher terraces overlooking the river. Residential sites could incorporate continuously occupied floodplain rancherias, seasonal base camps, or temporary camping areas reused to varying degrees. Ceremonial sites likely focused on geoglyphs or petroglyphs. Other sites may have been created as a result of specific economic activities involving tool manufacturing or the procurement and processing of raw materials, sacred materials such as quartz, or floral and faunal food resources. Travel and communication were additional activities that generated archaeological remains. There are strong indications that landscape modification, in the form of modified desert pavement surfaces and rock arrangements, may have

conveyed both sacred and mundane information. The Native Americans spoke with rocks, ground figures, and pecked symbols that served as texts, shrines, and signs to people who traveled widely and frequently for many purposes.

Many areas may have been used primarily for certain purposes, while other areas may have supported multiple activities, even combined ceremonial and economic pursuits. For example, the procurement of certain resources may have occurred during the course of long-distance travel. Ceremonial and social gatherings may have been held at temporary camps occupied to escape seasonal floods. At Pilot Knob and other geoglyph areas, archaeological evidence indicates both sacred activities and the initial manufacturing of stone tools. Unfortunately, many residential sites were likely destroyed by flooding or river development projects. Thus it will be difficult to compile a comprehensive picture of the region's cultural resources. However, the remaining archaeological record may well reveal functional diversity and complex land use patterns that are disguised by the simple and repetitive nature of many of its cultural resources.

Types of Cultural Resources in the Lower Colorado Region

Archaeological "sites," for which boundary definition can be a difficult and sometimes arbitrary task, vary in area and the numbers, density, and diversity of cultural resources. The following discussion describes the types of cultural resources which, singly or in combination, form sites in the lower Colorado region.

Artifact Scatters

Artifact scatters, located in diverse environmental zones, exhibit considerable variation in size, artifact density, internal structure and diversity, extent of reuse, and function. They may or may not be associated with the remains of structures or other features. Among other functional types, these scatters may represent riverside "rancherias" (dispersed residential locations), seasonal base camps, temporary camps, repeatedly used gathering or hunting areas, low-density scatters indicative of travel or short-term economic uses, nonlocalized lithic manufacturing areas, or specialized sites such as Willow Beach, a camp on a trade route. Small isolated scatters of a few artifacts may represent lithic raw material testing or chipping areas, or artifacts broken during transit. Differences in area, artifact density and diversity, and internal structure can indicate the frequency and duration of use; and the nature of artifacts and features can indicate the activities conducted there. Low-density lithic scatters, common in desert areas, probably represent the remains of numerous single episodes of the manufacture, use, and discard of expedient tools. They often result from the "quarrying" of nonlocalized lithic sources such as cobbles exposed in eroding washes on bajadas. Many low-density scatters evidence the use as well as the manufacture of crude tools, support for an argument that tool production was often "embedded" as an incidental activity to travel or subsistence pursuits.

Many artifact scatters, particularly those located on desert pavement, are likely to have little depth. However, geomorphic contexts should be taken into consideration. Buried deposits may be present at floodplain margins, old lagoon areas, in canyon or upper bajada contexts, or within dunes. Even relatively recent sites, as evidenced by the historic Reef site (Oswald and Euler 1970), may contain subsurface archaeological remains. Soil deposition is not the only factor that can obscure the presence and extent of artifact scatters. Crude desert-varnished stone tools can be difficult to detect when they are embedded within highly varnished desert pavements. Some scatters appear relatively insubstantial at first glance, but the longer one looks, the more artifacts are found.

Artifacts typically include such durable items as lithic manufacturing debris, chipped stone tools, grinding implements, hammerstones, pottery sherds, and occasionally shell or minerals. Perishable items such as baskets, wooden tools, and sharpened arrows, are rarely preserved at open sites. Such artifacts, a significant component of Yuman material culture, tend to be preserved in dry cave and rock shelter deposits. Some items may be cultural artifacts even though they represent neither tools, production aids, manufacturing debris, nor ornaments. Such items could include nonlocal raw materials such as obsidian or shell, stones incorporated into shrines or other features, or pieces of broken quartz, regarded as a source of spiritual power by Yuman peoples.

Research Values. The varying configurations and contents of artifact scatters will affect their contribution to the resolution of various research issues. The research potential of specific sites must ultimately be assessed on a case-by-case basis, in the context of well-defined research objectives. Through the interpretation of activities, correlated environmental features, length of occupation or extent of reuse, and intersite relationships, artifact scatters will contribute to studies of prehistoric settlement systems and land use patterns. Lithic scatters can contribute to studies of raw material selection and technology. Some artifact scatters will offer important contributions to the reconstruction of chronological sequences, patterns of interaction, boundaries and frontiers, and the prehistoric natural environment. Such sites would include those holding subsurface cultural deposits or features; datable substances, such as charcoal or fired clay, in controlled contexts; patinated lithic artifacts; artifacts considered to be diagnostic of a particular time period or culture; lithic or ceramic artifacts of identifiable raw material sources; and such rare or "exotic" items as shell jewelry or polished stone axes.

Many small or low-density sites may well be visually unimpressive, and they may be devoid of datable or diagnostic remains. However, together they reveal patterns of human behavior across a desert landscape through time. Low-density scatters need not simply represent the outlying remains of more substantial artifact concentrations. Many of these areas may have been foraging zones or revisited lithic manufacturing areas used by either river-based or desert-based groups. Functional and technological variations among low-density scatters, as well as their associations

sampling was the most commonly employed. Sampling fractions varied, since the primary goal was to obtain an adequate number of sample units per site. At least 100 units were selected at most sampled sites, with a minimum of 30. There is little doubt that random sampling saved time and labor while yielding representative data on many large lithic scatters. The use of probabilistic techniques also enabled a statistical evaluation of predicted artifact frequencies for different sites (Lewenstein and Brown 1982:134-137). The "equivocal" results indicated that probabilistic sampling is not the most efficient means of obtaining information from some types of artifact scatters. In specific circumstances, other strategies should be considered.

Several factors impinge on the selection of total collection, probabilistic sampling, purposeful sampling, or a combination of these approaches. These include research objectives, the internal spatial structure of sites, and their relative sizes and artifact densities. Unless artifact densities are extremely high, total collection should be appropriate at small sites with definable boundaries. The costs of establishing and implementing a sampling design would probably outweigh any savings in effort, particularly considering the loss of information on intrasite spatial structure and artifact associations. If practical limitations are not extreme, "it would be better to investigate the entire population of items rather than a sample before making summary statements about them" (Redman 1975:153).

Large scatters vary in artifact densities and internal configuration. Probabilistic sampling is an efficient technique for investigating large, dense scatters. This is particularly true for such sites as lithic quarries, where there is likely to be a minimal range of artifact diversity. However, important information could be lost in the sampling of base camps or specialized sites with a high diversity of artifact types or evidence of definable activity areas. Probability sampling "will not provide adequate data on configurational or associational patterns" (Redman 1975:153). Purposeful collection of selected artifact concentrations or feature areas could augment the overall sampling design.

In general, the efficiency of probabilistic sampling decreases as artifact densities are reduced to extremely low levels. Along the Granite Reef Aqueduct, extensive, low-density scatters "could be interpreted only marginally as a coherent entity, or site" (Brown and Stone 1982:83). Nevertheless, surface collections were accomplished through simple random sampling. A 15 percent sample of AZ T:6:1(ASU) yielded 350 artifacts from 115 sample units, an average 3 per 50- by 50-meter unit. At AZ S:6:3(ASU), 132 sample units, measuring 2- by 30-meters each, yielded only 114 artifacts. Clearly, the costs of locating and covering dispersed sample units were unwarranted in view of the meager return in artifacts. This is not to say that the sites lacked information. However, a more efficient approach would have involved the recording of isolated artifacts during the survey phase of investigations. An alternative technique would be the collection of artifacts from a long, narrow transect within such a scatter.

Random sampling appears to be less efficient where artifacts are distributed in dispersed clusters or loci. Lewenstein and Brown (1982:134-137) statistically evaluated sample collections and found that estimates of overall artifact frequencies could be made only within very large confidence intervals. The largest confidence intervals were found at sites with dispersed clusters of artifacts. Confidence intervals were reduced, yielding more reliable estimates, where random samples could be stratified according to areas of variable density and where the spatial distribution of artifacts was relatively homogeneous. Brown and Stone (1982:342) concluded that for extensive sites with dispersed loci, where no identifiable patterns are apparent to structure the sample, "a probabilistic strategy may not necessarily yield more reliable results than one designed along other parameters." At sites with dispersed small loci, it is probably most efficient to focus on a sample of loci or to employ a combined strategy of purposeful and random sampling. Schilz, Carrico, and Thesken (1984:20-22) collected both random and purposely selected sample units at three sites. Only 7 artifacts were found in 60 random sample units, while 344 specimens were collected from 51 purposely selected sample units of the same size.

Archaeologists should consider the use of mixed sampling strategies in appropriate situations. For example, where a site consists of a high density core area with a lower peripheral density of artifacts, total collection could be augmented by a random sample of the peripheral area. At the extensive area defined as site AZ S:7:13(ASU) along the Granite Reef Aqueduct, intervening low-density areas were sampled at a lower intensity than the more dense artifact concentrations at "field loci" (Brown and Stone 1982:71-72). Researchers should be flexible in their approach to sampling and investigative procedures. There are no easy answers or single, correct procedures applicable to all types of artifact scatters.

The results of surface collection can aid researchers in the design of subsurface testing strategies. Unfortunately, spatial relationships between surface and subsurface remains are poorly understood by archaeologists, although many are now researching these relationships. In western Arizona, most tests have yielded very shallow if any subsurface remains. Thus there are few known clues for the detection of such rare phenomena.

There appears to be little justification for test excavations of low-density scatters or sites located on desert pavement (Brown and Stone 1982; Carrico and Quillen 1982:184). However, subsurface testing should not be written off entirely. For example, testing might yield insights into the formation processes of desert pavement. Testing is indicated for any site with evidence of post-occupational deposition. Test excavations should also occur in the following situations: (1) at possible base camps with a high diversity of artifacts; (2) at sites with numerous features and associated artifacts; (3) at sites on alluvial surfaces; (4) where the color, texture, or composition of on-site soils

differ from those of the surrounding area; (5) where features may yield organic or datable substances; and (6) to obtain geomorphological or subsurface pollen data.

Specific testing strategies should be based on the particular characteristics and environment context of the site. Researchers often focus on areas of high artifact density or diversity as well as features or unusual soil deposits, such as diffuse charcoal scatters. It is probably best to diversify the test locations, through either random sampling or the selection of areas of different densities. Such a procedure will minimize subjective biases which may limit the discovery of unexpected spatial patterns. Subsurface features may well be located outside areas of relatively high artifact density.

Rock Rings

Rock rings are among the most common archaeological features in the lower Colorado region. Stone and Dobbins (1982) summarized the results of studies conducted at these features and provided a detailed review of information on rock rings in the deserts of Arizona and California.

Rock rings vary in size and configuration, but their interior diameters appear to cluster within three ranges: 30-70 cm, with a mean value near 40 cm; 1-4 m, with most values between 2 and 3 m; and 5-7 m. The 83 features found along the Granite Reef Aqueduct included 25 small rings, 53 medium-sized features, and 5 large ones (Stone and Dobbins 1982:253-254). Most are circular or semicircular, with some unusual configurations such as "keyhole" shapes or attached features. Rock rings are frequently isolated and devoid of other cultural remains. Over half of the Granite Reef features fit this description, and less than a third had any associated artifacts. Nevertheless, these features sometimes occur in clusters and are often associated with trails. Some may even represent base camps: possible examples include AZ S:8:6(ASU) along the Granite Reef Aqueduct and AZ X:4:1(ACS) along the Yuma 500 kV transmission line (Effland, Green, and Robinson 1982; Schilz, Carrico, and Thesken 1984). These sites consisted of groups of features associated with lithic debris, utilized artifacts, and formal tools. Ceramics are rare at such sites.

Rock rings appear to be most common on areas of desert pavement on upper bajadas, pediment slopes, and river terraces. This context may account for their lack of depth, although contained areas are often cleared and slightly depressed.

Functions have been inferred on the basis of ethnographic analogies. Small rings have been interpreted as supports for baskets or ceramic containers used during gathering and other tasks. Many researchers interpret the larger features as foundations of temporary brush shelters or windbreaks (see Stone and Dobbins 1982:246-247). Some features may have served as hunting or observation blinds (Whalen 1976). The more substantial features with piled "walls," rather than narrow courses of

surface rocks, may represent blinds particularly when located at overlooks at terrace edges. Rings of large, heaped rocks, measuring over 4 meters in diameter, may have been used as vision quest rings or prayer circles for spiritual pursuits (Johnson 1985:37). At the other extreme, Von Werlhof (1982:45) described relatively insubstantial rings with no discernable entryway gaps and relatively widely spaced rocks. He suggested that these were cleared areas for visions or prayer "with a protective cloak of rock lining the perimeter." Alternative rock ring functions remain to be tested.

Research Values. Keyser (1979:142) summarized the research potential of rock rings:

> Careful study of stone circles -- their construction, morphology, associations, and site locations -- can yield information concerning seasonal utilization, settlement pattern, and function. Minor attributes of construction and associated features might yield information relevant to temporal variation, cultural affiliation, . . . and cultural patterns of use if significant comparative data were available.

Investigations of rock rings will contribute primarily to research on settlement and land use patterns. The writings of Rogers (1939) and others have perpetuated the idea that these features are primarily associated with early San Dieguito occupations. The virtual absence of ceramics, the frequent presence of crude or patinated lithics, and an association with "ancient" landforms have been cited in support of this idea. However, these features may have been used over a long span of time by different groups. Indian shelters described by Spanish missionaries were anchored by similar foundations. Rogers suggested that differences in weathering, environmental context, and associated artifacts could distinguish San Dieguito features from later ones (Rogers 1939:8). Boma Johnson has examined aspects of weathering and feature cross-sections that could at least indicate relative dates of features within local areas. Although many rock rings may well be pre-ceramic, chronological and cultural assignments are tenuous at present. Relative and chronometric techniques for dating desert varnish may ultimately be applicable to the dating of interior surfaces and associated artifacts (Solari and Johnson 1982).

Investigative Procedures. When surveyors encounter rock rings, they should be alert for the presence of associated features such as trails. Associated artifacts might be difficult to detect. They tend to be located outside rather than within rings. It can be difficult to recognize heavily patinated or weathered lithics camouflaged by the surrounding desert pavement. It is important to detect such specimens, as they might be of value in establishing the antiquity of these features.

Some rock features have been created as a result of modern military exercises. These include small rectangular features, rock-lined bunkers, and rock rings. They are often associated with obvious recent trash,

such as C-ration tins and tent posts. Interestingly, rock rings at AZ L:16:2(ASU), a military site near Osborne Wash, had interior diameters uncharacteristic of prehistoric features (Brown and Stone 1982:98,254).

Nearly half of the rock rings found along the Granite Reef Aqueduct were partially or totally excavated using alternative testing strategies (Stone and Dobbins 1982:249). Their depth rarely exceeded 5 cm. In general, "excavations of rock circles and cleared circles have consistently proven unproductive in southern California and western Arizona desert regions" (Carrico and Quillen 1982:184). Thus, data recovery should focus on mapping and surface collection. Accurate, detailed recording is essential, since most data will be left in the field rather than transported to the lab. In addition to maps and photographs, data should be recorded on constituent materials and environmental context. Comparative and settlement pattern studies will require information on locations and spatial distributions, morphology (size, shape, and composition), environmental context, and associated artifacts and features. Stone and Dobbins (1982:252) listed a series of variables appropriate for an attribute analysis of rock rings. Such an approach could be modified and applied to regionwide comparative studies, if all projects recorded data at a similar level of detail. Time and effort could be saved through field recording in the initial phase of survey.

Although testing has proven unproductive, it would be unwise to dispense completely with excavation. If we simply assume the lack of subsurface remains, we will never find those that might exist. Therefore, testing should be a highly selective procedure. Where large projects will impact many rock rings, a small sample of representative features should be tested. Tests should be conducted in features and intervening areas of the relatively rare sites with multiple rock rings and associated artifacts. Finally, tests should be conducted at rare features of unusual configuration.

Cleared Circles

Cleared circular areas on desert pavements, unbounded by rocks but similar in size to rock rings, are common along the lower Colorado River. Rogers referred to them as "sleeping circles." The scraping or removal of desert pavement resulted in a cleared, slightly concave depression surrounded by a gravel berm. Some may have been locations of temporary brush shelters or windbreaks, while others may have served as meditation or vision quest sites. Cleared circles, unlike "habitational" rock rings, were associated with "ceremonial sites" as well as "occupational sites" in the Big Maria Mountains area (Von Werlhof 1982:47). Even on archaeological sites having other features or artifacts, these features should be interpreted cautiously. Some cleared zones may represent remains of creosote hummocks or burrowing or wallowing areas, natural rather than cultural phenomena.

Geoglyphs, Rock Alignments, and Rock Piles

These feature types are lumped together since they are frequently associated within "earth figure" sites (Johnson 1985). "Earth figures" incorporate representational or abstract images or patterns created through man-made modifications of desert pavement surfaces. The most conspicuous and intriguing features are giant human and animal figures etched into the earth. At least three processes could have produced such "geoglyphs" (Johnson 1985:7): (1) an "intaglio" process involving the intentional displacement of surface gravels to expose a lighter-colored substratum in the form of a slightly depressed image; (2) tamping of gravels down into the subsurface soil; or (3) intensive, repetitive, and patterned foot traffic as an origin of patterned trails and paths. If undisturbed, geoglyphs tend to persist on stable desert pavements even when secondary pavement surfaces become reestablished.

Johnson (1985:8) defined four types of geoglyphs: intaglios, dance paths, dance staging areas, and "avenidas" (very wide cleared paths). At "earth figure" sites, frequently associated features include geoglyphs, rock clusters and mounds (cairns), patterned or linear rock alignments or rock figures, gravel mounds, quartz scatters, cleared circles, trails, and rock rings. Lithic artifacts are frequent but inconspicuous elements at earth figure sites; "macroflaking" and chipping took place at some sites. Ceramics and grinding implements are comparatively rare. Geoglyph and earth figure sites exhibit considerable variation in overall size, number and types of features, and patterned relationships among features. Although many anthropomorphic, zoomorphic, and geometric designs are common, their execution and associations vary. The most numerous designs, human figures, often are intentionally incomplete or "deformed" in some way. Zoomorphic and geometric figures include serpents, quadrupeds, fish, birds, crosses, spirals, and stars. "Dance patterns" are primarily circular paths, but also include more intricate layouts, multiple paths, turnouts, and turnaround areas. Although specific design elements are repeated in different areas along the rivers, each geoglyph site is unique and many are quite complex.

In North America, known earth figure sites are restricted to the desert regions immediately adjacent to the lower Colorado and lower Gila Rivers. Over 200 sites have been recorded, many on the desert pavement-covered terraces overlooking the rivers. Within the Yuma District, over 150 such sites include at least 90 areas on BLM-managed lands close to the Colorado, Gila, and Bill Williams Rivers, although a few sites exist in the Quartzsite vicinity. Further to the east are numerous sites in the Gila Bend area, as well as the anthropomorphic giant Hakvak near Sacaton on the Gila River Indian Reservation. Among the major sites along the Colorado River are the "Blythe Intaglios," giant human and animal figures at the base of the Big Maria Mountains. The "Mystic Maze," enigmatic but not a true maze, is a series of parallel gravel windrows covering at least 10 acres near Needles, California. Native legends indicate that the maze may have served as a purification rite area for travelers using a nearby major trade route (Johnson 1985:34). Although geoglyphs are not

unusual occurrences within the lower Colorado region, on a global scale they are rare. Large intaglio figures exist in desert regions of Peru and Chile. Those massive South American patterns contributed to Von Danikan's wild theory regarding extraterrestrial contacts, expressed in Chariots of the Gods. One could easily imagine that geoglyphs and ground figures were the desert folks' answer to the Midwestern effigy mounds, the Easter Island statues, and Stonehenge. They certainly impart a similar sense of mystery.

Earth figure sites have been attributed to nearly every aboriginal group believed to have occupied the river margins over several thousand years. Unfortunately these surface sites generally contain few datable materials or culturally diagnostic artifacts. Horse representations indicate that at least some intaglios were produced during the protohistoric or historic periods after Spanish contact. Patayan or Yuman origins are indicated by the geographic distribution of geoglyphs and by the presence of site concentrations near major agricultural zones occupied by native groups. The largest geoglyph complexes exist near known or likely rancheria zones occupied historically by Mohave, Halchidhoma, Quechan, Kaveltcadom, Cocopa, and Maricopa groups. Continuing ethnographic studies reveal that designs and design configurations often show a remarkable correspondence to Yuman creation myths and cultural traditions (Johnson 1985:16). The true antiquity of geoglyphs remains a speculative issue.

Most geoglyphs apparently were accessible yet separate from occupational areas. Except for some manufacturing of stone tools, they exhibit little evidence of mundane everyday activities. The most visually impressive sites tend to offer commanding vistas of the Colorado River Valley. The character and locations of these sites, supported by ethnographic information, indicate that they probably functioned as areas for spiritual, ceremonial, ritual, or social activities. Johnson (1985:16-28) argued in favor of alternative purposes for different earth figure sites: social or war dances; dances associated with healing or puberty ceremonies or the use of intaglios by shamans in a manner similar to Navajo sand painting; mythical representations supportive of cultural traditions, particularly the dominant creation myth shared by river Yuman tribes; or special uses such as racing competitions or purification rites. Some sites may have served as territorial boundary markers or astronomical devices. Yuman people frequently traveled up and down the rivers, and their trips often entailed large social gatherings or ceremonial events (Kroeber 1951). Some geoglyph sites may have been used repeatedly by large groups, while other areas may have been restricted to special uses by shamans or vision seekers. Others may have risked spiritual danger by venturing too close to particular sites (Woods 1986).

The rock clusters, alignments, and piles associated with many earth figures may have served as shrines or symbolic elements, and they are sometimes incorporated into overall design configurations. According to Johnson (1985), such features may have communicated messages or even served to confuse or divert evil spirits. In some cases, trails are bordered by series of rock mounds. However, rock alignments and clusters

are widespread and common archaeological features also often associated with utilitarian activities. In isolation, at occupational areas, or at sites other than earth figures, rock concentrations may represent remains of hearths, roasting pits, trail markers, or observation blinds. Rock alignments may be remnants of walls, trail markers, or check dams for soil retention or water diversion.

Research Values. Geoglyph and earth figure sites offer an unusual opportunity to examine linkages among mythology, oral histories, and cultural practices. Native American consultants may well offer valuable insights, although much related information may have been lost or extremely sensitive and thus guarded. Alfred Kroeber's journals at the University of California at Berkeley may contain oral histories and maps relevant to the interpretation of geoglyphs, tribal migrations, and historic events.

The regional patterning of geoglyph sites, their relationships to major trails and habitation areas, and similar design configurations repeated in different areas can reveal aspects of tribal organization and social interaction. Some earth figure sites may have served as pan-tribal meeting areas. Others may have contributed to tribal integration of those who occupied dispersed rancherias yet engaged in resource sharing or other social activities. Similar sites in different areas could represent the repetition of the basic creation myth in different tribal or subtribal homelands. Tracked through space and time, this information could indicate the origins and migrations of the Patayan and Yuman groups and relationships to other groups in northern Mexico and southern California. Geoglyph sites relatively distant from the rivers, such as those near Quartzsite, may indicate use of desert resources or interaction between river and desert peoples. If intaglios functioned as trail or boundary markers, they could be a significant factor in the investigation of regional land use patterns, travel and trade routes, territorial ranges of social groups, or social interaction processes.

Obviously "basic questions about the intaglios concerning their time of construction, purpose, and creators remain largely unanswered" (Solari and Johnson 1982:417). Archaeologists should explore approaches to relative or chronometric dating such as cation-ratio analysis, the study of formation processes, and the dating of any associated ceramics.

Variations in the structure, size, and contents of rock concentrations potentially can be linked to functional, temporal, or cultural differences. Although preservation is a problem, these features are potential repositories for organic remains that can be radiocarbon dated or used to reconstruct subsistence practices. They can thus contribute to chronology building, the dating of associated artifact types, and the study of temporal shifts in patterns of settlement and subsistence. Cairns may contain ceramic types that can be dated in relative terms. Cairns and rock clusters may have been elements of potentially decipherable systems of aboriginal communication. White (1980:70) suggested that different prehistoric groups could "be distinguished by the differences in the

attributes of the rock clusters that they created and used." However, it would first be necessary to rule out differences related to function or the availability of raw materials for feature construction.

Investigative Procedures. With the possible exception of hearths or roasting pits, most geoglyph and rock features in the lower Colorado River region are surface features. Thus intensive mapping and recording are the primary investigative procedures. Geoglyph and earth figure sites often have indistinct or obscure features or embedded artifacts that only become apparent through careful or sustained observation. All features and artifact concentrations, not just the major figures, should be recorded within defined site boundaries. In many cases, site boundaries will coincide with topographic features such as particular terrace ridgetops bordered by major washes. The environmental context should be recorded and, if possible, low-level aerial photos should be taken. At the scale of the Bureau of Reclamation's aerial photos of the Colorado River, the large "Mystic Maze" is clearly visible, but even enhanced images might not reveal smaller sites or trails. Luckily, lower-level aerial photos taken by avocational archaeologists like Harry Casey exist as a documented record of known geoglyphs. To coin a bad pun, it may be worthwhile to conduct pilot studies of alternative aerial photography and photo enhancement techniques as aids to site discovery, recording, and protection.

Careful field recording and mapping also should apply to rock concentrations. White (1980:67) recommended ways to record and interpret at least 12 key variables: (1) depth; (2) dimensions; (3) configuration or shape; (4) density; (5) number of rocks; (6) rock sizes; (7) percentage of thermally cracked rocks; (8) raw material; (9) constituents or fill; (10) placement of different rock types or sizes; (11) associations; and (12) location within the site. Data should also include a description of the environmental context. Features should be tested or excavated for the determination of structure and depth. Samples should be collected for radiocarbon and archaeomagnetic dating (if feasible), faunal or macrobotanical identification, and flotation, pollen, and soil analyses.

Trails

Hundreds of ancient trail segments crisscross the terraces of the lower Colorado, Gila, and Bill Williams Rivers (Figure 6-1). Malcolm Rogers defined extensive trail networks and major long-distance routes linking settlements along the Colorado and Gila Rivers. In many cases, modern roads correspond to ancient trail routes, particularly in the vicinities of mountain passes (Brown and Stone 1982; Davis 1961).

Trails are most discernable on desert pavements and cleared slopes. Most prehistoric trails are relatively straight, narrow (30-50 centimeters wide) paths indented on desert pavement surfaces. Larger rocks and cobbles have been cleared from these paths. Julian Hayden (1965:273) described the formation of trails on desert pavement:

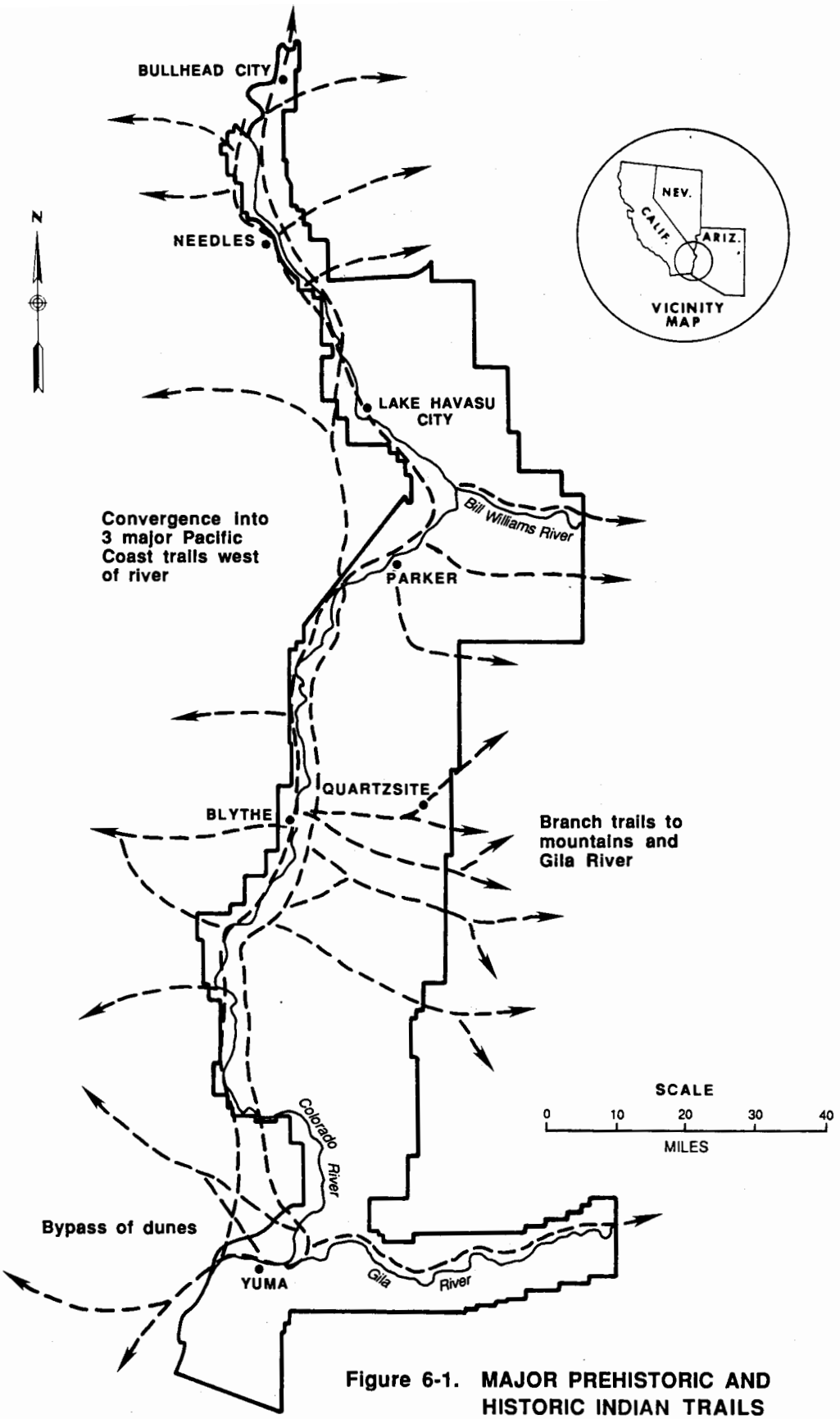


Figure 6-1. MAJOR PREHISTORIC AND HISTORIC INDIAN TRAILS

> These pavements are, when unbroken, essentially imperishable and impenetrable by natural forces, but because of their nature are very readily imprinted or damaged by man and animals. The single layer of stone above the soft base may be impressed into the base by continued use of a trail either by man or beast, and this slight displacement of the protecting layer becomes permanent as any exposed silts are blown or washed away . . . the pavement will re-form quickly and retain a permanent record of the disturbance in the form of a paved depression.

In rocky areas and on slopes, trails may take the form of cleared paths with rock berms. Robertson (1983:2-7), writing of the prehistoric roads radiating from Chaco Canyon in New Mexico, drew a distinction between "roads" and "trails." "Roads" were defined as "true constructed surfaces" ranging from 3 to 15 meters wide. "Trails," less than 2 meters wide, resulted from "surface clearing, minor leveling or stabilizing."

Cairns, rock rings, cleared circles, and artifact scatters are frequently associated with trails. "Shrine" features, formed from successive "sacrifices" of pottery, artifacts, and stones, are distinctive associated elements (Waters 1982). Linear scatters of artifacts, particularly sherds of broken pottery, often border trails. Small nearby "trail camps" incorporate artifact scatters and hearths.

Research Values. Trails are particularly relevant to the investigation of regional settlement patterns. They represent established links among sites, resource areas, and social groups. In both prehistoric and historic times, travel was a major type of land use in the western Arizona desert. Major north-south trails linked tribal heartlands along the Colorado River. Inland bypasses skirted areas where rugged mountains abutted the river in the vicinity of the Chemehuevi, Whipple, and Chocolate ranges. A major river route, the Quechan trail, was both a real and mythical path, the way of southward migrations from the sacred Mt. Newberry (Avikwame) in southern Nevada. The Quechan trail and other trail segments are frequently associated with geoglyphs and are often incorporated as elements of earth figure sites. The river Indians were good swimmers and constructed rafts for downstream trips, but foot travel remained the major form of transportation.

Many trails, some as major trade routes, radiated outward into the California and Arizona deserts, leading as far as the Pacific coast and the Gila Bend region. Some followed the Gila River, and others followed passes through the Black, Dome Rock, Trigo, and Kofa mountain ranges. Away from the rivers, "the dispersed spacing of food and water resources made travel over long distances routine for hunting and gathering groups. Even sedentary groups established along the rivers were motivated to travel through the desert to maintain social and economic ties with their neighbors" (Brown and Stone 1982:348).

Archaeologists should attempt to determine the relationships between the location and spatial structure of trail networks and the distribution of different site types and natural resources. Large trail systems may

have been anchored to areas of relatively dense populations along the Colorado and Gila Rivers. Rogers (1941, n.d.) proposed a basic hierarchical structure of main long-distance trails, minor long-distance lines, and subsidiary trails to particular settlements and resource areas. Along the Palo Verde-Devers transmission line, trails were most numerous and dense on the Colorado River terraces. From there they converged on mountain passes, and main long-distance routes traversed the interior desert. Other trails branched off to minor passes and upland resource areas (Carrico and Quillen 1982). Trail networks can be studied at different spatial scales. An extensive regional perspective is exemplified by Rogers' (n.d.) maps of trails linking the rivers. Intensive studies of smaller geographic areas could focus on the linkages among trails and site types in local systems. For example, a system of trails in the Palo Verde Hills may have connected temporary camps, areas of resource exploitation, and ceremonial loci (Carrico and Quillen 1982).

An interesting research issue concerns the degree to which trails were purposefully established, reused, monitored, and maintained over long periods of time. Due to long distances between scarce and unpredictable water sources in the desert, aimless wandering would have been inefficient and potentially deadly. Established routes, with access to water and other resources, would have reduced the risks of desert travel. According to Robertson (1983:2-2), associated features indicated that "the trails in question were formalized and not expected to change."

Insights into the use of prehistoric trails can be found in ethnographic studies of travel in arid regions. Gould (1980) defined two basic patterns of movement for Australian aborigines. Foraging activities involving searching or the gathering of information, such as hunting or gathering from a base camp, were characterized by random patterns of movement. In contrast, planned and purposeful trips to known water sources and resource concentrations involved direct travel. The second pattern would be expected to result in the formation of trails.

Survival and successful use of desert resources demanded an intimate knowledge of the natural environment. For many groups, this knowledge incorporated mental "maps" of the regional geography (Gould 1980). In Australia, geographic knowledge was embedded in myth and ritual. Kroeber (1951:137) discovered a similar system of knowledge among the Mohave, "an endless interest in topography, and a constant reflection of this in their myths and song cycles, which are almost invariably localized in detail." Furthermore, he noted that:

> Most old and middle-aged Mohave I met around the first decade of the century seemed to be carrying in their heads a good equivalent - whether visual or kinaesthetic - of a map of a large area surrounding their valley; and to have done so largely from a sheer interest in place and orientation for its own sake, an interest further nourished by constantly fed information.

Established trails may not only have promoted safe and efficient travel. They may also have played a role in communication and boundary

maintenance among bands or social groups. Inadvertent trespasses and disputes may have been avoided through the use of formal trails. In addition, knowledge of the movements of other groups can enable hunter-gatherers to plan their own travels more efficiently (Moore 1981). The use of definite trails, as well as the characteristics of associated features, may have allowed groups to monitor the movements of other bands. Cairns or "shrines" may have contained relevant information, and they may also have served as signaling stations. The Australian aborigines, traveling by alternative routes, used smoke signals to indicate the presence or absence of water at particular sources (Gould 1980:70). The mapping of cairn locations could indicate their suitability as overlooks or signaling stations or their association with potential boundaries indicated by natural landmarks or artifact type distributions.

Trails offer the potential for interesting archaeological research. In addition to the above issues, the distribution of ceramic types and exotic trade items along trails can indicate boundaries, frontiers, or patterns of trade and social interaction. Rogers (n.d.) mapped the distribution of Lower Colorado Buffware types along major trails (Waters 1982). In some cases, these types were relatively dated through the excavation of cairns or the study of "horizontal trail stratigraphy" (Waters 1982:276).

Investigative Procedures. Recorders must be careful to distinguish human trails from vehicle tracks and modern game trails. Although animals and people may have shared travel routes, prehistoric trails tend to be relatively straight uniform paths with varnished desert pavement and associated artifacts or features. Trails and nearby archaeological remains should be traced, recorded, and mapped. Surveyors should note apparent line-of-sight orientations to prominent landmarks and spatial relationships to natural features such as springs or natural tanks. Aerial photography and remote sensing techniques were useful in defining the prehistoric Chaco Canyon road network (Kincaid 1983), but their applicability to less substantial trails is untested.

Data recovery should include systematic recording or collection of associated artifacts. Grid units can be used where specimens are distributed fairly continuously along a trail segment. At AZ S:1:5(ASU) along the Granite Reef Aqueduct, collection units of 10- by 10-meters were bisected by the trail (Brown and Stone 1982:91). Along other trails, isolated clusters of artifacts were collected separately. Associated features, particularly cairns, should be tested or excavated. Carrico and Quillen (1982:65) conducted "trail tests" involving the removal of desert pavement and the comparison of cross-sectional profiles. The results were inconclusive. However, such tests could provide a measure of differences between trails that are "thin, short and apparently seldom used to those that are large, lengthy, and deeply rutted such as segments of the Cocomaricopa Trail" (Carrico and Quillen 1982:138).

Petroglyphs

Petroglyphs are a form of "rock art" created by pecking, abrading, or scratching away the thin surface layer of darker patina to expose the light-colored subsurface of the rock. Painted designs, known as pictographs, are relatively rare or unpreserved in the lower Colorado region. Petroglyph sites within the Yuma District exhibit a range of variation in designs, areal extent and numbers of separate panels, environmental contexts, and associations with other types of sites. They incorporate a blend of representative and abstract images on surfaces ranging from varnished volcanic rocks to relatively fragile sandstones. At least 40 petroglyph sites exist on Federal land within the Yuma District. Although some consist of single glyphs or panels, about half of these sites are large areas incorporating numerous design elements on multiple panels. Major concentrations exist in the Muggins, Laguna, Big Maria, and Mohave mountain ranges, but petroglyph sites are distributed throughout all areas of the District (Figure 6-2). They are frequently associated with trails, springs or natural tanks, mountain passes or constricted river canyons, and distinctive topographic landmarks.

Research Values. These challenging and provocative sites may represent ceremonial, informational, or social functions served by few other types of sites. They obviously served as important components of aboriginal communication systems, but their social or economic purposes and symbolic meanings are obscure and diverse. Rock art symbols may have functioned as ceremonial or ritual devices related to shamanistic practices, vision seeking, or mythical representations; insignia of specific persons or groups; mnemonic devices or records of events; aids to hunting magic; maps or markers of territorial boundaries or trails; calendrical devices associated with recurrent astronomical events; or artistic expressions. These alternatives need not have been mutually exclusive at a single site.

Symbolic interpretation, deciphering the meanings of design elements and their interrelationships is a subjective process and a risky one given the possibility of alternative yet untestable meanings. Ethnographic research and literature may lend insight into tangible links between petroglyphs and important myths or cultural practices. Petroglyphs may well echo important cultural symbols embodied in geoglyphs and oral histories.

In order to assess the functions of petroglyph sites within broader social and settlement systems, one should examine the geographic contexts of sites in terms of their access and relationships to natural resources, travel routes, and other sites. Recurrent design associations or contextual situations could be linked to certain purposes, social groups, or time periods.

Several methods have been employed in the relative and chronometric dating of rock art and in the assignment of cultural affiliations. At a single site, designs can be relatively dated by variable degrees of

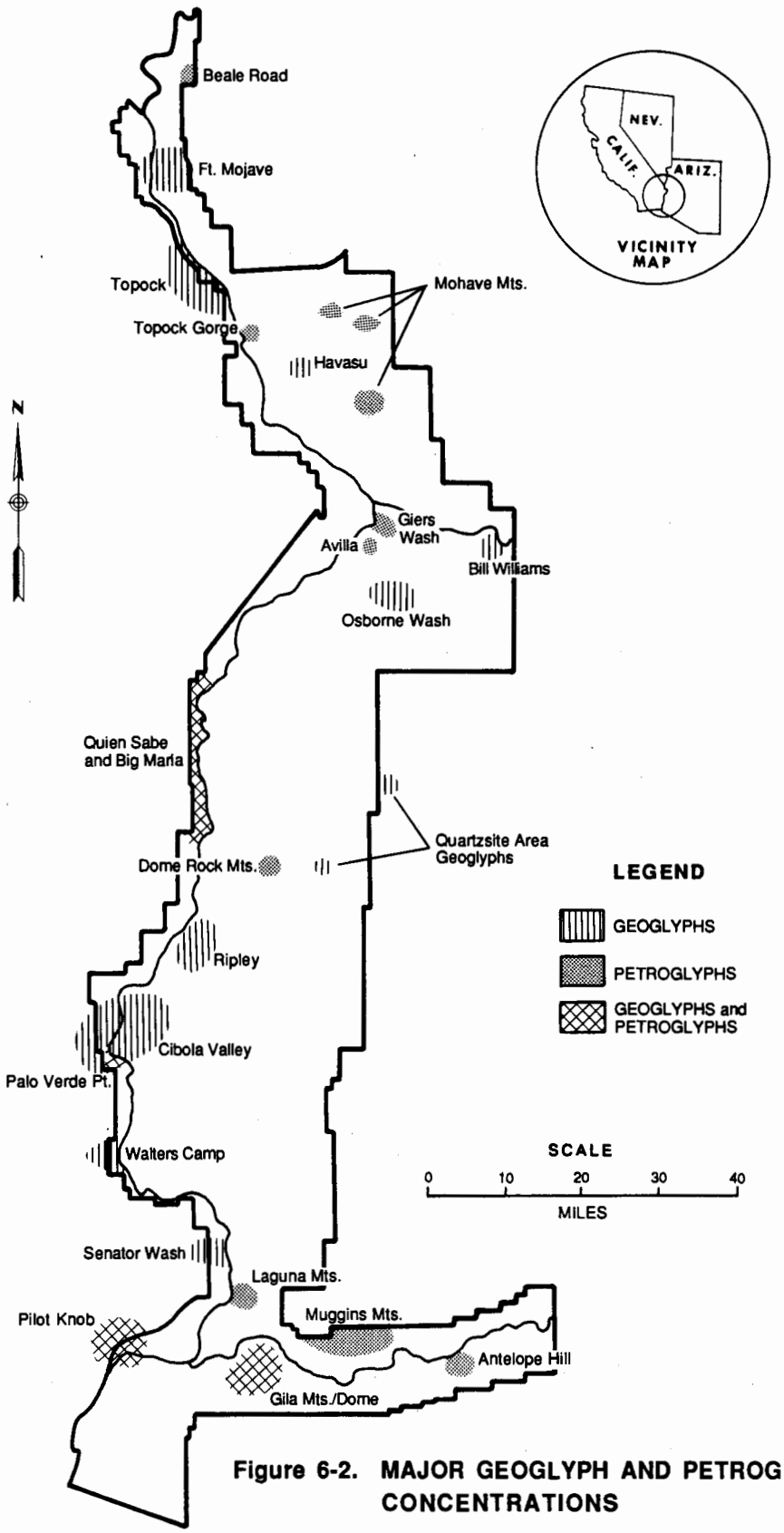


Figure 6-2. MAJOR GEOGLYPH AND PETROGLYPH CONCENTRATIONS

patination or weathering. In conjunction with these differences, consistencies in the superimposition of designs can indicate relative dates. If one assumes that associated, dated artifact types were contemporaneous with petroglyphs, tentative dates can be assigned to the designs. Temporal and cultural affiliations also can be assigned on the basis of designs used in other media, such as pottery or textiles. Bruder (1983:156) found that about 50 percent of the major design categories at the Hedgpeth Hills site corresponded to Hohokam ceramic design elements. However, attempts to temporally order design categories were complicated by the fact that "design motifs on Hohokam ceramics do not neatly occur during single time intervals and then disappear" (Bruder 1983:204). One must contend with temporal overlapping and the persistence of certain design elements.

Intersite consistencies in the associations of design elements can contribute to the definition of regional rock art "styles." The geographic distribution of such styles can be mapped. For example, in the Great Basin, the "curvilinear abstract" style is thought to be earlier than the "rectilinear abstract" style (Grant 1967:45). Wallace and Holmlund (1986) refined the definitions of Western Archaic abstract and later Gila petroglyph styles in southern Arizona. Wallace (1989) studied the distribution of those styles and possible elements of a Patayan style in the Gila Bend region. Few petroglyph sites in the lower Colorado region have been investigated in detail, and a Patayan regional style remains to be defined. Wallace (1989:67) suggested that certain anthropomorphic and shield designs, remarkably similar to common geoglyph designs, represented Patayan or Yuman petroglyphs associated with Patayan ceramics in the Gila Bend Mountains. Related studies could illuminate the nature of social boundaries and interaction among lower Colorado, Gila River Patayan, and Hohokam groups and their descendants. Comparative studies of sites along the lower Gila River, at Gila Bend, Sears Point, Antelope Hill, and the Muggins Mountains, would be interesting in that regard.

Several researchers have conducted experiments in the dating of rock art by physical and chemical means. Two experimental techniques used at the Hedgpeth Hills site near Phoenix were hydrogen profile analysis and cation-ratio analysis. The first technique was based on the absorption of atmospheric water by rock surfaces. It was proposed that "surfaces that have been modified at different times by incising will exhibit variability in the morphology of the hydrogen profile" (Taylor 1983:290). The results were unsuccessful. Taylor stressed the need to determine the mechanisms by which hydrogen profiles are actually produced in different types of rock.

Cation-ratio dating, based on the trace element analysis of desert varnish, is a new and promising technique (Dorn 1983). It focuses on minor elements believed to be relatively insensitive to microenvironmental factors. At Hedgpeth Hills, analytical results tended to support other indicators of relative age, including color differences (Bruder 1983:204). Related techniques for absolute dating are under development (Dorn 1983).

Bouse site, the well yielded localized, stratified fill deposits interpreted as different phases of Patayan prehistory (Harner 1958). The sustained prehistoric use and proximity of the Quartzsite area indicate that suitable locations there could have been sites for similar primitive wells.

Although this document focuses on Native American cultural resources, the rich historical legacy of other groups left its mark on the Yuma District. Significant activities included Spanish and later explorations, the early American fur trade, military operations, overland and steamship transportation, mining, and river engineering. These activities generated roads, mines, settlements and ghost towns, steamship landings, stage stations, railroad camps, military camps, dams, canals, and other sites. Historians can offer advice on the significance and research values of historic sites or site types. As demonstrated by the development of the Yuma Crossing historical park, interpretive efforts can combine prehistoric and historic elements to produce a particularly interesting and compelling picture of the American West. From antiquity to the present, the Yuma District has hosted an incredibly diverse range of human groups and activities.

The Known Geographic Distribution of Cultural Resources

According to the Yuma District Resource Management Plan, as of 1985, file records incorporated over 1,300 prehistoric and historic sites including at least 875 sites on BLM-administered lands. Earlier, Swarthout and Drover (1981) reported over 1,000 sites recorded on lands adjacent to the lower Colorado River. The figures exclude many sites on Indian reservations for which information is unavailable. By late 1989, over 1,500 sites were recorded. Approximately 60,500 acres, about 4.8 percent of the Yuma District, had been inventoried for cultural resources. Federal lands likely contain thousands of archaeological sites within the Yuma District boundaries.

Summarization of the database is complicated by vague descriptions and site locations particularly for early surveys; differences in recording techniques and levels of survey intensity; different approaches to defining site boundaries; and qualitative information that often does not reveal differences in the numbers, density, diversity, and combinations of artifacts and features at sites. Since the quality of data varies and only a small percentage of the District's area has been surveyed, any summary necessarily is general and subject to change as additional data is generated.

The time allocated to this study did not allow for a detailed review of individual site records or intensive searching of computer files. The summary presented here is based primarily on two data sets generated in 1987: a listing of basic information on Yuma District sites entered into the Statewide AZSITE computer databank; and a color-coded Districtwide map of site and feature types compiled from the site files by student volunteers. Both data sets contain approximately 1,000 site records.

The AZSITE file consists entirely of sites numbered according to the Statewide numbering system. Additional information on the distribution and nature of cultural resources was obtained from site tours, published research, selective examinations of site files, and discussions with Yuma District archaeologists.

The Statewide site numbering system is based on numbered quadrants; those that cover the Yuma District, extending into California, are shown in Figure 6-3. For the purpose of this geographic summary, the data will be organized by blocks of quadrants extending from north to south along the river. Of the approximately 1,000 sites or loci within each data set, roughly 95 percent are prehistoric or aboriginal rather than historic non-Indian sites. Varied combinations of multiple features and artifacts account for over half the recorded sites, dominated by geoglyph complexes, trail networks, and probable campsites. Trails, rock rings, and cleared circles are nearly ubiquitous features. Further research is required to distinguish functional variations among these sites. Approximately 11 to 15 percent of all sites incorporate geoglyphs, and 3 to 5 percent are dominated by petroglyphs. Approximately 20 percent of the sites are dominated by cleared circles or rock rings with few associated artifacts. Another 10 percent consist solely of lithic scatters, and about 10 percent of the sites are more diverse artifact scatters incorporating ceramics and lithic tools and debitage, located primarily in valley zones which likely supported villages and farms. There is generally insufficient information for cultural and temporal assignments. Based on the presence of Lower Colorado Buffware pottery, about 15 percent of the sites are designated as Patayan or Yuman.

Starting at Bullhead City and moving from north to south within the Havasu Resource Area, Quad F:14 covers the area of the city and the north end of the Mohave Valley. Huge macroflaking areas exist on the bajada extending from the Black Mountains. Other cultural resources include trails, lithic scatters, petroglyphs, and historic wagon roads. Much of this quadrant now incorporates private land.

Quads L:2 and L:3 incorporate the Mohave Valley. The Fort Mohave Indian Reservation contains village sites and the "Twins" geoglyph. A pestle manufacturing area is located west of the river. The terraces incorporate diverse sites including geoglyphs, trails, petroglyphs, stone features, and diverse artifact scatters probably associated with the valley's status as a major occupational zone. Historic sites include Fort Mohave and railroad camps.

Quads L:6, L:7, and L:8 encompass the Topock Gorge, Chemehuevi Mountains, Mohave Mountains, and upper Chemehuevi Valley extending to the Lake Havasu City area. Geoglyphs in the Topock area include the "Mystic Maze," an extensive series of parallel raked gravel rows. Most recorded sites are close to the river, a diverse mix of petroglyphs, trails, stone features, rock rings, and lithic scatters but fewer artifact scatters of diverse composition as occur in the Mohave Valley. Few surveys have been conducted in the mountainous areas. Bedrock mortars exist at some

geoglyphs exist on the bajadas. Rogers reported relatively substantial camps along Tyson Wash and French Creek. Historic sites in the Ehrenberg-Quartzsite area include structures, mines, trash dumps, and graves.

Surveys along the river have revealed a high density of prehistoric sites in the Cibola Valley encompassed by Quad R:10. Large complex sites on both sides of the river incorporate geoglyphs, cleared circles, rock rings, trails, stone features, and diverse artifact scatters. Geoglyphs, petroglyphs, large rock alignments, trails, and macroflaking areas exist in the vicinity of Palo Verde Peak. Within Quads R:11 and R:12 encompassing the Trigo Mountains are dispersed rock rings, lithic scatters, rockshelters, cache sites, trails, and roasting pits. Historic sites include structures and roads. Much of the mountainous zone and the southern La Posa Plain are part of the Yuma Proving Ground.

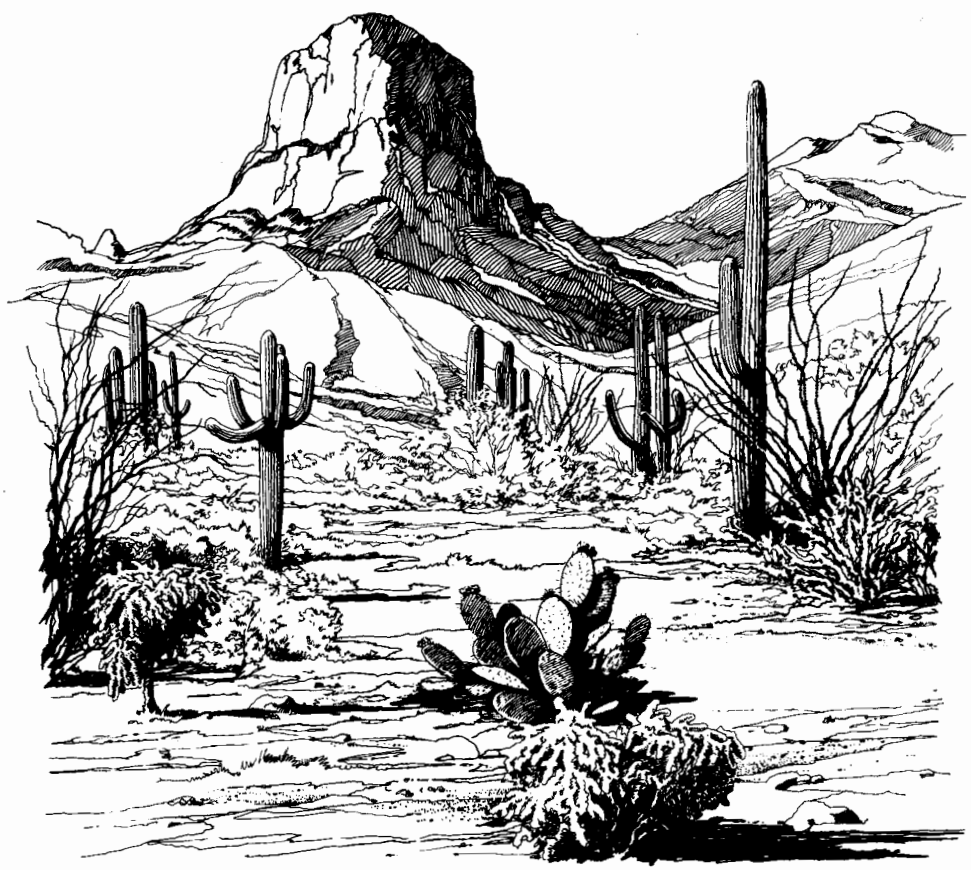
Quads R:14 and R:15, particularly the rugged Picacho, Trigo, and Chocolate mountain ranges have received a minimal level of archaeological survey. At the lower end of the Cibola Valley, the Walter's Camp area contains geoglyphs, trails, and cleared circles. South of the valley, elevated terraces may hold additional sites. Although travel routes largely bypassed this rugged area, Picacho Peak was a sacred site. Trails appear to be relatively uncommon, but lithic scatters, rockshelters, and petroglyphs are present. This section of the Colorado River apparently was visited by Yavapai from the Castle Dome Mountains. The juxtaposition of river and mountains suggest that both game and Archaic hunter-gatherers may have been drawn to this area. It was later a major area of mining activity that now contains a relatively large number of historic mines, camps, structures, trash dumps, and roads.

Quads X:2 and X:3 incorporate the Imperial Dam area bordered by the Chocolate and Laguna mountain ranges and the northern portion of the Quechan (Fort Yuma) Indian Reservation. Archaeological information indicates that this area may have served as a major occupational zone for Archaic, Patayan, and Yuman groups. It contains over 10 percent of all sites in the database. Sites typically are large, diverse, and complex. In the area of the Imperial National Wildlife Refuge, numerous rock rings, cleared circles, artifact scatters, and trails border the river and extend up Los Angeles Wash. The Senator Wash area also contains many sites including geoglyphs. The Laguna Mountains and Laguna Dam area, a historic ford, contain many petroglyphs and the site of the Spanish mission Bicuner, now gone and marked by a monument. The Reservation likely holds former village areas, but agriculture may have obliterated many sites.

Finally, Quads X:4-8 and Y:5 encompass the Yuma area and the portion of the Yuma District extending up the lower Gila River. Despite urbanization and intensive agricultural activities in the Yuma Valley and Wellton-Mohawk Irrigation District, numerous archaeological sites have been recorded. Particularly in the northern Gila Mountains, Dome Valley, and Muggins Mountains, there are many petroglyph sites as well as geoglyphs, trails, cleared circles, rock rings, and artifact scatters. Several

villages, now destroyed or difficult to detect, may have existed along the lower Gila River. Antelope Hill was a major petroglyph area and metate manufacturing locus. Historic sites could include early irrigation features, railroad construction camps, or stage stations. The sandy Yuma Desert likely contains sparse cultural resources, but few surveys have been conducted there.

Figure 6-4 depicts indicated patterns of prehistoric land use. In summary, the Mohave, Palo Verde, and Cibola Valleys and the Colorado-Gila confluence area exhibit the largest proportions of sites designated as Patayan or Yuman by the common presence of ceramics. This picture is consistent with the locations of major historic occupational and farming zones. Bajada and mountainous zones apparently were used for travel, caching, and temporary activities associated with the exploitation of raw materials and wild foods. Mountainous areas, mountain-river juxtapositions, and major washes may exhibit a relatively higher proportion of definable Archaic sites. The La Posa Plain in the vicinity of present-day Quartzsite, was an area of relatively intensive activity and frequent travel. The lower Colorado River obviously was an oasis for prehistoric groups, but regional patterns of occupation and use require further surveys and archaeological research.



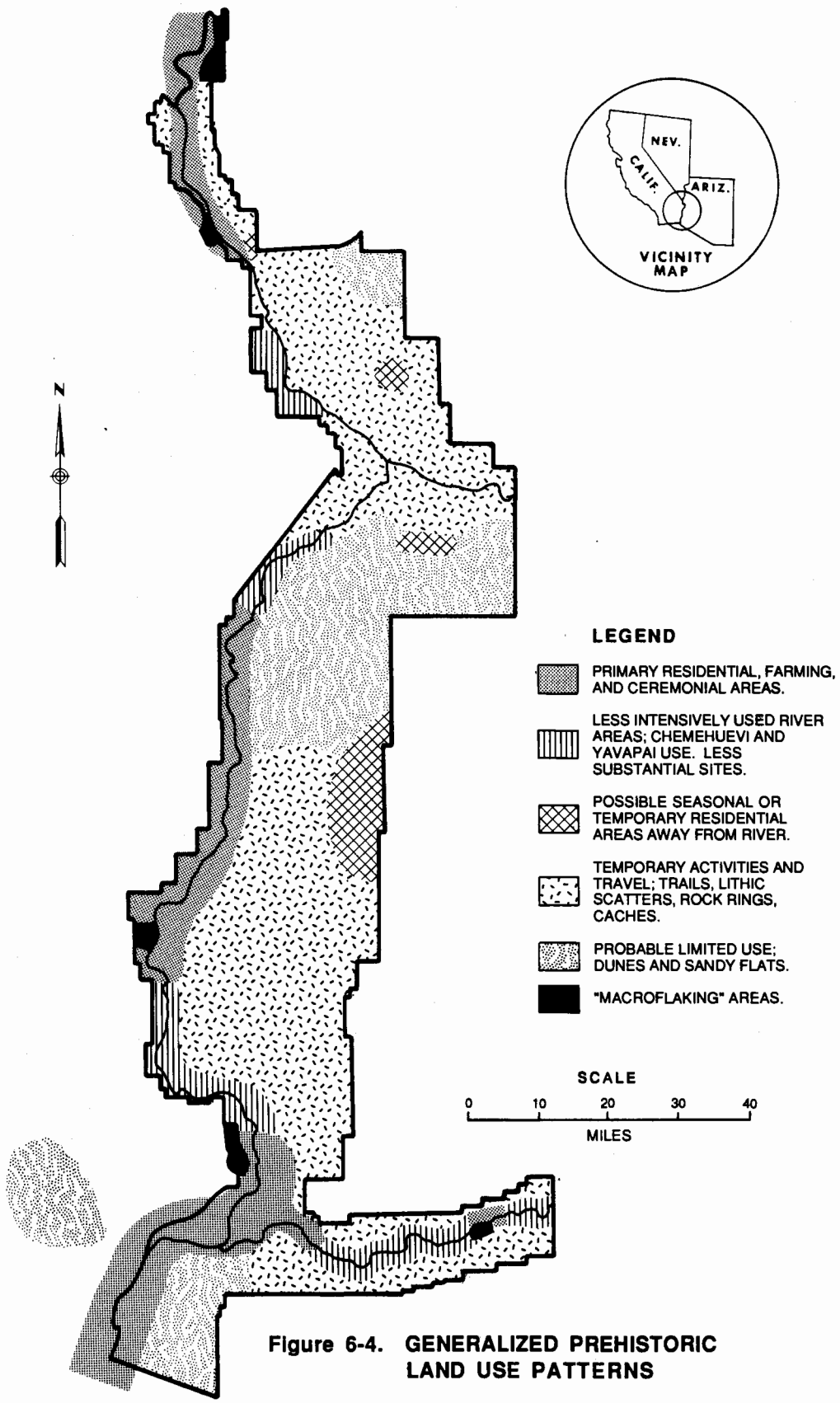


Figure 6-4. GENERALIZED PREHISTORIC LAND USE PATTERNS

CHAPTER 7

MANAGEMENT OPPORTUNITIES: RESOURCE EVALUATION

"Management" refers to a process of decisionmaking that establishes objectives, specific plans to meet those objectives, and means to resolve conflicts among various goals. Management opportunities represent the active implementation of objectives and plans. As directed by the Federal Land Policy and Management Act of 1976 (P.L. 94-579), the Bureau of Land Management engages in long-range planning for the management of multiple resources based on principles of multiple use. The Yuma District Resource Management Plan and Environmental Impact Statement (1985), the "RMP-EIS," addresses future management options and issues for approximately 1.2 million acres administered by the Yuma District Office. The Office's broadly defined mission, and the diversity of issues and resources with which it deals, contrast with its originally narrow task of restraining illegal trespassers on Federal lands along the Colorado River.

Management objectives ultimately are based on the values associated with particular types of resources. As defined in the American Heritage Dictionary, a "value" is a "principle, standard, or quality considered worthwhile or desirable." Thus resource evaluation, whether of cultural, wildlife, recreational, mineral, or other types of resources, is a critical step toward planning and implementing appropriate uses which might involve conservation, enhancement, or productive exploitation according to the direction of the District RMP. Inventories and monitoring are activities that support evaluations and enable determinations of resource conditions and management effectiveness over time.

According to the Federal Land Policy and Management Act, the Bureau is to manage public lands in a manner that will "protect the quality of . . . archeological values." Cultural resources are the record and substance of thousands of years of human occupation. These resources include archaeological and historic sites or properties as well as places that have relatively intangible but real meanings for modern cultural groups. Cultural resources possess informational and heritage values. In the first sense, they contain information that can contribute to our knowledge of human prehistory through scientific anthropological studies of human behavior, cultural systems, and the interrelationships between human societies and the natural environment. Heritage values contribute to maintaining a cultural group's traditional system of religious beliefs or cultural practices. The American Indian Religious Freedom Act of 1978 (P.L. 95-431) requires that special consideration be given to the effects of Federal programs and policies on places of religious importance to Native Americans. In a broader sense, heritage values encompass the general public's interest in learning about human prehistory, history, and the challenges of archaeological research. Heritage values thus incorporate educational, recreational, and spiritual aspects.

Public recognition of the values, fragility, and irreplaceable nature of cultural resources resulted in the passage of Federal legislation mandating their inventory, consideration, and protection. In addition to carrying out the mission outlined in the Federal Land Policy and Management Act, the BLM must also meet its legal responsibilities under a series of Federal statutes which include the National Historic Preservation Act of 1966 (P.L. 89-665), the National Environmental Policy Act of 1969 (P.L. 91-190), and the Archaeological Resources Protection Act of 1979 (P.L. 96-95), as amended.

The National Environmental Policy Act requires the preparation of environmental impact statements for major Federal undertakings. The Archaeological Resources Protection Act provides severe penalties for unauthorized excavations or damage to sites on public or Indian lands. It also establishes permit requirements and penalties for illegal trafficking in antiquities.

The National Historic Preservation Act and subsequent amendments expanded the National Register of Historic Places, maintained by the National Park Service as a listing of cultural properties, both prehistoric and historic, found to qualify for inclusion because of their local, state, or national significance. Section 106 directs Federal agencies to take into account the effects of their undertakings (actions and authorizations) on properties listed or potentially eligible for the National Register. The Act established the Advisory Council on Historic Preservation and State Historic Preservation Officers who oversee the process of consultation conducted in association with Section 106 compliance procedures.

According to BLM procedures described in appropriate manuals, cultural resource evaluations involve the assessment of informational and heritage values followed by allocations to appropriate "cultural resource use categories" defined in BLM Manual 8111. The groundwork which provides an assessment of values also enables evaluation of "significance" or National Register eligibility. Two basic qualities relate to the evaluation of National Register significance: integrity or condition; and for prehistoric resources, "Criterion D," properties "that have yielded, or may be likely to yield, information important in prehistory or history."

The Assessment of Scientific Informational Values of Lower Colorado Cultural Resources

Cultural resources are repositories of information that can further our understanding of human social relations, the interrelationships between societies and their natural environmental contexts, and the nature of traditions and cultural meanings attached to those interrelationships. Anthropologists study human ecology, cultural stability and changes, and processes of technological advancement and increasingly complex social organization - in short, virtually all aspects of human behavior.

In order to extract information from prehistoric cultural resources, which offer a unique long-term perspective, scientists define specific research problems that can vary in terms of topics, levels of generality, and geographic scale. For specific cultural resources or sites, the assessment of informational potential involves two basic judgments: (1) the expected information content relevant to single or multiple research problems; and (2) physical integrity, the condition of preservation and the severity of previous or ongoing damages which could reduce or destroy usable data.

Regional Research Issues

Archaeological and ethnographic studies can make important contributions to anthropological research beyond the lower Colorado region. Particular issues relevant to cross-cultural comparative analyses include the operation of extensive trade networks; the spread of agriculture; the nature of economic strategies and social support systems in unpredictable arid environments; the causes of primitive warfare; and on the general scale of social organizational complexity incorporating bands, tribes, chiefdoms, and states, the development and functioning of tribal organizations.

A current theoretical dichotomy in archaeology is based on a distinction between "processual" and "post-processual" studies. To admittedly oversimplify this distinction, processual studies focus on economic and ecological factors in cultural systems and cultural evolution, while post-processual studies deal more directly with issues of ideology, meaning, and symbolism. The cultural resources of the lower Colorado River region can be accommodated within both theoretical perspectives. Settlement patterning and technological studies are particularly relevant to the processual perspective, and geoglyph and petroglyph sites are amenable to broader comparative studies of myth and symbolism.

The lower Colorado region was one of four major geographic and cultural zones inhabited by prehistoric farmers within the American Southwest. The Anasazi, Mogollon, and Hohokam traditions were based respectively on the Colorado Plateau, in the forested mountains of eastern Arizona and western New Mexico, and in the Sonoran Desert of south central Arizona. The relatively poorly understood Patayan tradition of the lower Colorado River basin evidently never attained the levels of population density, economic intensification, and organizational complexity reached by the other cultural traditions. Yet the Patayan tradition endured and ultimately expanded its territorial range while the others underwent territorial consolidation and abandonments, possible political and social turmoil, and for some, an apparent return to less complex organizations and economic strategies. The Patayan tradition thus offers a comparative baseline for studies of more complex Southwestern societies that underwent more pronounced series of changes over time.

Early archaeological and ethnographic researchers recognized the distinctiveness of the Patayan tradition when they attempted to characterize the lower Colorado River as the Nile of North America. As Colton (1945:117) noted, both rivers originate in well-watered highlands and flow through extensive deserts to ultimately deposit huge silt loads

on their deltas. Riverside peoples practiced floodwater agriculture, planting crops in areas left moist by the retreat of seasonal floods. Yet "while the Nile Valley for over 4,000 years has supported civilized communities, the Colorado Valley supported a population that seemed to be quite backward, according to our standards, when white men first visited them" (Colton 1945:117). The ethnographer William Kelly (1977:1) commented on the Cocopa:

> Although they lived in a land well-suited to agriculture and knew and practiced the art of agriculture, they failed to become an agricultural tribe either in their dependence on farm crops, in their attitude toward this mode of subsistence, or in the development of religious and social patterns usually associated with agricultural peoples. Their culture was remarkably simple.

The Colorado River, like the Nile, was a linear oasis bordered by exceedingly arid, barren desert and mountains. Yet the annual Colorado River floods were variable and unpredictable, while concentrations of desert resources were available in higher mountain ranges at least a day's journey from the river. Economic flexibility, mobility, and cultural simplicity may have promoted survival along the Colorado and lower Gila Rivers. Anthropologists can examine the environmental factors and social contexts which promoted relatively simple but flexible economic strategies by dispersed family groups who traveled and traded over long distances and waged warfare in the service of tribal solidarity.

Productive research ultimately is rooted in the description of basic patterns of spatial and temporal variation in settlement patterns, material culture, and symbols. At lower geographic scales of analysis, studies focus on particular sites, local areas, or comparisons of specific areas. At this level of analysis, the causes and processes of cultural stability and change are treated in the most specific sense. This is the ultimate base of knowledge applied to research issues at higher levels of geographic scale or generality.

Specific research issues can be related to alternative domains: culture history, cultural ecology and socioeconomic systems, primitive technology, social organization and interaction, ideological systems, and paleoenvironmental reconstruction. Although the domains often overlap, each poses certain data requirements and interpretive challenges.

Culture History. The domain of culture history involves chronological ordering; identification of the timing, spread, and effects of major events or changes; and the classification of consistently associated traits into "cultures" or "branches" generally perceived to represent ethnic groups or areas of long-term and frequent interaction. It is "an essential first step in the investigation of regional prehistory" (O'Connell, Jones, and Simms 1982:228).

Basic data are those applied to chronometric and relative dating techniques: organic materials such as charcoal or perishable artifacts for radiocarbon dating, fired clay hearths or floors for archaeomagnetic dating, obsidian artifacts for hydration dating, and patinated lithic

artifacts for experimental cation-ratio dating (Dorn et al. 1986). Sites can be cross-dated by the presence of "diagnostic" artifacts anchored to chronological sequences from other regions. Distinctive ceramic or projectile point styles can indicate certain time periods or group affiliations. At specific sites, successive occupational periods could be indicated by variations in natural weathering, pavement reestablishment, or desert varnish thicknesses measured on artifacts or features.

The definition of culture history obviously involves the tracking of variations in material culture through space and time. Interpretive problems include overlapping traits or time lags in their appearance and spread; the problem of distinguishing variations in function or raw material distribution as opposed to temporal or cultural differences; and certain technical limitations of chronometric dating. In western Arizona, relatively nondescript and common utilitarian artifacts changed little over hundreds of years, while decades of recreational artifact collecting have reduced the incidence of more rare and distinctive diagnostic artifacts.

Chronological sequences can best be refined and strengthened through studies of stratified cultural deposits yielding datable and diagnostic artifacts or materials. Such sites are rare within the Yuma District, where most recorded sites consist of artifacts or features resting on the surface. Caves are obvious candidates for chronological studies. As for settlements near the rivers, the frequent shifting of locations and subsequent inundations by floods may have prevented the buildup of stratified deposits. Yet the possibility of open stratified sites cannot be dismissed, given the probable frequent reuse of favored locations and the example of the Willow Beach site, preserved rather than destroyed by depositional episodes associated with flooding. The detection of buried cultural deposits poses a difficult problem. Erosion or development might expose buried sites, and the locations of historic or ethnographically recorded village zones could indicate potential subsurface deposits.

Rogers and other researchers devised creative approaches to date Lower Colorado Buffware types in relative and chronometric terms. They excavated trailside "shrines" and the prehistoric well at Bouse. "Horizontal trail stratigraphy" traced the physical structure of trail systems to detect differences in artifacts associated with newer versus older trails. At some sites, Patayan pottery was associated with dated ceramic types of other cultural traditions. In the California desert, ceramic types were tracked along successive final shorelines of ancient Lake Cahuilla. A handful of radiocarbon dates from the Salton Basin and western Arizona offered additional support for a chronological sequence of Lower Colorado Buffware types.

Waters (1982) defined three Patayan phases based primarily on differences in ceramic rim forms, vessel shapes, and surface treatments (painted designs, polishing, etc.). Paste and temper characteristics were secondary discriminators. Disagreements persist between the Rogers-Waters classification scheme and that of Schroeder, who favors a stronger emphasis on temper and paste characteristics. Questions also

exist regarding the degree to which geographic variations can be interpreted as types associated with certain territories or ethnic groups. Each approach poses problems, ranging from the geographic and compositional overlapping of physical characteristics to the difficulty of applying Waters' typology where fragmented plainwares reveal few distinctive rim forms, shapes, or decorative elements. There is an obvious need to reevaluate and refine ceramic classifications through quantified attribute and physiochemical studies of collections from a variety of geographic areas. These should be coupled with studies of raw material availability and associated technological constraints, as well as other variables such as functional differences, which can affect ceramic variability.

The following research problems are among those relevant to the domain of culture history: the antiquity of human occupation along the Colorado River; the nature and distribution of Archaic and San Dieguito occupations; the origin and spread of farming and the Patayan tradition; the timing and nature of migrations to and from the river, from initial settlement to the final exodus from dessicated Lake Cahuilla; the ages and creators of geoglyph and petroglyph sites; and the effects of Spanish and later contacts upon the river Yuman tribes.

Cultural Ecology and Socioeconomic Systems. This research domain focuses on the links among environmental, economic, and technological factors which influence all other aspects of society. In archaeology, it incorporates the study of subsistence and settlement strategies, the organization of labor and resource consumption, and impinging environmental and technological factors.

The characteristics and spatial patterning of artifacts, features, and structures within sites indicate the nature, range, and positioning of activities and the size and composition of groups. Animal bones, plant remains, and coprolites (ancient fecal remains) indicate the types, diversity, and relative importance of food resources and the season and duration of occupation.

Studies of specific sites incorporated into regional analyses can indicate relative degrees of mobility or sedentism, the range of functional site types within settlement systems, the seasonal scheduling of activities, and the composition of local groups as well as hierarchical relationships among settlements.

Land use patterns are revealed by the characteristics and spatial distribution of artifacts, features, and settlements across the landscape. They are interpreted with reference to environmental variables which may have constrained or influenced land and resource use. The distribution and variable qualities of agricultural land, wild foods, raw materials, and ground surfaces determined the relative suitability of particular areas for residence, subsistence, tool manufacture, communication, travel, and ritual activities.

Interpretive challenges exist in determining site-specific activities and the role of particular settlements within larger socioeconomic

systems. Plant and faunal remains are poorly preserved on desert surface sites. There is no simple correspondence between particular tool or feature types and specific activities or resources. Tools can be used for multiple purposes, and resources can be processed by alternative procedures. Finally, differences among sites are related not only to the possibly changing nature of activities and the size of the local group but also to the duration of single occupational episodes and the number of reoccupations through time. Interpretation can be a complex and difficult process, particularly for extensive surface scatters of artifacts and features.

Where favorable areas have been reused over time, surface sites may incorporate a mix of loci used during different time periods by different cultural groups. In the lower Colorado region, it can be difficult to separate Patayan and Yuman occupations from pre-ceramic ones. Along the rivers, pottery and grinding implements tend to be confined to lower terraces and floodplain margins. Yet their scarcity on upper terraces, except at trails and manufacturing areas, need not necessarily indicate that most upper area sites should be attributed to pre-ceramic occupations. Such areas may have been used for alternative purposes, such as ceremonial activities or travel, that did not involve the use of those implements. On the other hand, apparent camps containing tools and probable shelters, yet no ceramics, might well represent pre-ceramic sites. Interpretation is difficult, but archaeologists recently have made significant advances in sorting out the patterns of cultural residues.

Regional research issues incorporate, but are not limited to, the following topics: the nature of subsistence and settlement systems prior to the adoption of farming; the use and changing importance of desert resources in both river-based and desert-based settlement systems; the nature of flexible responses to variations in farming success and the abundance of wild resources; the adoption, spread, and relative importance of farming in different areas; the nature and importance of storage strategies; and the role of exchange and trade, at different geographic scales, in the operation of socioeconomic systems.

Archaic groups and later groups primarily dependent on desert resources may have favored areas where mountains were closest to the rivers, particularly the higher or larger ranges which likely contained springs or resource concentrations - the Black, Mohave, Whipple, Castle Dome, and Kofa ranges and in Mexico, the Cocopa Mountains. Good waterfowl hunting areas also may have attracted those groups. In turn, river-based farmers may have traveled periodically or seasonally to favorable desert areas, to mountain ranges or major washes.

Differences existed in subsistence and settlement systems along the Colorado River. Among the farmers who inhabited the arable delta and broad valleys, there was an increasing reliance on agriculture northward along the river (Castetter and Bell 1951). Swarthout and Drover (1981) developed alternative settlement models for the Mohave Valley and for valleys south of Topock. The Mohave Valley model incorporated a greater

reliance on agriculture and larger, more permanent floodplain area settlements augmented by temporary flood camps, food collecting areas, and lithic manufacturing areas along terraces, washes, and bajadas. The alternative southern model proposed higher mobility and a greater reliance on wild resources, expressed through seasonal shifts from summer farming camps to winter base camps away from the river, where people subsisted on wild foods and stored quantities of mesquite and cultivated crops (Swarthout and Drover 1981:62-68). The models proposed by Swarthout and Drover were difficult to test given the paucity of recorded floodplain area sites. Nevertheless, future researchers should examine the extent to which subregional differences in settlement stability and subsistence strategies were influenced by varying access to wild desert resources, fluctuating river channels, farming conditions, intertribal trade relations, or population densities. Different delta and valley zones, although generally similar environments occupied by groups sharing a similar culture, offered different adaptive challenges to local groups.

Primitive Technology. Technology incorporates the manufacture and use of tools and related facilities for extracting and processing resources and for producing other tools, material objects, and structures. Technological capabilities and constraints affect the effort devoted to tool production and resource use, the organization of labor, and the efficiency of economic strategies. Technological changes can be sensitive indicators of shifts in subsistence practices, task organization, or trade relations.

Relevant data include the geographic distribution and technical qualities of raw materials; attributes of tools and debitage (material testing and manufacturing debris) that reveal manufacturing techniques and stages, functional efficiency, maintenance, and use wear; and experimental studies of manufacturing and use.

It can be difficult to distinguish the effects of multiple and interrelated sources of variation. Among these are raw material qualities, manufacturing or construction techniques, intended function or range of functions, cultural custom, formal or decorative styles, and changes in the characteristics and uses of single tools through time.

For lithics, ceramics, and perishable artifacts, descriptive studies of geographic distributions, temporal changes, compositional variations, and technological attributes need to be pursued and if indicated, existing classification schemes may require revisions. Museum collections, such as Rogers' collections at the San Diego Museum of Man, offer analytical opportunities. Perishable artifacts such as baskets are relatively rare, but museum and private collections may hold some specimens recovered from caves and ethnographic fieldwork.

Once patterns of spatial and temporal variation are established, it may be possible to link them to changing patterns of tool manufacture, use, maintenance, and discard associated with socioeconomic systems (Binford 1979; Brown and Stone 1982; Doelle 1980). It may be possible to examine in more detail the timing, associated cultural changes, and

factors underlying such major technological shifts as the switch from the spearthrower to the bow and arrow or the adoption and spread of pottery.

A great deal of information exists on Lower Colorado Buffware and the brownware pottery of the deserts and uplands bordering the Colorado and lower Gila Rivers (Euler 1982; Kroeber and Harner 1955; Rogers 1936; Schroeder 1952; Stone 1982; Van Camp 1979; Waters 1982). Greater attention should be devoted to the functional qualities of different pottery types. The distinctive "stucco" treatment added to vessel walls, as well as relatively coarse or abundant temper, may have distinguished cooking vessels from those used primarily for storage or transport. Although different ceramic types exist along the lengths of the Colorado and lower Gila, all areas exhibit both coarse-tempered crumbly types and finer-textured harder types possibly indicative of different functions. Investigative procedures could incorporate experimental production and use of vessels made from native materials.

Historic changes in Lower Colorado Buffware, incorporating new forms and more elaborately painted decoration, deserve further study. The Mohave along the Santa Fe Railroad line may have produced pottery for the tourist trade. BLM archaeologists recently recovered and reconstructed a distinctively shaped vessel from the Needles area, a possible trade piece. The production of beaded ceramic effigies should interest students of Native American art, and such figurines might be incorporated into a revitalized craft industry.

Huckell's (1986) study of metate manufacturing loci near Bullhead City represents a model technological investigation. The study incorporated archaeological data recovery and analyses, experimental replication, and ethnographic fieldwork. The Big Bend quarry study offers a comparative baseline for analyses of metate manufacturing areas in other areas of the District. For example, differing accessibility to major occupational zones may have affected production strategies. Pestle manufacturing areas exist but have not been analyzed at a similarly detailed level. The Colorado River sites have provided an impetus for research at grinding implement manufacturing areas throughout the Southwest.

Social Organization and Interaction. This research domain incorporates the definition of cultural systems as networks of interacting local groups with shared traditions or concepts of ethnic unity. It addresses the nature of economic, social, and political relationships among groups and societies. Research pursuits include the definition of territories, boundaries, or frontiers (zones of cultural interaction or shared land use) and the study of trade. Communication systems, alliance formation, and warfare are related topics.

Relevant data include the geographic distribution of traits considered to be diagnostic of particular cultural groups; the distribution of possible territorial markers such as petroglyph designs or cairn shrines; the geographic configuration of trail networks and possible communication

systems; and sourcing and distributional studies of particular raw materials or trade commodities.

Some interpretive problems focus on the definition of culturally diagnostic traits. Variations in material culture, architecture, or economic strategies may reflect local adaptations to an environmental or social context rather than ethnic differences. It can be difficult to distinguish among technological, functional, and cultural sources of variation in artifact types. Stylistic differences, if they can be defined as such, are likely to be the most sensitive indicators of ethnic distinctions.

Where culturally diagnostic traits overlap in space, one must consider several possibilities: social interaction and trade; shared use of the land and its resources; or sequential occupation and use. The issue of shared land use versus trade involves the difficult question of whether items were discarded by their manufacturers or by others who had obtained them through trade. For highly mobile populations, it can be difficult likewise to determine whether raw materials were obtained through trade or travel to the source.

Dobyns (1956) had to face these problems in his analysis of ceramic ware distributions undertaken in the support of Hualapai land claims. For example, Lower Colorado Buffware vessels found in the Black Mountains may have been dropped by river groups who periodically exploited mountain resources. Alternatively, upland groups may have obtained the pots through trade. Dobyns established arbitrary criteria, in the form of relative percentages of pottery wares at particular sites, in order to define territorial boundaries and frontiers.

He found that Tizon Brownware dominated ceramic assemblages in much of the Hualapai ethnographic range. To the west and south, Lower Colorado Buffware was dominant along the Colorado and Bill Williams Rivers, and it accounted for approximately 30 percent of the potsherds in the Black Mountains. There was a very sharp falloff of Lower Colorado pottery to the east of the Cerbat and Hualapai ranges. Dobyns concluded that the river groups utilized the western bajada of the Black Mountains and that occurrences further to the east represented pots obtained by upland groups through trade. He noted that pottery found along the Bill Williams River combined characteristics of Lower Colorado and Tizon wares, and he surmised that this indicated local production by river-based groups (Dobyns 1956:421).

Further to the south, in the desert between the Bill Williams and Gila Rivers, both Lower Colorado Buffware and desert brownware were widely distributed at campsites and trails (Stone 1982; Waters 1982). There may have been a less clear division between river and desert groups in this region, perhaps more travel and resource sharing rather than relatively formal trade between river-based farmers and desert groups. Kroeber (1951) noted that the Hualapai routinely traveled to the Mohave Valley, while river groups further south more frequently traveled to the desert although the flow of traffic went both ways. Oral histories,

trails, ceramic distributions, and early historic documents indicate close ties between the Great Valley of the Colorado and the lower Gila-Gila Bend region east of the Mohawk Mountains. That reach of the Colorado River may have been the original homeland of the Maricopa groups.

The presence of Lower Colorado Buffware in the western Papagueria, south of the Gila River, has been interpreted as evidence of desert resource use by Gila River farmers and as a result of trade between the Quechan region and Papaguerian desert dwellers (Doelle 1980; Hayden 1967). To the west of the Colorado River, Lower Colorado Buffware was manufactured in the Salton Basin.

The Patayan and Yuman peoples participated in extensive social networks that structured long-distance trade, friendly interaction, and warfare among Southwestern and California groups. The Mohave and Quechan, and their antecedent groups, were situated along major east-west trade routes that delivered marine shell to Southwestern groups (Colton 1945; Davis 1961). The Great Valley may have been situated at a disadvantage for interregional trade, a factor that may have undermined long-term occupational stability in that area. However, as Schroeder noted, the Great Valley evidently participated in trade with the central Arizona Hohokam prior to A.D. 1200. The late prehistoric and protohistoric periods are known to have incorporated major shifts in the structuring of trade networks linking Mexico and the Southwest (Riley 1988). Any studies of Patayan-Yuman participation in larger social networks should be interpreted in light of the changing nature of those interaction systems, including changes in patterns of trade and warfare wrought by the Spanish conquest.

Along the Colorado and lower Gila Rivers, the development and interactions of tribal or subregional groups is an important research issue. Broad valleys separated by constricted canyons structured the ethnic differences among groups which nevertheless shared a similar heritage. One important aspect of that heritage, the creation myth and its associated stories, may have been expressed in similarities among geoglyph and petroglyph sites in different areas. Ethnographers reported that each tribe interpreted the creation myth in reference to the local topography. The tracking of similarities and differences in symbols and site layouts could indicate the nature of social relations, tribal unity, and migrations. Some geoglyph sites may have served as convention areas where normally distant groups met not only for ceremonial events, but also for such social purposes as trade, food sharing, or marital matchmaking. The extensive, complex, and centrally located Big Maria geoglyphs may represent such areas. Finally, the distribution of cultural symbols might reveal the nature and functions of a social clan system that seemed to have become relatively inactive by the time that ethnographers studied the river Yuman groups.

An intriguing research issue is the abandonment associated with the final desiccation of Lake Cahuilla. Groups likely migrated from its eastern shore to areas of the Colorado River valley below the Bill Williams confluence. In archaeological terms, the processes of

abandonment will be less difficult to track than the arrival of migrants at the river. An influx of population may have ultimately generated conflicts, intertribal warfare, territorial expansions, and the expulsion of groups out of the Quechan and Great Valley areas.

Ideological Systems. This is the domain of cultural meanings and beliefs embodied in symbolism, myth, religious or magical practices, healing practices, and art. Data which might reveal symbolic or ceremonial behavior are geoglyphs, petroglyphs, symbolic rock alignments or cairn shrines, trails, or burials. All "ground figure" sites would relate to this domain. The most obvious interpretive difficulty is a strongly subjective quality which renders it difficult to test alternative hypotheses. Detailed contextual analyses and distributional patterning could offer insights into symbolic and ceremonial behavior. Ethnographically recorded information and interviews could reveal links between cultural ideologies and their physical manifestations. For example, many archaeologists now seek the advice of Native Americans in interpreting petroglyphs. Many geoglyph sites appear to directly express cultural traditions embodied in myths. A Student Conservation Aide recently discovered a startling correspondence between a distinctive geoglyph and an image displayed at a tribal museum. These links between archaeological and ethnographic information indicate that the Yuman people and their ancestors were creators of many ground figure complexes.

Comparative studies of myths, ceremonial practices, and symbols could examine the possibility of ancient kinship and shared ideologies among groups occupying a larger area of California, western Arizona, and northern Mexico. Numerous geoglyphs in northern Mexico's Sierra Pinacate offer a starting point for comparative analyses (Hayden 1982). Johnson (1985) briefly discussed parallels to cultural traditions and archaeological features in California and Mexico.

Yuman and Patayan religions apparently differed from those of some Southwestern groups, particularly in the lack of named religious societies, a strict ceremonial calendar, ceremonial structures, or public ceremonies emphasizing agricultural fertility. Ground figure sites may have served the purposes of ceremonial structures or plazas. Yuman ceremonies and social events apparently were staged when favorable circumstances, such as a good harvest, allowed certain families to sponsor them. Kelly (1977) argued that the individualized focus of Yuman religions, which emphasized shamanism, dreaming, puberty and death rites, reflected the self-sufficiency and organizational flexibility required for survival in an arid environment offering unpredictable farming success. However, nearly all Southwestern groups coped with the unpredictable environmental conditions of the North American desert, yet different cultural traditions emerged. The economic, organizational, and historical factors which fostered different ideological systems and religious practices require further examination and comparison.

Paleoenvironmental Reconstruction. The accurate description of past environmental conditions, as well as major changes and periodic or cyclical fluctuations, is critical to understanding prehistoric

subsistence strategies, land use patterns, migrations, and changes in cultural systems through time. Relevant data can be gained through studies of geomorphic processes, Great Basin lake levels, tree-ring widths, fossilized packrat nests, and such archaeological organic remains as fossilized pollen, coprolites, animal bones, and plant remains. Interpretive problems are related to poor preservation, the recovery of adequate sample sizes, and biases introduced by collection or analytical procedures. It is best to employ a multidisciplinary approach incorporating multiple classes of data (Madsen and O'Connell 1982).

Fossilized packrat nests are often preserved in caves and rockshelters. They offer a relatively sensitive and datable picture of local conditions. The pioneering applications of this analytical approach were developed in the desert areas adjacent to the lower Colorado River (Van Devender and Spaulding 1979; Wells 1976). Given previous research and a probable abundance of data, additional studies should be encouraged.

The fluctuating levels and channels of the Colorado and Gila Rivers obviously affected the extent of arable lands, the success of agricultural harvests, and the existence and levels of Lake Cahuilla. Farmers took advantage of opportunities to cultivate crops along Imperial Valley channels which occasionally received the Colorado River's delta flow. Dendroclimatic (tree-ring) studies in the upper watershed of the Colorado River basin could contribute to the reconstruction of river levels through time. Graybill (1988) has worked toward reconstruction of Salt River fluctuations relevant to the operation of Hohokam irrigation systems. His work thus provides a model for future dendroclimatic analyses.

Historic maps, geomorphic studies, and perhaps even remote sensing can indicate the history and processes of channel shifting. The extreme instability of delta channels renders it difficult to determine periods when high floods may have been diverted into Lake Cahuilla. The shifting of channels on the delta, a natural process that would have made farming a relatively risky and unpredictable endeavor on the fertile plain, was compounded by a high level of seismic activity at the head of the Gulf of California. The San Andreas Fault, San Jacinto Fault, and numerous minor faults pass through the Imperial Valley to the Gulf. Ives (1861) noted that a major earthquake of the nineteenth century left ships standing high and dry. During the present century, at least 40 earthquakes have exceeded a Richter scale magnitude of 5.0 in the Imperial Valley-Colorado delta region. Greater environmental instability may well have promoted greater mobility, wild resource use, and organizational flexibility among the delta peoples in comparison to those who inhabited the Mohave Valley (Castetter and Bell 1951; Kelly 1977). All river peoples ultimately coped with the fluctuating nature of a river now tamed by modern technology.

Evaluating the Research Potential of Cultural Resources

A previous chapter describes the types of cultural resources known or likely to exist within the Yuma District. Each type description

summarizes research values relevant to different topics discussed above as research domains. Given great variation in the size, nature, and composition of archaeological and historic sites, evaluations should ultimately focus on the informational characteristics and physical integrity of specific cultural resources. However, general observations can be made regarding values held in common and characteristics of sites likely to harbor greater research potential than others.

Unless deprived of integrity through destruction or removal, even relatively small sites of limited diversity, common resources such as isolated rock rings, broken pots, or small lithic scatters, can contribute information relevant to subsistence and settlement systems and technology. For land use studies, one can examine their content and patterning across the landscape in relation to environmental features and more specialized or substantial sites. The majority of cultural resources thus can make some contribution to cultural ecological, organizational, and land use studies.

Certain qualities will indicate a potentially high informational value for particular sites. Several key qualities are discussed below:

1. An unusual nature or unique character relative to other regional sites. These could be the only sites at which particular research issues can be pursued, or they could be associated with unusual activities or events. This quality could also apply to rarely preserved sites such as floodplain rancherias or pithouse structures. The quality of uniqueness is sometimes contrasted with that of redundancy. Yet relatively common resource types should not be written off, since individual sites occupy distinctive local contexts. Similar loci within a local area, such as the Big Bend metate quarry, could be considered as redundant and subject to sampling for data recovery. Although geoglyph and ground figure sites are not rare within the region, each is individually unique. Widely recognized as a distinctive aspect of lower Colorado basin archaeology, these site types are rare worldwide.

2. A potential to resolve particularly difficult research problems or to address domains, such as chronology building or ideological systems, that cannot be studied at most sites.

3. The presence of rare or particularly useful types of data such as organic remains, perishable artifacts, culturally or temporally diagnostic artifacts, or materials traceable to regional or raw material sources.

4. The presence of multiple classes of data relevant to multiple research problems.

5. Evidence of particularly intensive use, sustained occupation, or reuse over a long period of time as indicated by relatively high diversity and density of artifacts and features or complex internal patterning.

6. The presence of intact subsurface cultural deposits.

7. A locational correspondence to villages, camps, or use areas identified through historic documents or prior ethnographic research.

The following list suggests examples of cultural resources likely to hold particularly high scientific informational value given the current state of knowledge. Although the list is rather lengthy and diverse, such sites will likely represent a minority of the cultural resources within the District. Nevertheless, with the inclusion of geoglyphs, at least a hundred separately numbered sites should conform to these descriptions. They echo the qualities listed above. They are not listed in any particular order.

1. Sites having buried features or stratified deposits indicating multiple occupations or relatively continuous use over time.

2. Sites containing perishable artifacts for technological and chronometric studies, or organic remains for chronometric, subsistence, or paleoenvironmental studies.

3. Probable camps or ceremonial-social activity complexes used over a long period of time or by relatively large groups as indicated by high numbers, densities, and diversities of artifacts and features or internal spatial patterning of activity zones. At present, the quality of data in the files does not support strictly quantitative definitions of "high." File information and visual observations do allow for reasoned archaeological judgments based on comparisons among sites. Listed numbers 1-3 might incorporate seasonal or base camps, rancheria zones along the rivers, more substantial caves or rockshelters having depth, or sites encompassing geoglyphs with diverse artifacts and features.

4. Sites containing inorganic datable remains or temporally diagnostic artifacts such as fired clay hearths for archaeomagnetic dating, projectile points, imported decorated ceramics, reconstructable vessels of Lower Colorado Buffware, or variably patinated lithic artifacts for relative or cation-ratio dating.

5. Sites holding traceable raw materials or trade items such as obsidian, shell, turquoise, or materials of Anasazi, Hohokam, Mexican, or Pacific coast origin.

6. Geoglyph or ground figure sites.

7. Larger petroglyph sites of apparently long-term, repeated, or Archaic period use. Less substantial rock art locales exhibiting particularly unusual designs or strategic locations relative to other cultural resources. An example of the latter case is an unusual boulder site, defined as a map glyph by a native consultant, along a trail later used as the Beale wagon road.

8. Major localized trail networks.

9. Major quarries repeatedly used over long periods of time.

10. Prehistoric or historic water control features or irrigation systems constructed by Native Americans.

11. Sites situated on environmental remnants, areas where other cultural resources have likely suffered destruction by human disturbance or natural erosion, for example at floodplain edges.

12. Unusual occurrences such as cleared circles associated with ceramics and grinding implements, or sites that are apparent exceptions to known distributional patterns.

13. Sites that correspond in location to particular villages, camps, or use areas identified by prior ethnographic research.

14. Sites amenable to interpretation by native consultants, particularly geoglyphs and petroglyphs.

15. Sites postdating A.D. 1500 that could reveal effects of non-native contact on native populations.

16. Major historic settlements, mines, steamboat landings, forts, or roads as evaluated by criteria of historic significance. For historic sites, National Register eligibility criteria include but are not limited to Criterion D (informational value).

The Assessment of Heritage Values of Lower Colorado Cultural Resources

As the remaining physical manifestations of ancient ties to the land and tribal ancestors, cultural resources hold profound heritage values for Native Americans, particularly the Yuman and Chemehuevi tribes. The river Yuman peoples carried a strong sense of tribal identity, a unity characterized as "nationalism" by ethnographers. Although the tribes suffered through military defeat, poverty, and acculturative pressures, their reservations retained tribal heartlands essential to the identity and spiritual maintenance of their culture. Cultural practices and beliefs were justified and strengthened by the repetition of myths and oral histories linked to specific places. Oratory provided a geographic framework for the creation myth and other important beliefs. According to Woods (1986:10), "mythical teachings provide the deepest structure, and the underlying code, for a labyrinth of cultural practices." Some geoglyph and petroglyph sites may represent direct expressions of those mythical teachings.

The tribes have expressed a strong interest in the protection of cultural resources. They have commented on archaeological projects and have cooperated in archaeological and interpretive efforts such as the testing of Bighorn Cave in the Black Mountains and the development of the Yuma

Crossing historic park. The Colorado River Indian Tribes maintain a cultural museum at Parker offering demonstrations of traditional crafts as well as standing exhibits. The tribes recently cooperated with the U.S. Fish and Wildlife Service in the installation of an interpretive sign at a petroglyph site in the Topock Gorge.

Information regarding the locations and significance of cultural resources can be obtained from ethnographic documents, modern surveys of native attitudes (Bean et al. 1978; Woods 1986), and interviews with native consultants. Informational barriers include a reluctance to reveal and possibly jeopardize the cultural heritage, a distrust of government officials and archaeologists, and possible proscriptions on speaking of spiritually sensitive or dangerous information. Woods (1986) noted that some Indians wished to know the locations of archaeological sites so that they could avoid them. During the past century, much information has undoubtedly been lost through the death of elders and a decline in the maintenance of oral histories. Perhaps respectful and sensitive interviews can help to pass on the oral heritage. As for its protection, the tribes should be reassured that cultural resource locations are not freely divulged by Federal agencies.

In relation to heritage values, cultural resources need not be limited to tangible archaeological sites. Sacred areas could include topographic landmarks, mountain tops, quartz outcrops, or mineral sources. Some hot springs may have been sacred zones. The Cocopa used a hillside outcrop of decomposed white rock at the foot of the Cocopa Mountains for "curing" enemy scalps (Kelly 1977:135). The following list describes areas or types of cultural resources likely to possess important heritage values for some Native Americans. They are not listed in any particular order.

1. Sacred mountains, particularly distinctive landmarks and mountain tops. Mountains housed spirits, "talked" to each other, and anchored the network of sacred places. Newberry Peak at the southern tip of Nevada, Avikwame, is the mythical point of origin for the Yuman tribes. Documented sacred mountains also include, but may not be limited to, the Needles, Black Peak, Picacho Peak, Pilot Knob, the Muggins Mountains spires, and the peaks opposite the interstate highway pass through the Gila Mountains. Ethnographers have indicated that in some areas, local landmarks may have assumed the roles of Avikwame and subsidiary peaks. At geoglyph sites, some rock piles may be representations of sacred mountains.

2. Geoglyphs and ground figure sites.

3. Petroglyph sites.

4. Caves and rockshelters.

5. Trails and associated features such as cairn "shrines," particularly north-south trails linking Avikwame to other places along the rivers.

6. Ancestral village areas.

7. Quartz scatters, as quartz was regarded as a source of spiritual power.

8. Cremation grounds or burials. Likely buried or eroded away, these sites should be relatively rare. The disposition of human remains is an extremely sensitive and controversial issue. It may be advisable to remove features exposed by ongoing natural erosion. These sites should not be disturbed without Native American consultation or observation.

9. Locations of historic events important to Native Americans or places associated with revered persons.

10. Areas still exploited for natural resources. None are specifically known.

Heritage values incorporate not only Native American concerns but also public interests in archaeology, anthropology, history, and the conservation of environmental and cultural resources. These interests are expressed through park and museum visitation, media publicity, and participation in avocational clubs, field trips, supervised archaeological work, classes, and related volunteer programs. Avocational archaeological societies exist in Yuma and Kingman, and other enclaves of interested citizens exist in the Bouse and Gila Bend areas. Active avocational archaeologists, committed to scientific and informational values, are motivated to study and protect a wide range of cultural resources. Specialized history "buffs" often focus on particular contexts such as military or railroad history.

Mysterious and visually impressive sites, such as geoglyphs and petroglyphs, will likely generate the greatest public interest. The intaglios of the Yuma District have received statewide, national, and worldwide publicity through periodicals, books, and television.

Allocations to the BLM Cultural Resource Use Categories

Appropriate use is the general objective of management. Cultural resources potentially can be used as objects of scientific study or public interpretation. In a less tangible sense, they can contribute to the perpetuation of Native American cultural identity. The BLM Cultural Resource Inventory and Evaluation Manual 8111 defines six "cultural resource use categories" as classifications employed in setting management priorities. Two categories emphasize scientific informational values: "scientific use" and "conservation for future use." Two categories emphasize heritage values: "sociocultural use" and "public use." Finally, two categories focus on management concerns: "management use" and "discharged use."

Site-specific assignments require judgments based on evaluations by qualified archaeologists or other cultural resource specialists. Sites

exhibiting multiple values may be assigned to compatible use categories such as scientific and public use, or conservation for future use and sociocultural use. In general, the "management use" and "discharged use" categories are incompatible with the other categories in the sense that they usually apply where other uses have been exhausted or when sites cease to exist.

Scientific Use

This category signifies that a site or property is suitable for consideration as an object of scientific study utilizing current research techniques. In management terms, appropriate data recovery procedures can be implemented if preservation or avoidance are not viable options and if the area does not qualify for the more protective category of conservation for future use. This category will apply to the majority of cultural resources, those having adequate physical integrity and the potential to yield information relevant to research problems. Direction for using cultural properties as subjects of scientific study is provided in foregoing discussions of cultural resource types, research values, and regional research issues.

Conservation for Future Use

This classification is reserved for rare resource types, resources of "singular historic importance," or those having research potential "that surpasses the current state of the art." Incorporated cultural resources receive a high priority for protective measures which could include designated segregation from land uses or activities posing potential threats to site integrity. Data recovery, aside from nonintrusive recording, could take place only under specified conditions. Cultural resources assigned to this category likely would conform to the foregoing list of "cultural resources likely to hold particularly high scientific informational value given the current state of knowledge." Exceptional historic or heritage values could also justify assignment to conservation for future use.

The Yuma District Resource Management Plan (1985) identified 33 cultural resource areas, incorporating approximately 130 numbered sites and 6,800 acres, that should be assigned to the conservation category. These areas would receive a high priority for protective measures, and allowable land uses "would include activities that are compatible with the objective of preserving these resources in place for future use" (BLM 1985:16). The slightly revised list now incorporates 36 areas covering over 8,500 acres, ranging from geoglyph and petroglyph sites of a few acres to areas of 1,500 acres incorporating camps, geoglyphs, petroglyphs, and possible villages along the rivers (Table 7-1). These zones hold particularly high informational, heritage, and historic values corresponding to evaluative criteria discussed previously. They include 13 geoglyph sites or complexes, 8 petroglyph sites or areal concentrations, 7 areas of possible villages or groups of campsites, 5 "complex" areas of camps or villages associated with geoglyphs or petroglyphs, 2 historic sites, and

Table 7-1. Areas Designated as "Conservation For Future Use."

Site or Area Name	Type	Original Site Numbers	Minimum Acres
Park Moabi	Geoglyph	AZ-050-429, 887	10
Walter's Camp	Geoglyph	97, 107, 470, 499	300
LimeKiln Wash	Geoglyph	549	10
Beale Slough	Geoglyph	195	10
Rattlesnake	Geoglyph	209	25
Mystic Maze	Geoglyph	118	150
Dome	Geoglyph	407-12 432, 494	150
Thunderbird	Geoglyph	223	10
Ligurta	Geoglyph	201, 402-6, 408, 423	100
Blythe Complex	Geoglyph	22	600
Ripley Complex	Geoglyph	60	200
Needles	Geoglyph	413	5
Quien Sabe	Geoglyph	418-22, 498	40
Tule Springs	Petroglyph	26	80
Mohave Mt. Canyons	Petroglyph	168-9	15
Laguna Mts.	Petroglyph	12, 135-6, 206, 424	200
Avilla Park	Petroglyph	270	5
Tyson Wash	Petroglyph	27	5
Quien Sabe	Petroglyph	1427	5
Antelope Hill	Petroglyph	134, 1469	300
Dome	Petroglyph	948, 1433, 1435	25
Beale Road	Petroglyph/ Historic Trail	1035	200
Cibola Valley	Diverse Complex	400, 401, 428, 690	1,500
Palo Verde Point	Diverse Complex	471, 473, 474, 736	1,500
Mohave Mesa	Diverse Complex	507-9	40
Muggins Terraces	Diverse Complex	133, 747, 1436-41	1,500
Big Maria Terraces	Diverse Complex	At least 30 sites	1,300
Senator Wash	Village/Camp	696	100
Martinez Lake	Village/Camp	210	50
Osborne Wash	Village/Camp	182, 288-90, 544-48, 657-59	5
Osborne Wash	Village/Camp	654	5
Black Tank	Village/Camp	291, 295, 297-99, 500-4	100
Mohave Mt. Springs	Village/Camp	267-68, 271-74	80
Bowman's Wash	Village/Camp	1012	5
Swansea Mining Town	Historic	555	200
Hardyville/ Ft. Mohave Road	Historic	703	30

a combined petroglyph and historic road area. The probable camp areas include several rockshelters. The historic sites are Swansea mining town and the Hardyville/Fort Mohave road, and the prehistoric areas include the well-known Blythe, Ripley, and Mystic Maze geoglyphs. The majority of resources are located on the desert pavement - covered terraces overlooking the river floodplains, but some of the camp and petroglyph areas are situated in mountainous zones or areas along major washes. Particularly conspicuous zones of multiple areas or large acreages exist in the Needles vicinity, the Mohave Mountains, the Big Maria terraces, the Palo Verde-Cibola Valley, and the Dome-Wellton area along the Gila River (Figure 7-1). Of the 36 areas allocated to the "conservation for future use" category, 20 are within the Yuma Resource Area and 16 are within the Havasu Resource Area. New discoveries or revised evaluations could generate additions. Many of the listed areas combine informational and heritage values.

Sociocultural Use

This category applies to places valued by a particular social or cultural group for qualities that contribute to maintaining that group's heritage. Native American heritage values would indicate assignment to sociocultural use. Sociocultural values are taken into account in land use planning. For specific undertakings, managers must comply with notification and consultation procedures outlined in legislative regulations.

The types of cultural resources assigned to sociocultural use probably will conform to those listed above as "likely to possess important heritage values for Native Americans." The Colorado River tribes may express concerns regarding access to sites, protection of cultural resources, interpretive or data recovery efforts, and the impacts of authorized projects on cultural resources and sacred places. They may also request advice concerning the protection of archaeological sites on reservation lands. Native Americans generally favor the avoidance and protection of cultural properties, although they tend to view erosion and weathering as natural processes that should not be artificially arrested. Native American concerns may extend beyond the disposition of archaeological sites to such issues as the construction of communication stations or other facilities on mountain tops. Cooperation for mutual benefits, rather than confrontation, should be the basis for Federal-tribal relations.

Public Use

Some properties will be suitable for consideration as interpretive exhibits or subjects of supervised participation in scientific or historical studies. Prospective interpretive exhibits should be areas most interesting and readily accessible to the public. Within the Yuma District, such areas would consist of relatively substantial geoglyph, petroglyph, or historic cultural resources near highways.

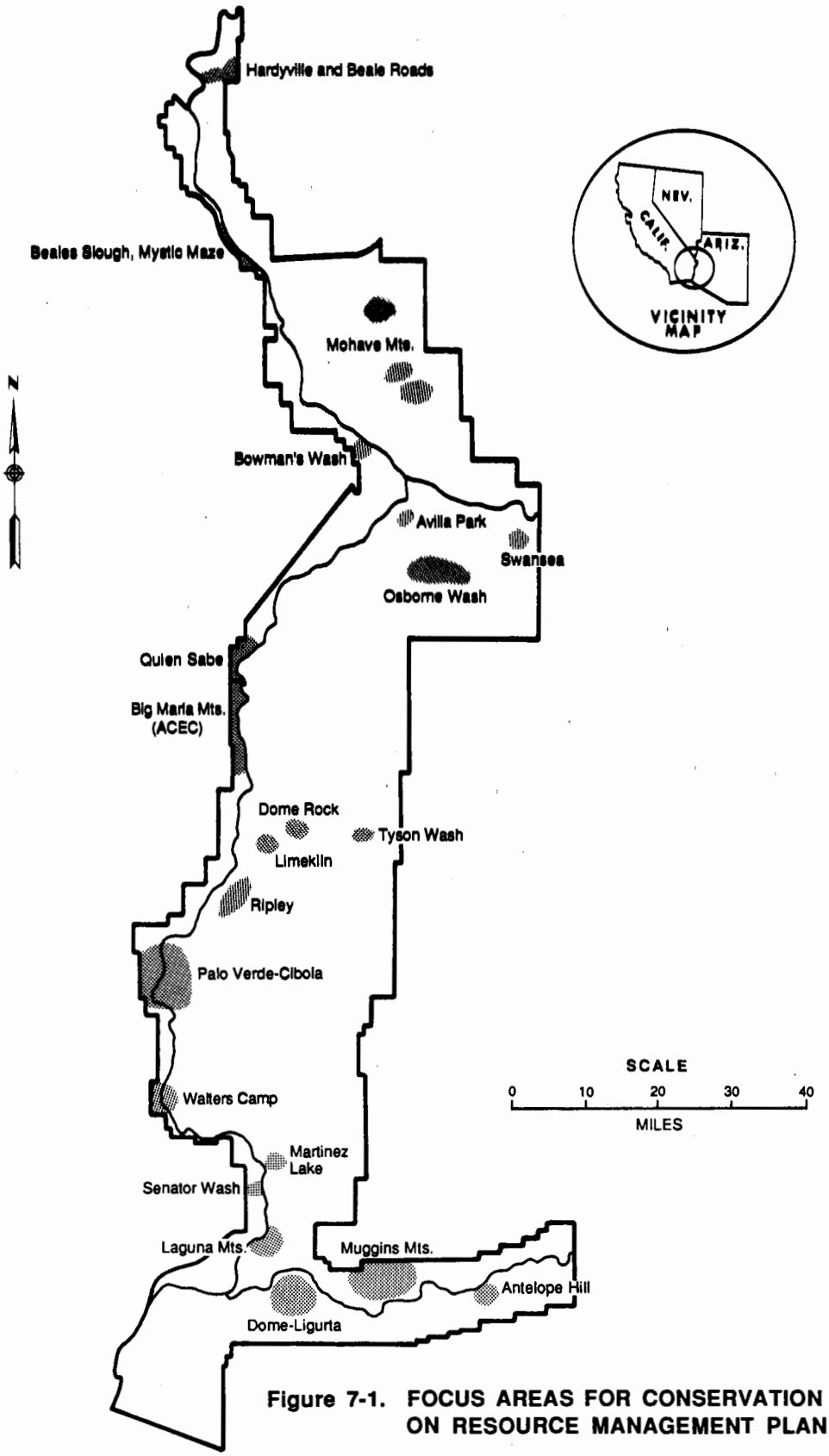


Figure 7-1. FOCUS AREAS FOR CONSERVATION BASED ON RESOURCE MANAGEMENT PLAN

Since visitation exposes cultural resources to damage or deterioration, measures should be taken to ensure adequate protection of areas developed as interpretive exhibits. To avoid loss of scientific values, data recovery minimally should consist of mapping and intensive inventory of the entire area designated as an interpretive exhibit. Care should be taken to ensure that other cultural resources in the vicinity will not be threatened by discovery or deterioration associated with increased human traffic. Solari and Johnson (1982) discussed strategies for the interpretation, display, and protection of geoglyph sites.

Many geoglyph and petroglyph sites are potential candidates for assignment to both sociocultural use and public use. Native Americans might object to the interpretive development of highly sacred sites, and they likely will be concerned with the specific interpretive content and protective strategies applied to particular exhibits. For example, the confinement implied by close fencing of geoglyphs could be offensive to Native Americans. As demonstrated by the closely fenced Blythe Intaglios, the resulting rings of bare compacted soil enhance neither the preservation nor the visual quality of the encircled figures, and damage could be inadvertently directed toward associated but less obvious cultural features.

Native Americans should have the opportunity to comment on interpretive content or to cooperate in developing interpretive materials. Culturally sensitive or guarded information should not be revealed, nor should oversimplification trivialize or misrepresent Indian cultures. The enigmatic yet representational nature of many geoglyph sites, in conjunction with commanding vistas of the mountains and Colorado River Valley, appeal strongly to one's vision and imagination. Interpretive approaches should emphasize the creative processes and unique nature of the cultural resources; respect for the antiquity, traditions, and environmental resourcefulness of the Colorado River tribes; and interesting but less sensitive accounts of tribal myths embodied in the cultural resources. Suggested parallels to such intriguing phenomena as cave paintings, Peruvian intaglios, or prehistoric Midwestern earthworks can extend the frame of reference beyond the lower Colorado region. A starting point for enlightened interpretation is provided by a descriptive brochure on geoglyphs published recently by the BLM.

In order to most effectively preserve the scientific and sociocultural values of Yuma District cultural resources, quantity should be minimized and quality maximized for interpretive exhibits. For selected interpretive exhibits, integrated strategies for inventory, interpretation, display, protection, and repair or restoration should be developed through cooperative efforts of cultural resource and recreation specialists. Land uses that conflict with interpretive values or protection should be restricted in the vicinity of exhibits. Resources presently on exhibit include the Fort Mohave-Hardyville wagon road near Bullhead City and the Blythe Intaglios on the Big Maria terraces. The famous Blythe Intaglio figures, repeatedly publicized and easily accessible, are an obvious and logical location for a future interpretive project provided that specific development plans call for adequate

CHAPTER 8

MANAGEMENT OPPORTUNITIES: PRIORITIES AND PROTECTION

Cultural resource management reflects the unique challenges of land use management within the Yuma District. Unlike other BLM Districts, its areal focus is a river and adjacent deserts that annually attract millions of people from urban areas of the West and from the harsh winters of the temperate states and Canada. Multiple use management considerations range from rapid urbanization and intensive recreational use to the conservation of wilderness and riparian habitat. The District's boundaries incorporate a complex mosaic of other landholders pursuing diverse land uses: rapidly growing riverside communities, Indian reservations, the U.S. Fish and Wildlife Service, state and county parks, the military services, and large-scale agricultural operations (Figure 8-1). Although technically it holds no lands, the U.S. Bureau of Reclamation operates hydraulic facilities, regulates the Colorado River flow, and uses riverside lands for related needs.

Due to its character and composition, the Yuma District deals with more than its share of conflicts and crises. In effect, the District Office was established in response to a crisis that had brewed for decades. Originally the Lower Colorado River Land Use Office, in 1961 it was empowered to deal with the problem of widespread illegal trespassing on vacant Federal lands along the river. Now in addition to the lingering problem of trespassing and the contemporary development of urban areas, the Yuma District Office responds to big demands and big events, both unplanned and planned. Huge seasonal population influxes generate increasing needs for recreational facilities. Wildfires threaten wildlife habitat in the few remaining riparian zones. Big events include the Parker/SCORE 400 off-highway vehicle race and the annual Quartzsite Gem and Mineral Pow-Wow that has attracted a million people through that desert town over a single weekend. Even the tamed Colorado River can occasionally act up, as it did in 1983, when massive summer floods inundated floodplain structures. All of these demands and events can threaten the integrity of cultural and natural resources.

Among its large number of cultural resources, the Yuma District contains giant "ground figures," geoglyph sites that comprise one of the most unusual and intriguing concentrations of archaeological sites in North America. In terms of large scientific archaeological projects, it is one of the continent's least studied areas. Its cultural resources have suffered from the intensive modern use and taming of the Colorado River, and these enduring yet fragile areas are seriously threatened by the diverse and increasingly intensive activities within the region. Although many cultural resources are situated in the District's rugged and pristine backcountry, the majority of geoglyphs are among other significant resources situated in accessible areas vulnerable to destruction. These factors necessitate active cultural resource management focused on the protection of resources threatened by ongoing and expanding modern activities, reinforced by greater public awareness and support. Key management strategies thus should include the

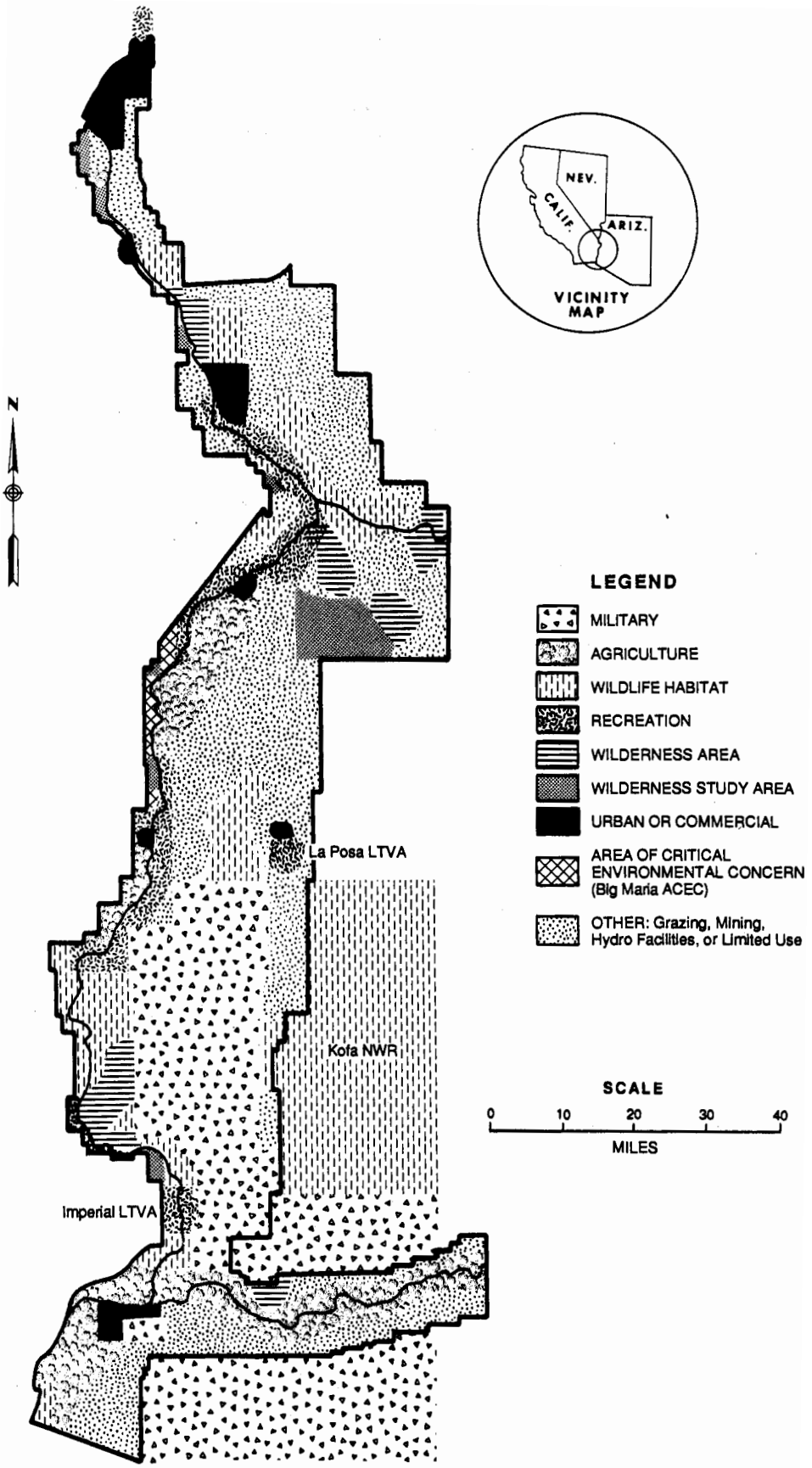


Figure 8-1. YUMA DISTRICT PRIMARY OR PROPOSED LAND USES

definition of high priority areas, significant and fragile as well as seriously threatened cultural resources, as zones for inventory and active protection measures; effective law enforcement; frequent monitoring of the condition of cultural resources and the locations and severity of potentially destructive activities; and the development of interpretive and protective programs enlisting the support of Native American tribes, volunteers, and other Federal and governmental agencies.

Threats to the Integrity of Cultural Resources

The deterioration or destruction of cultural resource values can be caused by planned and unplanned land use activities and the associated impacts, or by natural processes such as erosion, weathering, and trampling or burrowing by wildlife. Planned projects and natural processes in general pose less serious threats. In the case of proposed construction projects such as transmission facilities, associated activities and outcomes are predictable and manageable. Since many projects will involve "undertakings" subject to Section 106 compliance procedures (36 CFR 800) of the National Historic Preservation Act, adverse effects can be minimized through preliminary planning, avoidance of physical impacts on cultural resources in the siting of projects, intensive inventory (clearance surveys), scientific data recovery if avoidance is not feasible, and appropriate review by the State Historic Preservation Officer (SHPO).

Natural processes, particularly arroyo cutting and bank erosion, can alter cultural resources. Natural erosion can be aggravated by mining, grazing, off-highway vehicles, and other modern land uses. Many sites close to the river likely were displaced or washed away long ago by the seasonal floods, and remaining cultural resources in lower areas close to floodplains may still be vulnerable to fluctuations in river levels. However in many of the areas exhibiting relatively high densities of cultural resources, particularly desert pavements, "soil erosion is generally low due to the gravelly or cobbly surface layer that protects the soil from the impact of raindrop splash and channel runoff" (BLM 1982:46). If left undisturbed, such areas can retain cultural resources in remarkably good condition. However, human traffic and activities, whether purposeful or inadvertent, can seriously disturb the integrity of surface sites through displacement, removal, obliteration, or permanent scarring of artifacts and features situated on these "fragile pattern areas" (Hayden 1965). Within the Yuma District, off-highway vehicles are the primary source of surface disturbance, from bulldozers to motorcycles. Off-highway traffic from recreational vehicles and motorhomes is bound to increase as more people settle and use urban areas, recreational facilities, and camping areas. Since unauthorized and casual activities are difficult to monitor and control, they pose the greatest threat to cultural resources located in areas accessible to highways and urban or recreational centers.

Urbanization and Recreation

Real estate development and continuing encroachment on the surrounding desert are associated with the long-term growth of urban communities such as Yuma, Lake Havasu City, and Bullhead City. Lured by the large gambling casinos at Laughlin, Nevada, job searchers have been among the nearly 7,000 immigrants who have moved to Bullhead City since 1985. An additional 40,000 people have settled in the unincorporated 30 miles between Bullhead City and Needles. It is the fastest-growing community in Arizona, and a housing shortage and low service wages have forced many to inhabit makeshift camps on vacant land (Negri 1989). Much of the Federal land in the vicinity of Bullhead City has been exchanged for more remote and manageable parcels, but continuing growth threatens cultural resources on remaining Federal lands.

Recreation is the key activity and management issue along the lower Colorado River, as well as the force that has powered much of the urban growth. The river is within a half-day drive of over 17 million people in California, Nevada, and Arizona. In 1986, the Yuma District received over 7 million visitor days of recreational use, a level exceeding the annual use in the Grand Canyon National Park. Recreational use takes two basic forms: river-related recreation and extended winter camping.

River recreational use for water sports and fishing peaks during the spring, summer, and fall. The BLM operates many developed and undeveloped recreational sites for short-term camping, fishing, boating, birdwatching, and picnicking. BLM-Private Sector "Cooperative Management Units" are more highly developed facilities that incorporate camping, motels, resorts, marinas, and commercial operations. Many of these privately operated concessions originated as trespass businesses. Outside of BLM-managed lands, additional recreational developments and use areas exist on private lands, state and county parks, and leased areas of Indian reservations.

The Parker Strip area between its namesake dam and town is by far the most intensively used recreational zone and the location of most of the Cooperative Management Units. Although cultural resources have undoubtedly suffered from this intensive use, in general the area is a rugged canyon zone characterized by less substantial and fewer resources in comparison to the broader valley zones. Other major recreational zones are the area between Needles and Bullhead City, the margins of Lake Havasu, the area from Ehrenberg south to Walter's Camp, and the Laguna-Martinez area in the vicinity of Imperial Dam. The wildlife refuges generally receive less intensive use than more developed zones. However, since few areas are restricted from recreational use and since lands bordering the river are easily accessible by boat or highways, all cultural resources along the river are vulnerable to human traffic. Important recreational and cultural resource zones coincide in the Needles area, the Palo Verde and Cibola valleys, and the Laguna-Martinez area. In addition, recreational developments on the California shore south of Parker and north of Blythe threaten encroachment on cultural resources of the Big Maria terraces.

Seasonal immigrants seek refuge from colder regions through extended winter camping. The winter crowd, labeled as "snowbirds" by year-round residents, consists largely of retired people who camp in recreational vehicles for periods ranging from several weeks to several months. Many seek relatively inexpensive accommodations on expanses of desert pavement located on public lands. In response to this strong demand, likely to increase in the future, the BLM has established two "long-term visitor areas" (LTVAs). The Imperial Dam LTVA encompasses several thousand acres west of the river in the Senator Wash-Imperial Dam-Laguna Mountains area. Further from the river just south of Quartzsite, the La Posa LTVA incorporates 11,000 acres on the La Posa Plain. Camping during the winter season from September 15 to April 15 requires a $25 LTVA permit. Other non-fee areas have been designated for 14-day limit camping.

The seasonal influx at the La Posa LTVA is nothing short of astounding. The hamlet of Quartzsite expands by tens of thousands with up to a million travelers during the annual Pow-Wow, a gem and mineral show. During the Pow-Wow, up to 8,000 people stay on Federal campgrounds. A recent article in TIME magazine (May 22, 1989) featured this "curious desert scene" of "boondocking," potluck dinners at evening bonfires, and starlit square dancing. In April, "the huge encampment with its bustling activity rolls away, evaporating like runoff from a desert cloudburst," after residents have participated in dirt biking, rockhounding, and gold prospecting. Related management challenges include damage to fragile desert pavement and associated cultural resources, wood collecting, garbage and sewage disposal, high levels of dust, and safety and regulation enforcement problems.

Unfortunately both LTVAs are situated on expanses of desert pavement known or likely to contain cultural resources. The La Posa LTVA seems to have served a similar function for both prehistoric users and modern campers, as a stop for cross-country travelers and a longer-term or seasonal camping area. The bad news is the presence of fragile surface sites; the good news is the apparently repetitive dispersion of surface remains that can yield much of their scientific information through detailed recording during surveys. That situation might not apply, however, to sites exhibiting relatively high material densities, diverse artifacts, or possible subsurface features. In addition to the more common rock rings, trails, and small artifact scatters, unusual geoglyph sites have been found in the Quartzsite vicinity even though it is relatively distant from the rivers.

Only the most remote and rugged areas escape off-highway vehicle (OHV) traffic. Solari and Johnson (1982) provided photographic examples of the serious damage visited on cultural resources overrun by vehicle tracks. Swarthout and Drover (1981:75) estimated that 20 percent to 30 percent of cultural resources along the lower Colorado River had been damaged by OHV activity. More recent estimates indicate that over half the sites near the rivers have been disturbed by continually increasing traffic. The problem is particularly serious near recreational and camping areas. In many cases, drivers probably fail to realize that they are disturbing the subtle surface patterning of cultural resources. The same cannot be said

for those who intentionally drive over such obvious features as the Blythe Intaglios. Casual, unauthorized, and oblivious driving probably is the major source of OHV damage, but it sometimes results from intentional vandalism.

Designated competitive courses allow for recreational OHV use that can be planned, monitored, and managed to reduce impacts on cultural resources. There are two competitive use areas within the Yuma District: the Ehrenberg Sand Bowl and the Parker/SCORE 400 course. The SCORE 400 race is an annual event that follows existing roads in the vicinity of Parker and Osborne Wash. Archaeological inventories have indicated that although the Cactus Plain is largely devoid of cultural resources, areas adjacent to Osborne Wash were used for traveling, camping, and temporary activities by prehistoric groups. The race is difficult to manage since it involves up to 20,000 spectators and requires monitoring for protection of cultural resources, sensitive wildlife habitat, and an unusual area of stabilized dunes. Approximately 200 volunteers help the BLM and race promoter manage the race each year, and it contributes a sizable income to Parker's economy. Despite the costs to the BLM, the race provides an opportunity to deal with organized OHV groups in a cooperative manner that could enhance their promotion of more responsible OHV use and acceptance of reasonable regulations.

Vandalism

Vandalism of cultural resources is a serious problem nationwide and the single most serious threat to sites in many areas of the Southwest. The Society for American Archaeology (SAA) recently launched a major anti-vandalism project to combat the destruction, defacement, disturbance, and looting of cultural resources (Neumann and Reinburg 1989). The predominance of subtle and unusual surface features, the lack of substantial prehistoric structures, and the paucity of artifacts suitable for commercial trading have made vandalism a less serious problem along the lower Colorado River relative to other regions of the Southwest. As previously noted, serious damage to sites is often an inadvertent consequence of recreational activities. Yet vandalism is a tangible threat to cultural resources within the Yuma District.

Vandalism is a multifaceted problem that takes different forms in different regions. For example, the SAA project defined several types of perpetrators: professional looters, treasure hunters, and dealers who traffic in cultural items for material or commercial gain; intensive collectors and casual collectors whose motives are not monetary, but rather for personal collections; intentional defacers motivated by the power or thrill of criminal behavior; unintentional defacers (such as those who chalk rock art) motivated by fun and ignorant of the negative effects of their actions; and instigators, a miscellaneous group of those having monetary interests, such as the film industry and sponsors of artifact shows.

Considering the nature of cultural resources and land use activities within the Yuma District, most vandalism likely will be perpetrated by collectors, intentional defacers, or unintentional defacers. Looted items commonly traded by dealers are relatively rare within the lower Colorado region. However, recreational collectors have worked the region for decades, removing projectile points, pottery, grinding implements, and perishable items from campsites and caves. In the Black Mountains just east of the Yuma District boundary, illegal digging and artifact removal have marred the important and remote site of Bighorn Cave. In the 1930s, Malcolm Rogers documented the existence of private collections of artifacts taken from camps and caves in the mountains east of the Colorado River. At a large site near a spring in the New Water Mountains east of Quartzsite, Rogers (n.d.) noted that 78 metate fragments and a few whole metates remained after "most of the whole metates and manos were taken away" and that "miners and ranchers gathered up practically all the arrowpoints, blades, and dartpoints from the area previous to 1930." He also stated that at a site near Bouse Wash, "arrowpoints almost absent but local ranch boys have hunted this area considerably." At petroglyph sites, boulders had been "trucked away by relic hunters." Cultural resources most seriously threatened by illegal digging or removal include relatively accessible or conspicuous caves, rockshelter caches, campsites having diverse or diagnostic artifacts, and petroglyphs. Unfortunately such sites often hold particularly high informational values that can be severely diminished by physical disturbance and artifact removal. Other significant cultural resources are particularly vulnerable to defacement: relatively accessible or conspicuous geoglyphs, earth figure sites, and petroglyphs. Vandalism thus threatens many of the most highly valued cultural resources within the Yuma District.

Mining and Quarrying

Mining and quarrying disturb or destroy ground surfaces and thus pose a serious threat to cultural resources. Through clearing, road construction, and the destruction of alluvium, mining-related activities can intensify erosional processes. The construction of roads to quarries and remote mines can increase public and OHV access to formerly inaccessible cultural resources, a contributing factor to vandalism.

The mining of "locatable minerals" such as gold or copper could adversely impact cultural resources in canyons and the mountainous backcountry. Ironically, those cultural resources might include historic mines and ghost towns. Historically, mining was a major land use within the lower Colorado region. Based on historic mining zones and a modern assessment of mineral values, future mining activities likely would focus on the Mohave, Whipple, Buckskin, Dome Rock, Trigo, Laguna, or Muggins mountain ranges. Mining activities could threaten canyon campsites or roasting pits, caves, petroglyphs, prehistoric lithic quarries, or food/water storage caches.

Throughout the Yuma District, the potential for oil, gas, and coal resources is low. Along the lower Gila River, the Wellton area has a

potential value for geothermal energy development. Along the rivers, the greatest threat to cultural resources exists in the quarrying of rocks and gravel for various purposes. All sites on desert pavement are vulnerable: geoglyphs, artifact scatters and camps, aboriginal lithic quarries, and the entire range of surface features. Petroglyphs can be carted away with the other rocks. Permits for the exploitation of "salable minerals," and free use quarries established for public agency use, allow for inventory and avoidance of cultural resources. However, collectors who neglect to obtain permits can quickly remove areas of rocks and gravel on the terraces close to highways. Cultural resources are particularly vulnerable to those who illegally remove varnished desert pavements and "black rock" for sale to landscapers in distant urban areas. The BLM recently recovered petroglyphs removed from the vicinity of Bullhead City by rock collectors. Since the original context was lost, the boulders were moved to the Fort Mohave tribal community for curation and a potential interpretive display.

Agriculture and Livestock Grazing

Large-scale agricultural development of areas adjacent to the Colorado and Gila Rivers probably has obliterated or obscured many cultural resources, possibly including villages or camps spared by floods. Particularly in the vicinities of Blythe and Yuma and on lands adjacent to the lower Gila River, agriculture has obscured an expected high intensity of prehistoric use now indicated only indirectly by outlying concentrations of geoglyph, petroglyph, trail, and temporarily used sites. Most agricultural lands are situated on private holdings and Indian reservations. The BLM administers only a few thousand acres of agricultural lands under a permit and lease program, instead managing the majority of riverside areas for recreational values and wildlife habitat.

Livestock grazing likewise is not a major activity within the Yuma District's public lands, although it is a widespread use of more remote lands within the Havasu Resource Area. Since the region is so arid, most grazing allotments are "ephemeral" range plots which only periodically produce sufficient vegetation suitable for livestock grazing. Grazing can threaten the integrity of cultural resources through trampling of sites, breakage and displacement of artifacts and features, and accelerated erosion of riparian zones and areas adjacent to water holes.

Military Activities

A considerable area of southwestern Arizona has served as a training and testing range for the military services. Within the Yuma District boundaries, the Yuma Proving Ground encompasses a vast area of mountains and desert basins within the Yuma Resource Area. The testing range covers much of the Dome Rock, Trigo, and Muggins mountain ranges and the Castle Dome Plain. The potentially destructive impacts of military activities are offset by the restriction of public access and other land uses and by the practice of cultural resource management. The Yuma Proving Ground recently moved more definitively toward the latter

objective by funding overview and survey projects and adding a professional archaeologist to its staff. These actions reduced the level of assistance required by BLM archaeologists who had participated in previous surveys on the Proving Ground. The Yuma District can continue to offer informational and evaluative support to the Yuma Proving Ground.

Military training activities in other areas of the Yuma District have left their mark on its landscape. Luckily much of this activity took place in areas of relatively low cultural resource density on the La Posa and Cactus Plains. World War II military activities were associated with the use of lower Colorado regional deserts as General George Patton's Desert Training Center (Cook 1978). Now nearly 50 years old, the remaining sites may qualify as historic resources relevant to military history. Later training exercises, the "Desert Strike" maneuvers of the 1960s, were conducted near Osborne Wash. The distinctive features and debris are concentrated in highly eroded areas rather than desert pavements, suggesting a minimal impact on cultural resources.

As recently discovered during a field trip to a prehistoric campsite near Imperial Dam, cultural resources can be disturbed through unexpected means. Relatively inaccessible and far from obvious, the fragile site surface nonetheless was damaged by recent and repeated helicopter landings. The gashes marred a site that may well be a preceramic base camp containing diverse artifacts and unusual mounded features in a prime area overlooking the river. The military installations, Bureau of Reclamation or other Federal agencies that fly helicopters should be advised as to suitable landing areas, given that the flat elevated overlook zones that invite landings are also likely to have attracted prehistoric users. Perhaps certain areas should be surveyed and designated as landing zones if cultural resources are absent or if intensive recording can adequately recover data on small sites or common features that would not qualify for assignment to conservation for future use.

High Priority Zones for Inventory and Protection

In view of the importance, fragility, and vulnerability of its cultural resources in conjunction with the uniquely challenging and increasing demands of land use management within the Yuma District, clearly defined priorities for effective cultural resource protection are imperative. To best accomplish its mission in regard to cultural resources, the District must exceed the basic requirements of the National Historic Preservation Act. However, it would be very costly to conduct large-scale sample surveys for site discovery or predictive modeling prior to meeting protection needs. Thus priorities must be set to guide inventory and protection strategies.

Cultural resource inventories can serve several distinct functions within the broader purposes of discovery and evaluation:

1. The discovery and assessment of resource values within specific areas where proposed construction projects or agency actions could threaten resource integrity. This represents basic legal compliance.

2. The discovery and assessment of resources within areas of expected high cultural resource values that are seriously threatened by impacts from unauthorized OHV use, vandalism, quarrying, or other activities.

3. The monitoring of resource conditions within areas of known high cultural resource values threatened by impacts from unauthorized activities. Intensive mapping and recording would enable measurable assessments of disturbance or deterioration. Such information would enhance not only site protection strategies but also the strength of legal cases involving enforcement of the Archaeological Resources Protection Act and other statutes.

4. Intensive recording and mapping as de facto data recovery at important surface sites, thus protecting scientific values and establishing a basis for future restoration or interpretive development.

5. The collection of reconnaissance or regional sampling data for basic information relevant to planning documents or environmental impact statements.

6. The collection of data for the development, testing, and refinement of resource locational predictive models.

7. The discovery and assessment of cultural resources within areas poorly known but not imminently threatened by ongoing activities, such as little-used backcountry zones.

In the immediate future, the Yuma District must implement the first inventory strategy, should emphasize strategies 2, 3, and 4 as efficiently as possible, and should support strategies 5, 6, and 7 as longer-term management objectives or independently funded scientific research. Yuma District cultural resource inventory data was recently incorporated into a statewide geographic information system of multiple use values as a powerful management tool for the BLM. The District should make full use of this automated system to develop predictive models and explore relationships among cultural resources and other environmental values.

In regard to inventory strategy 2, survey areas could include the following:

1. The La Posa LTVA and the Senator Wash area of the Imperial LTVA. An ongoing inventory of the La Posa LTVA is in progress.

2. Zones of high OHV use near cities, LTVAs, river recreational areas, or known areas of cultural significance.

3. Areas of mining activity in the Mohave, Whipple, Buckskin, Laguna, or Muggins Mountains.

4. Prospective village locations indicated by documentary evidence or native consultants.

5. Riverside areas most threatened by human activities and traffic, particularly expanses of desert pavement on terraces; vista zones of elevated terraces or mesas with a panoramic view of the river valley; areas where mountains meet the river, as at Palo Verde Point and Senator Wash; and confluence zones of rivers and major washes.

River margin inventories could initially concentrate on imminently threatened zones and areas in the vicinity of known cultural resource concentrations. Aerial photographs could be used to identify promising vista, desert pavement terrace, and confluence zones. The Bureau of Reclamation has produced an extensive, potentially useful collection of aerial views of the river margins. A recent preliminary study by James Green, Havasu Resource Area Archaeologist, employed computer-enhanced aerial photographic images to assess the antiquity of the Parker snake geoglyphs. In mountainous areas, an informal cave watch could involve the inspection and reporting of potential cave sites by BLM archaeologists or professionals engaged in other management activities.

In regard to inventory strategies 3 and 4, efforts should focus on areas or resources assigned to the category of "conservation for future use," particularly those most threatened by unauthorized activities, most accessible to the public, or targeted for future interpretive development. Inventory methods should be comprehensive, not focused only on larger or more impressive features, and permanent datums (brass caps) should be established and maintained. Aerial photographs, particularly if taken at lower altitudes than most Bureau of Reclamation prints, could aid in defining features and monitoring natural weathering and human-caused damage.

The Big Maria terraces, incorporating the Blythe Intaglios and other sites, are the obvious initial choice for intensive recording and monitoring. Other appropriate inventory areas could include geoglyph, petroglyph, and possible habitation sites in the vicinities of Needles, the Palo Verde-Cibola Valley, the Chocolate-Laguna Mountains, the Dome-Ligurta area, and Antelope Hill. The status of inventory data for the Osborne Wash-SCORE 400 area should be reviewed. Specific areas to be inventoried should be selected on the basis of high values and serious threats to integrity.

Based on previous surveys and environmental characteristics relevant to human settlement, certain areas would appear to contain few cultural resources. Among them are the Aubrey Hills, Dutch Flat east of the Mohave Mountains, the Yuma Desert, and much of the Cactus Plain except for Osborne Wash and the Swansea ghost town and railroad line. Some of these areas have wildlife or botanical values vulnerable to the same

activities that can disturb cultural resources. The Cactus Plain also contains significant paleontological remains of desert tortoises and perhaps other species (Brown and Stone 1982).

Values and needs should indicate high priority zones for protective measures. Protective strategies should be developed for highly valued resources exhibiting ready public accessibility and ongoing or imminently serious threats to integrity. Priority should be accorded to resources of particularly high scientific value or combined multiple values (scientific, heritage, or public), such as the Mystic Maze, Blythe Intaglios, and Black Point site. A starting point for the allocation of protective measures is the revised RMP list of areas assigned to conservation for future use. Many consist of geoglyphs and petroglyphs, resource types of multiple values vulnerable to vandalism. Draft cultural resource management plans containing inventory and protective recommendations have been completed for the Big Maria area, geoglyphs, and petroglyph properties within the Yuma District (BLM 1984-1989).

Strategies for the Protection of Cultural Resources

Protective strategies take the form of direct and indirect measures. Direct measures include physical barriers and signs, monitoring and surveillance, law enforcement, and repair and restoration. Direct measures tend to be area-specific. Indirect measures incorporate administrative actions that enhance cultural resource preservation, cooperative efforts among agencies, tribes, and municipalities, and public education.

Direct Protection Measures

The use of fences, other barriers, and warning signs has become somewhat controversial in that they can reveal site locations and attract attention that ultimately works against protection. Yet when effective barriers are tailored to specific situations, they can work very well as protective measures. As Boma Johnson stated in a recent report on damages to cultural resources within the Yuma District, "it seems now that we must accept more site visibility with fences and signs in order to keep bulldozers and OHVs off of them." As Johnson indicated, the accessibility of many significant cultural resources and the problem of unregulated OHV traffic mandate the effective use of barriers to protect sites within the District. Several guidelines can be followed to minimize site visibility and enhance the effectiveness of fences, barriers, and signs:

1. Determine and use durable materials. Near the Blythe Intaglios, vehicles have driven over barbed-wire gates. In some cases, log and cable fences and metal gates may be more appropriate than barbed wire. Tests should be conducted to determine the most durable and attractive signing materials that can stand up to desert climatic extremes and bullets.

2. Avoid conspicuous placements that draw undue attention to cultural resources. For example, a conspicuous placement could consist of a fence and signs around the edge of a mesa or terrace ridge, clearly visible against the horizon. Fences instead should be situated in lower-lying areas to keep traffic off elevated desert pavement ridgetops. Fences too close to geoglyphs could draw attention to them and invite trespass. The protective effect could well justify extra costs of fencing larger areas. Fences are a common feature of the Western landscape, particularly near roads. People normally view them as indicative of livestock management or private property, not necessarily as barriers to be broken.

3. Tailor the use of barriers and signs to most effectively suit the particular area. For specific situations, relevant factors could include interpretive use, public knowledge of a site, traffic intensity and patterns, the visibility of the cultural resources, and the topographic situation. Topographic maps could be useful in designing physical protection plans. Site-specific plans could target the natural corridors or slopes offering access to vehicles. For example, in heavily dissected areas of ridges separated by deep arroyos, ridgetop resources could be protected by a few strategically placed post and cable barriers, rather than a perimeter fence.

4. Signs should be used in conjunction with fences or barriers at interpretive site displays or well-known and frequently visited areas. They should project not only a warning message concerning legal sanctions, but also a positive interpretive or preservation-oriented tone stressing the fragility, uniqueness, and heritage values of the cultural resources. Native American tribes along the river should be consulted for advice on interpretive content.

Monitoring strategies should be implemented to document the condition of vulnerable cultural resources, to detect the need to respond to imminent or ongoing disturbance or vandalism and to check the condition of fences. Adequate mapping, field records, and repeated inspections of established loci, such as particular features or petroglyph panels, would enable recognition of changes or damage to resources.

The draft cultural resource management plans prepared for the Big Maria area, geoglyphs, and petroglyph sites contain tentative schedules for patrolling specific sites and areas. Depending on site values and vulnerability, proposed visits range from once to four times per year. The patrol recommendations can be extended to incorporate other important cultural resources in the vicinities of those listed in the plans. Locations recommended for monitoring can be grouped into seven tentative patrol areas for more efficient planning and scheduling: the Topock-Needles area and the Osborne Wash-Bill Williams area within the Havasu Resource Area; and the Big Maria, Ripley, Palo Verde-Cibola, Quartzsite, and Laguna-Gila areas within the Yuma Resource Area. In terms of site frequencies and frequencies of proposed visits, the Big Maria, Palo Verde-Cibola, and Osborne-Williams areas pose particularly high needs for

monitoring. The Big Maria and Ripley areas are situated in the Blythe vicinity approximately midway between the Resource Area offices.

Effective site monitoring is an important facet of protective measures, yet it poses high time and travel demands on BLM archaeologists. Fortunately, they can recruit the aid of BLM rangers, volunteer site stewards, and others. A recent Society for American Archaeology conference on protecting cultural resources on public lands recommended cooperative protection efforts and law enforcement agreements among appropriate Federal, state, and local agencies and Indian tribes; combined agency task forces; and high visibility patrols in areas of greatest vulnerability. Park rangers and U.S. Fish and Wildlife Service officials could watch for situations of increased traffic that could threaten cultural resources. Since the Big Maria area contains the well-known Blythe Intaglios, indicated by a roadside sign and road maps, visible patrols are appropriate for that area. Tribal police and BLM rangers should travel the roads particularly during weekends or crowded periods. Colorado River tribal personnel or museum officials could assist in monitoring the Big Maria area.

The Yuma District has been incorporated into the Arizona Site Steward Program recently established to coordinate statewide volunteer monitoring of prehistoric and historic archaeological sites in order to prevent their destruction. The participation of state and Federal land management agencies was established through an Intergovernmental Agreement with the State Historic Preservation Office. A statewide program coordinator oversees the selection, training, and certification of site stewards organized by regions. Many of the stewards are members of avocational archaeological societies, extremely active in protecting Arizona's cultural resources. As of January 1990 there were 359 applicants, 161 active site stewards, and 47 stewards in training.

Federal archaeologists assist in recruiting and training site stewards and work with volunteer regional coordinators. They select the sites to be monitored on Federal lands, generally those most important, vulnerable, and accessible, and they keep records on steward activities. They are ultimately responsible for providing encouragement to sustain motivations for continued participation in the program. Thus although the Site Steward Program provides valuable opportunities for public involvement and much needed assistance in site protection efforts, land managers should recognize the associated supervisional demands placed on BLM archaeologists.

Avocational archaeologists, including seasonal residents, are among the site stewards within the Yuma District. Tribal governments are among the statewide sponsors of the program, and participation of Yuma District tribes would enhance the protection of cultural resources along the lower Colorado River. The Arizona Preservation News SHPO newsletter recently reported on steward recruitment efforts spearheaded by Con and Dawn Bergland in the Parker-Bouse area. At least 30 people there have applied to enter the program. This group of stewards could assist in monitoring

the Big Maria, Ripley, Quartzsite, and Osborne Wash areas relatively remote from BLM Resource Area offices. As of June 1990, at least 75 sites had been selected for monitoring by stewards within the Yuma Resource Area.

Law enforcement efforts should focus on active enforcement of the Archaeological Resources Protection Act (ARPA). Archaeologists, rangers, and land managers should take advantage of ARPA training courses sponsored by the U.S. Department of the Interior. Short and long courses have been developed to review the complementary enforcement roles and tasks of cultural resource managers, law enforcement officers, and legal professionals. Several BLM personnel from the Yuma and Phoenix Districts have attended the courses. Legal prosecutors also should be encouraged to attend.

Strategies for ARPA enforcement can be tailored to the nature of damage and vandalism problems within particular regions. For example, covert "sting" operations to capture professional looters and traffickers would be appropriate for the Four Corners area but not for the Yuma District. For the lower Colorado region, appropriate enforcement strategies could consist of the following:

1. Investigations of incidents of reported vandalism or unusual activities, with strict attention to proper evidence gathering procedures by law enforcement and cultural resources personnel.

2. For initial offenders or recreational collectors, the following alternative responses: stern warnings in the form of citations; diversion toward more acceptable avocational archaeological activities; civil rather than criminal prosecution (ARPA allows for both); penalties involving public service such as labor in repairing damages or constructing fences.

3. For repeat offenders or serious intentional cases of vandalism or theft: criminal felony prosecution; or civil prosecution with fine or forfeiture penalties. Civil cases tend to be easier to prosecute and win since the standard of proof is a "preponderance of evidence" rather than "guilty beyond a reasonable doubt." Forfeitures and severe fines can serve as effective deterrents. The forfeiture provision, which applies to both criminal convictions and assessments of civil penalties, enables the seizure and forfeiture of all vehicles and equipment used in connection with a violation. Thus a vandal might reconsider driving over an intaglio if it meant losing his OHV. Archaeological specialists in law enforcement strategies have recommended that ARPA regulations be revised to provide for the return of civil penalties to the agency to repair damaged resources.

4. ARPA should always be prosecuted in conjunction with statutes outlawing the destruction or theft of government property (for example, 18 U.S.C. 1361, Injury to Government Property, and 18 U.S.C. 641, Theft

of Government Property). The latter statutes are likely to be more understandable to juries and easier cases to prove.

5. The BLM should offer informational assistance to tribal governments regarding ARPA enforcement. The law provides that the tribes shall receive fines or forfeited items collected as penalties in cases involving archaeological resources excavated or removed from Indian lands.

Excluding cultural resources less than 100 years old, ARPA applies to a wide range of resources (Table 8-1) and a wide range of damaging or disturbing activities. Isolated surface "arrowheads" are excluded from the civil and criminal penalties of ARPA yet still may not be collected without a permit and still represent government property subject to sanctions against theft. ARPA does not apply to rocks or minerals unless they also are archaeological resources, nor does it apply to paleontological remains.

The assessment of ARPA penalties and the misdemeanor/felony cutoff (amended to $500 in damages) require value determinations for affected cultural resources. Determinations are expressed monetarily as estimated costs for information retrieval, repair, and restoration. Relevant costs can include research design preparation, fieldwork, laboratory analysis, report preparation, ground contour and surface reconstruction, physical protection facilities, and reinterment of human remains. Value determinations should incorporate conservative line item budgets. Obviously they represent a difficult task for the archaeologist and a rather unfortunate situation for the Yuma District. The surface sites of the District have high scientific values and unique heritage values, yet scientific data recovery would be less costly than would be the case at sites where information retrieval involved extensive excavation, analysis of thousands of artifacts and other specimens, and expensive technical analytical procedures. The law requires a monetary value determination for a quality that cannot be quantified, the tragedy of cultural loss akin to the extinction of a biological species.

Management studies could incorporate the artificial construction of earth figure sites to determine costs of repair and restoration applicable to ARPA cases. Repair and restoration could involve the reconstruction of cultural features or desert pavement surfaces, the repair of surface tracks or scars, the application of artificial desert varnish solutions to desert pavements, geoglyphs, features, or petroglyph sites, or the removal of modern structures such as the transmission towers at Black Point. At present, physical and chemical restoration procedures require experimental pilot studies prior to actual site applications. The construction industry has developed landscape restoration procedures that may be useful for archaeological applications, yet it may be difficult to finely tune these procedures to restore a natural appearance to damaged sites. The Yuma District currently is field testing "Permeon," an artificial desert varnish solution that mimics natural formation processes.

Table 8-1
ARCHAEOLOGICAL RESOURCES AS LISTED IN THE UNIFORM RULES AND REGULATIONS FOR THE ARCHAEOLOGICAL RESOURCES PROTECTION ACT
(must be more than 100 years old)

1. Surface or subsurface structures, shelters, facilities, or features, including but not limited to:

domestic structures	storage structures	cooking structures
ceremonial structures	artificial mounds	earthworks
fortifications	canals	reservoirs
gardens or fields	bedrock mortars	grinding surfaces
rock alignments	cairns	trails
borrow pits	cooking pits	refuse pits
burial pits/graves	hearths	kilns
post molds	trenches	middens

2. Surface or subsurface artifact concentrations or scatters.

3. Whole or fragmentary tools, implements, containers, weapons and weapon projectiles, clothing, and ornaments, including but not limited to:

pottery	other ceramics	cordage
basketry	other weaving	bottles
other glassware	bone	ivory
shell	metal	wood
hide	feathers	pigments
flaked stone	ground stone	pecked stone

4. By-products, waste products, or debris resulting from manufacture or use of human-made or natural materials.

5. Organic waste, including but not limited to:

vegetal remains	animal remains	coprolites

6. Human remains, including but not limited to:

bone	teeth	mummified flesh
burials	cremations	

7. Rock carvings, rock paintings, intaglios, and other works of artistic or symbolic representation.

8. Rockshelters and caves or portions thereof containing any of the above material remains.

9. All portions of shipwrecks including but not limited to:

armaments	apparel	tackle	cargo

10. Any portion or piece of any of the foregoing.

Wilderness area designations enhance cultural resource preservation by restricting traffic and incompatible land use activities, although access by researchers also is limited. In 1987, the Yuma District issued a Draft Environmental Impact Statement analyzing the various effects of designation or nondesignation as wilderness of 393,225 acres of public land in 22 wilderness study areas (WSAs). The larger WSAs over 10,000 acres included portions of the Mohave, Buckskin, Trigo, and Muggins Mountain ranges and the Cactus Plain. Many mountainous areas are currently managed as crucial habitat for desert bighorn sheep and are known to contain diverse cultural resources. The BLM recommended large areas of the listed WSAs as suitable for wilderness designation. In November 1990, approximately 87,000 acres were designated as wilderness.

Certain special designations applied to cultural resources represent official recognition of their scientific or heritage significance and confer special consideration in regard to state historic preservation plans and national or international preservation programs. The primary national listing of significant historic and archaeological properties is the National Register of Historic Places administered by the National Park Service. Currently four areas within the Yuma District are listed on the National Register: the Blythe, Ripley, and Parker Rattlesnake geoglyphs and the Martinez Lake prehistoric campsite. Future resource protection efforts would be supported by the preparation of a "multiple property" nomination for District geoglyph sites, obviously significant cultural resources at the national level. Few resource types in Arizona are more appropriate for this type of nomination. However, detailed documentation and justification of scientific significance is an involved process likely to require several weeks rather than days of work. Independent researchers could be encouraged to seek grants awarded by the State Historic Preservation Office (SHPO) for inventory and documentation of areas potentially eligible for the National Register. Johnson (1985) provides descriptive information that would be useful in preparing National Register documentation.

Criteria for National Register nomination of archaeological sites focus on scientific informational values, or significant developments in the history of archaeology, rather than heritage values. For historic sites, over 50 years old, nomination criteria also address significance in regard to historic persons, events, contexts, or architecture. Site eligibilities for other special designations could address heritage values in addition to those listed above. For example, the Beale Wagon Road or other historic sites might qualify as National Historic Landmarks, and it would be worthwhile to consider the eligibility of the Blythe or Ripley geoglyphs for listing as World Heritage sites, a designation generally applied to very significant archaeological sites or important natural areas such as National Parks.

Public outreach is expressed through volunteer programs and public educational efforts that support cultural resource management and

protection. Public outreach is a continuing process that perpetuates the public's interest in the wise stewardship of cultural and natural resources and the preservation of scientific and heritage values. It also fulfills the Federal government's obligation to work for and with the public. W. James Judge, director of a recent Society for American Archaeology (SAA) conference on protecting cultural resources, similarly expressed the obligations of professional archaeologists:

> The archaeological profession must become more responsible to the public, the ultimate consumer of our efforts and the ultimate provider of support for our research. If the past has relevance to the present, then archaeology is a form of insurance to society that the message of the past will be preserved and recognized. We must acknowledge the public as our primary allies and make archaeology meaningful to them (SAA Bulletin 7:5:4).

Public outreach has two major aspects: volunteer programs and public education. Federal land management agencies can serve as promoters and partners in cooperative programs, and Federal archaeologists can serve as advisors, participants, planners, and teachers. Fortunately, Arizona is nationally recognized for its outreach programs cooperatively organized and carried out by the State Historic Preservation Office, the Archaeology Advisory Commission, professional archaeologists, museums, avocational societies, and government agencies. A recent article in Opportunity and Challenge: The Story of BLM highlighted BLM's participation in these programs and the thousands of hours contributed by volunteers (Stumpf 1988).

Volunteer programs include site stewards, efforts contributed by avocational archaeologists and societies, museum docents, awards, and public educational displays. In Arizona, avocational societies publish archaeological research (see Johnson 1985), sponsor annual statewide meetings, and conduct training programs leading toward certification in field and analytical techniques. They are a tremendous asset to cultural resource protection. Responsible supervised volunteers can be granted access to archaeological site files normally excluded from disclosure under the Freedom of Information Act. Professional archaeologists and cultural resource managers are ultimately responsible for training, supervision, and resource evaluations, but volunteers can participate in site inventories, site monitoring, experimental studies of technology and subsistence, and interpretive programs. Avocational archaeologists have been particularly active in the recording and interpretation of rock art using nondestructive techniques. Interpretations vary from highly mathematical to imaginative, but the data is saved.

Public education incorporates school programs, museum programs, and interpretive displays, special events, and media activities. Elementary and secondary school programs meet the need to instill lifelong values and interests in the young. Archaeology and history can generate fun learning experiences that conform to a revitalized emphasis on science

education. The Schools Committee of the Arizona Archaeological Council has developed educational programs for students and workshops for teachers. As for post-secondary education, agency archaeologists have served as lecturers and course instructors, particularly at rural community colleges.

Displays, public lectures, and pamphlets should not only educate the public about the past but also communicate "the messages of protecting the past, sharing the archaeological experience, or understanding and respecting cultural values" (SAA Bulletin 7:5:6). Along the Colorado River south of Davis Dam, existing museums and publicly displayed sites include the Colorado River Indian Tribes Museum at Parker, a small but excellent facility; the Yuma Territorial Prison State Park near the future Yuma Crossing Park, a major historical center under development; the Quechan Tribal Museum near Yuma; the Hardyville historic wagon road segment on BLM-leased land near Bullhead City; and the Blythe intaglios, BLM-administered areas for which additional interpretive and protective planning is needed. There is an obvious lack of standing interpretive facilities in the vicinities of Lake Havasu City, Needles, and Bullhead City, yet these areas are tourist centers. Perhaps gamblers and water skiers are not easily drawn to museums, but the Mohave County region also attracts families, winter visitors, and travelers likely to visit interesting and innovative museums. Interesting regional themes include the native cultures; the history of transportation by steamboat, wagon, Army camel, railroad, and Route 66; dam building; mining and ghost towns; and natural history. Living history museums with participatory exhibits, or museums designed to evoke a sense of exploration or discovery, are more appealing than rows of display cases crammed with artifacts. The availability of BLM R&PP leases for museum development could encourage the establishment of a high quality facility that could help to generate jobs and additional tourist revenue. Native American tribal involvement would be desirable. The tribes already operate museums and have contributed as cooperative partners in the Yuma Crossing project. It would be particularly gratifying to see the Fort Mohave community divert some revenue from a planned casino development toward a museum that could also serve as a tribal educational and cultural center.

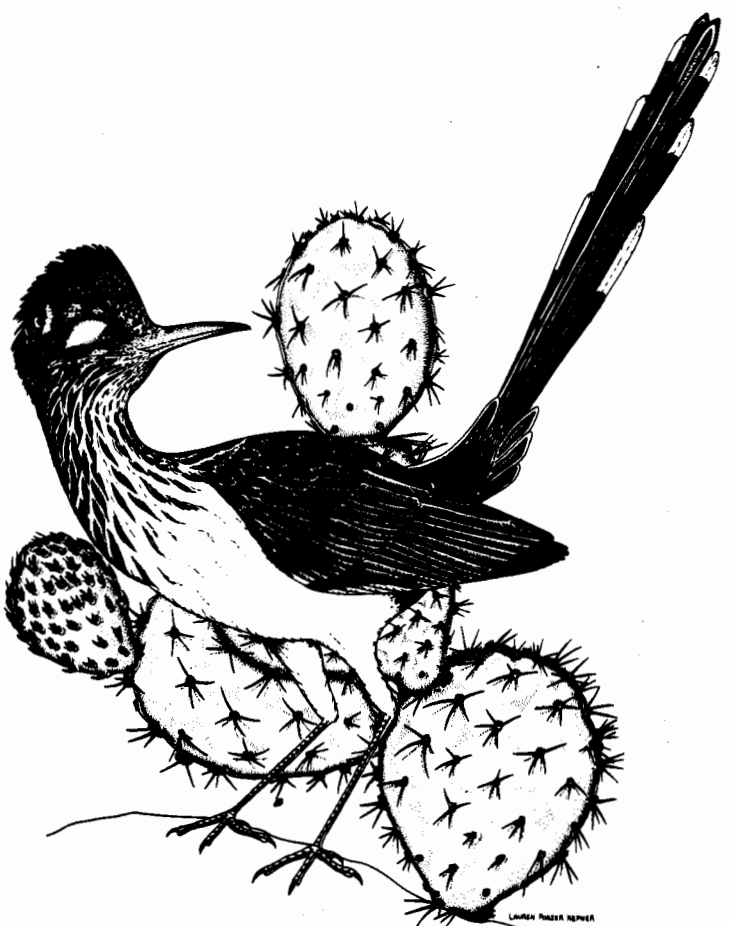
Interpretive displays and lectures need not be limited to museums. Public libraries, recreational areas and parks, LTVAs, and events such as the Quartzsite Pow-Wow offer opportunities for small but informative displays, pamphlet distribution, and recruitment of volunteers.

Special events are associated with annually designated Arizona Archaeology Week and National Historic Preservation Week, during which publicized fairs, site tours, lectures, and exhibits are staged in all areas of the State. The nationally recognized Arizona Archaeology Week program has grown steadily since its debut in 1983, with BLM cultural resource specialists as major participants in western Arizona.

Media activities include public service announcements, press releases, television news features, special interests magazine articles, and talk shows. The geoglyph sites within the Yuma District have generated

considerable media activity. Unless generally unknown site locations are revealed, well executed publicity should further the cause of resource protection. Public affairs officers can assist by coordinating media contacts.

As the nation prepares to enter the next century, the BLM can contribute toward enhancing economic, environmental, and cultural revitalization. Through the protection of cultural resources with sensitivity to Native American concerns, the BLM can support the perpetuation of a tribal heritage that sustains a transformed but ancient culture. To the native peoples, cultural resources include archaeological sites, sacred places, and even the ancient varieties of sweet corn, Chemehuevi, Cocopah Red, and Yuman Yellow, collected by prospectors during the 1860s and now harbored by Native Seeds/SEARCH, an organization of seed conservationists. The river and landscape are the enduring resources. The giant figures etched on the "floor of the sky" occupied "the vast terrain, with all its magical hues and friendly and fearsome earthforms . . . there must have been a pervasive, ever-present awareness of a tie to the supernatural" (Josephy 1986:164). Despite the taming of the river and the drone of human activity, the magic persists.



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