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People of the Desert, Canyons and Pines: Prehistory of the Patayan Country in West Central Arizona

Connie L. Stone

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People of the Desert, Canyons and Pines: Prehistory of the Patayan Country in West Central Arizona

by

Connie L. Stone

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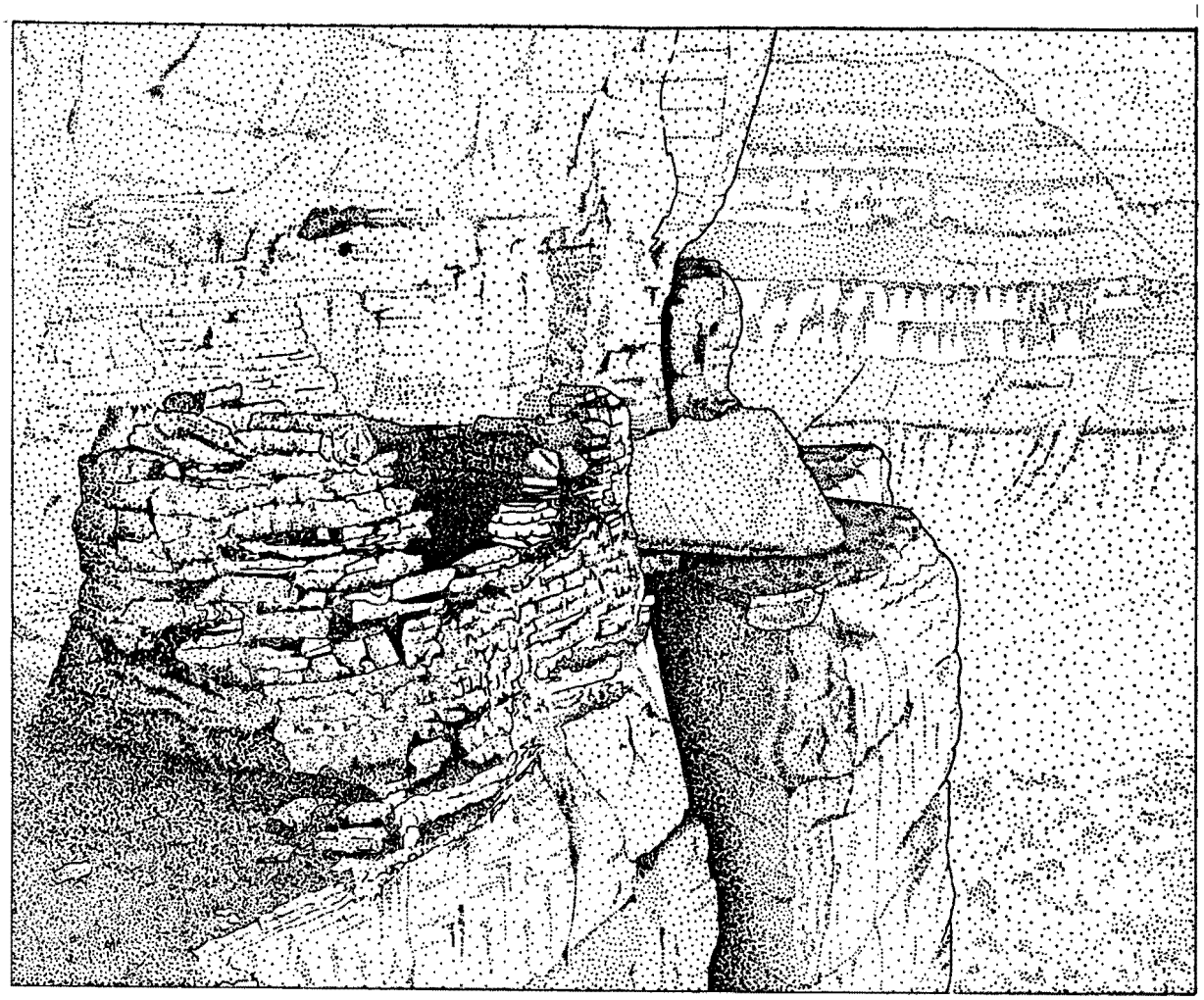

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CHAPTER 1
INTRODUCTION

This book describes the prehistory and Native American peoples of the Patayan country, an area of western Arizona that can also be called the Kingman region in reference to its central town. If one were to draw a box around this portion of west central Arizona, its corners clockwise from the northeast would be the lower Grand Canyon, an unparalleled natural wonder; the town of Prescott, Victorian homes nestled in the piney woods of the first territorial capital; Lake Havasu along the Colorado River, home of the imported London Bridge; and Hoover Dam, a wonder of engineering.

The territory bounded by these unique historic and natural resources contains the physical remnants of at least four thousand years of human occupation. Its native inhabitants had to cope with the region's fundamental aridity, but beyond that they could choose from the natural resources of diverse environmental zones. The lower Grand Canyon and its side canyons were oases cut deeply into the Colorado Plateau. According to the creation myth of the Hualapai Indians, these canyons were the original home of all of the northern Arizona tribes (Ewing 1961). The chaparral, pinyon-juniper woods, and high grasslands surrounding Prescott "formed such a rich larder for Yavapais that they surely were one of the gifts from Sun" (Trimble 1986:139). To the west of the Grand Wash Cliffs and the Prescott highlands, the land dropped down to the vast dry Basin and Range country. Isolated mountain ranges, separated by seemingly endless desert valleys, were the oases of this desert country. Early explorers moving westward from the high country were disillusioned by this eastern extension of the Mohave Desert. Hoping to reach the Colorado River, they seemed to encounter yet another mountain range beyond each barren valley (U.S. Senate 1936). The lower Colorado River was regarded as the Nile of North America by Harold Colton, a founder of the Museum of Northern Arizona (Colton 1945). Like the Nile, it supported a prehistoric population of farmers. However, the people could not count on successful harvests due to the relatively unpredictable floods of the Colorado. Whether they lived along the river or in the mountains, to the desert folk "survival was a matter of foresight, experience, and endurance" (Stevens 1986:75).

A sense of humor evidently also helped. To the Spaniards of the Onate expedition of 1605, a river Indian named Otata described the natives of California (Hammond and Rey 1953). Some had ears so long that five or six persons could stand under each one. According to Otata, some slept under water, and others slept while standing with burdens on their heads. However, most people on the "island" of California were bald men ruled by a giant woman called Cinaca Cohota. The Spaniards were skeptical, but those explorers in a strange land were not ready to discount everything they heard. Perhaps the natives succeeded in diverting the white men's attention to California. Over two centuries later, gold brought them back to west central Arizona. Gold was no laughing matter, and the lives of the Indians were altered forever.

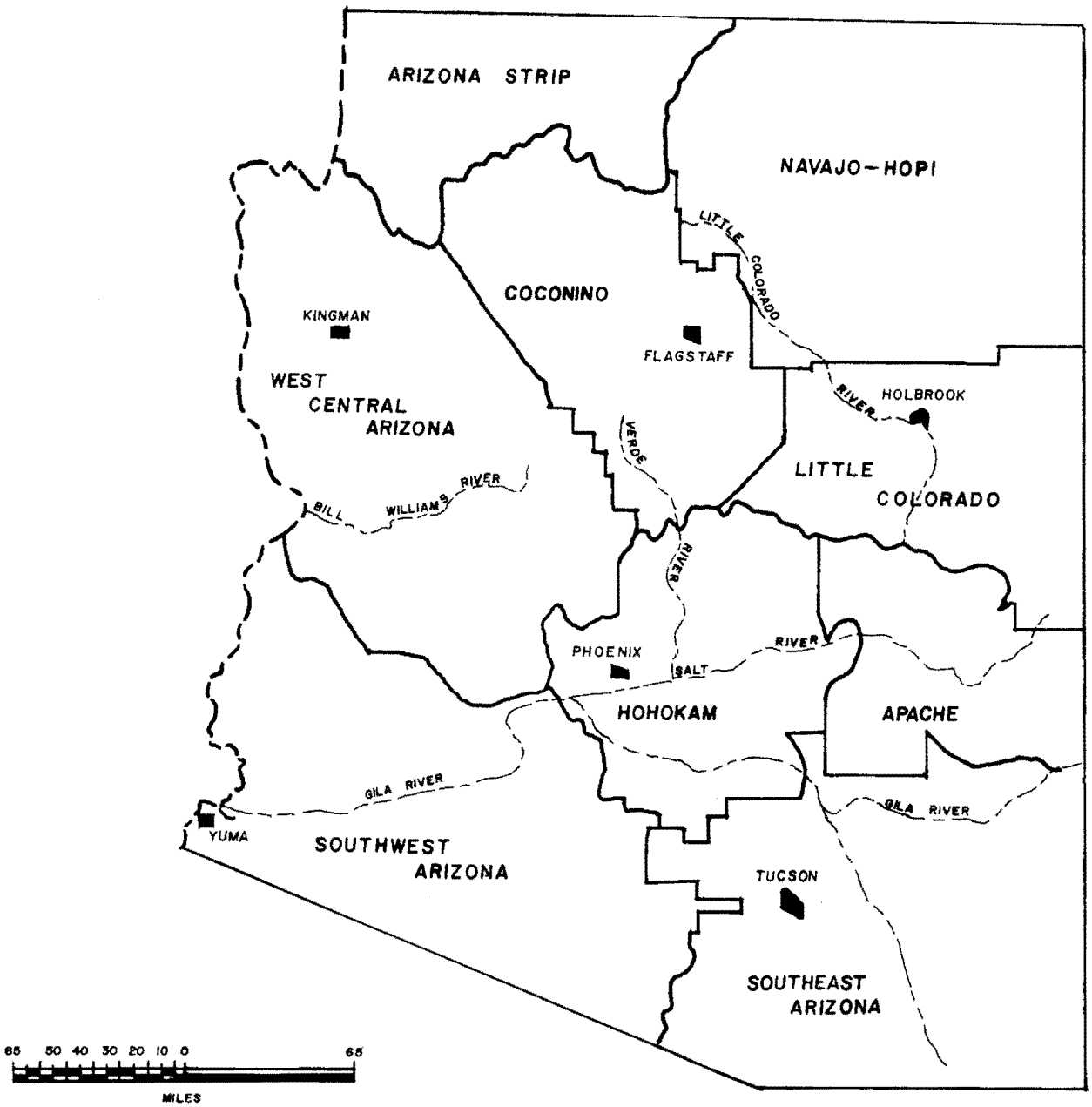
Over a thousand prehistoric sites have been documented in this region. They contain the record of thousands of years of human adaptation to its aridity and environmental diversity. In this transitional zone linking the Southwest, Great Basin, and southern California desert, these fragile and irreplaceable cultural resources possess important scientific and heritage values.

THE KINGMAN REGION: A CLASS I INVENTORY

This document is a "Class I overview" of prehistoric cultural resources within the region incorporating the Kingman Resource Area managed by the Bureau of Land Management (BLM), an agency of the U. S. Department of the Interior. Regional Class I overview preparation is an important phase of the cultural resource inventory process outlined in *BLM Manual 8111, Release 8-3* (1978). Based on a compilation and assessment of existing data, the Class I inventory provides background information and guidance for future planning and management decisions regarding cultural resources. It incorporates information on the natural environment, ethnographic background, and history of archaeological research; a summary review of the regional prehistory and related research issues; a discussion of archaeological site types; and a comprehensive bibliography. The synthesis of this information generates management recommendations regarding the evaluation, inventory, and protection of cultural resources. As stated in *Manual 8111*, Class I overviews provide "critical evaluations oriented towards the unique problems and concerns encountered in an active management program". This information can also provide the basis for incorporating cultural resources into multiple use planning.

Beginning in the late 1970s, regional Class I overviews were initiated in western areas managed by the Bureau of Land Management and the U. S. Forest Service. In 1978, the Arizona State Office of the BLM and Region 3 (Southwest) of the Forest Service established an "*Interagency Cultural Resource Inventory Agreement*" (BLM AZ-950-IA8-001) for the coordination of Class I overview efforts. This agreement partitioned Arizona into nine geographic areas, labeled "joint cultural resource overview units" (Map 1-1). A "lead agency" was designated to assume the completion of prehistoric and historic overviews for each unit. The BLM was held responsible for the West Central, Southwest, Southeast, and Arizona Strip overview units. The Arizona Strip overview is in progress, and the others have been completed (Brandes 1985; Bronitsky and Merritt 1986; McGuire and Schiffer 1982).

The West Central Arizona overview unit was divided into southern and northern zones for the prehistoric overview. The line of division, the Bill Williams River hypothetically extended east to Prescott, corresponded roughly to major environmental, cultural, and administrative boundaries within this environmentally and culturally diverse unit. The division enabled a more efficient and meaningful analysis and enhanced the clarity of the total synthesis. It also enabled a more sensitive treatment of inventory and



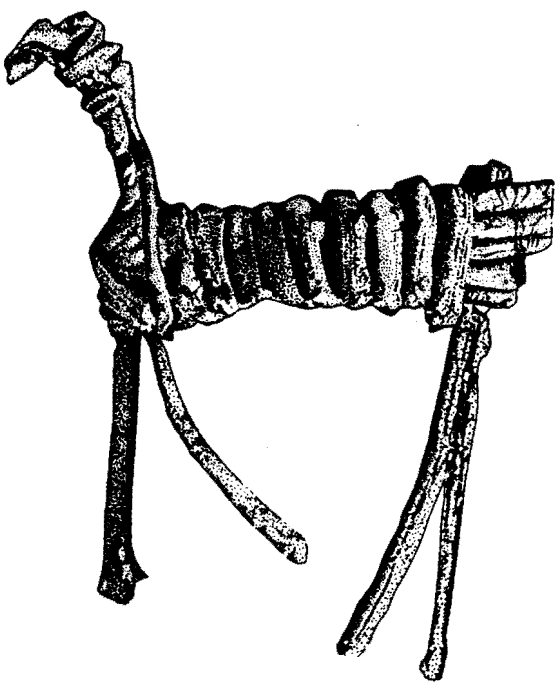
MAP I-I: CULTURAL RESOURCE OVERVIEW UNITS IN ARIZONA

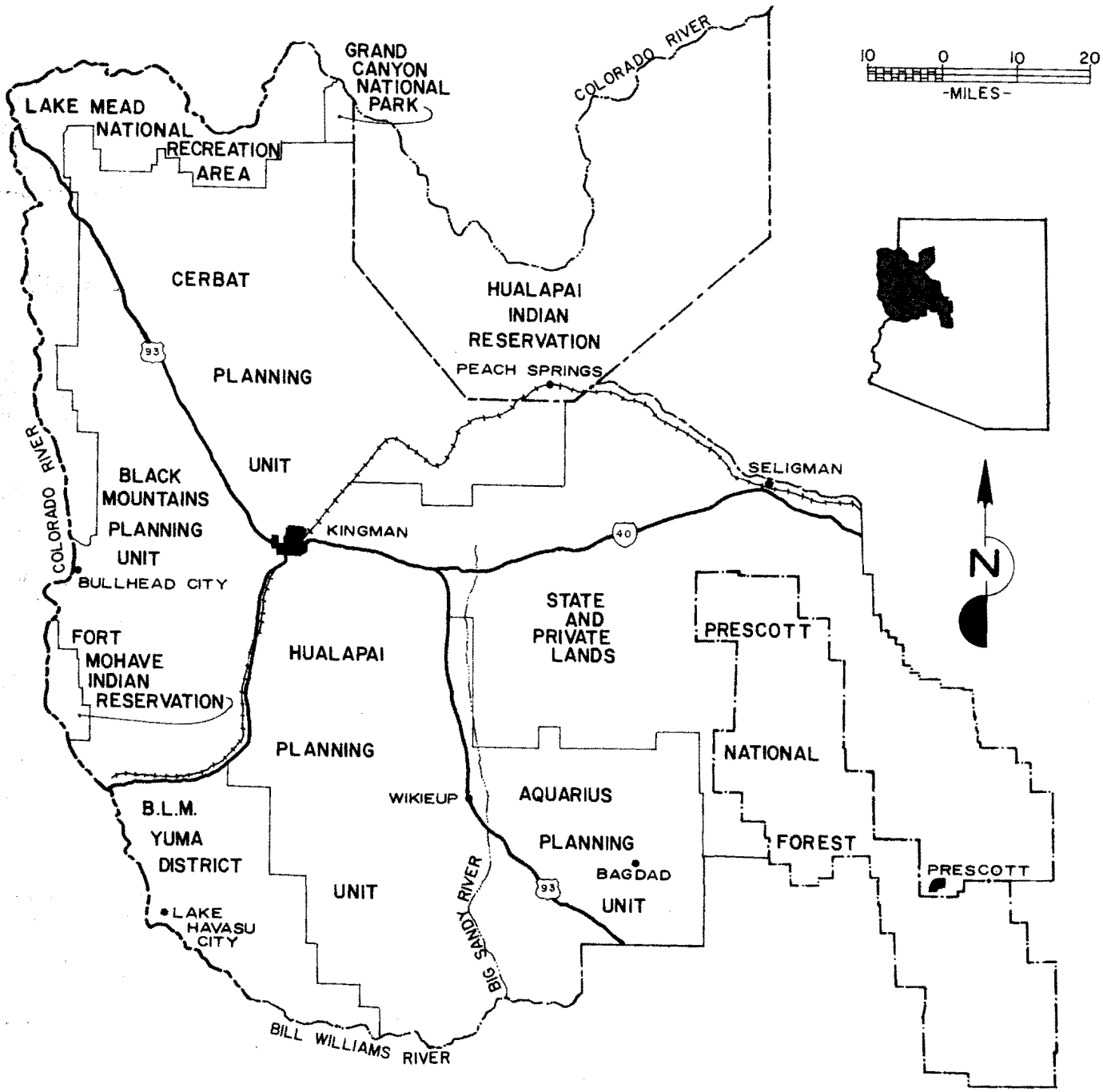
management priorities. The Class I overview of the southern zone, which incorporates much of the Bureau's Lower Gila Resource Area, was published recently by the BLM (Stone 1986). It is a companion volume to this overview of the Patayan country, the northern portion of the West Central Arizona overview unit.

Class I overviews summarize information concerning all lands within the study area boundaries, not just federally administered lands. However, management recommendations understandably are oriented more specifically toward cultural resources on public lands. In the present case, many discussions will focus on the BLM's Kingman Resource Area, an administrative zone within the Bureau's Phoenix District.

Map 1-2 depicts the boundaries of the overview region and the administrative areas incorporated within it. The boundaries coincide with the Colorado, Bill Williams, and Santa Maria rivers; the western boundary of the eastern unit of the Prescott National Forest; old Route 66; and the eastern boundary of the Hualapai Indian Reservation. This area incorporates approximately 8.2 million acres (3.3 million ha) in Mohave and Yavapai counties. The Kingman Resource Area contains approximately 2.5 million acres (1 million ha) of public lands within its Black Mountains, Cerbat, Hualapai, and Aquarius planning units. Additional lands along the Colorado River are incorporated into the Havasu Resource Area of the BLM's Yuma District. These areas contain many large blocks of federally administered land, although in some zones, land tenure patterns consist of a "checkerboard" of alternating public and private sections. The Lake Mead National Recreation Area, administered by the National Park Service, incorporates much land adjacent to the Colorado River. The Hualapai Indian Reservation encompasses approximately a million acres (400,000 ha). About 700,000 acres (283,000 ha) are included within the western unit of the Prescott National Forest. State and private lands each account for about 23% of the total area of the overview region, with holdings concentrated in the Chino Valley and areas surrounding the Prescott National Forest.

Chapter 2 begins with a comprehensive description of the natural environment and the resources it offered to sustain the aboriginal inhabitants. It also describes the changing natural environment over the past 12,000 years. Chapter 3 describes the historic Yuman peoples who inhabited the region. Chapters 4 and 5 review the history of archaeological research and the regional prehistory revealed by that research. These chapters lead into a discussion of scientific research problems in Chapter 6. Chapter 7 presents a summary of archaeological site types and their geographic distributions. Management directions, focusing on evaluation, inventory, and protection of cultural resources, are discussed in Chapter 8.





MAP 1-2: ADMINISTRATIVE AREAS IN THE KINGMAN - PRESCOTT REGION

CHAPTER 2
THE ENVIRONMENT AND NATURAL RESOURCES

An historic cultural resource, the ghost town, represents a typical image from northwestern Arizona. The wild, rugged, and rough environment evokes images of cowboys, grizzled miners and mountain men, covered wagons, and heroic explorers: one-armed J.W. Powell navigating the lower Grand Canyon, Lt. Beale running Army camels, Lt. Whipple struggling along the wrong route for a future railroad. Later pioneers performed their feats in a more civilized setting, as engineers who constructed massive dams to tame the powerful Colorado River. The most recent images approach the bizarre: the London Bridge over the Colorado River and desert gambling palaces on its western banks.

Beyond these colorful images, most Arizonans know little about the vast wild area encompassed by the Colorado River to the north and west, the Bill Williams and Santa Maria rivers to the south, and the Verde Valley and Coconino Plateau to the east. Many attempt to get through this territory as quickly as possible on their way to Las Vegas or Los Angeles. Over a hundred years ago, Joseph Walker, the first Anglo-American to gaze upon the Yosemite Valley, considered this rough country to be the "last big unexplored region in the territory of the Republic" (Gilbert 1973:216). It remains a sparsely settled region of vast deserts, deep canyons, sharp cliffs, and mountain wilderness.

This region is one of striking diversity in topography and vegetation. Elevations range from 500 feet (150 m) at the Colorado River to 8417 feet (2550 m) at Hualapai Peak. The diversity reflects not only the elevational range but also the transitional position of this zone. Three of the four subdivisions of the North American Desert overlap here: the Sonoran, Mohave, and Great Basin deserts. The region contains all six of the average annual precipitation zones in Arizona (Sellers and Hill 1974: Fig. 3). Among the nine cultural resource overview units in Arizona (Map 1-1), this northern section of the West Central unit is the only one that encompasses portions of all major physiographic zones in the state (Map 2-1): the Desert and Mountain regions of the Basin and Range Province, the Transition Zone, and the Colorado Plateau (Wilson 1962:86). The diversity within the region owes less to its arbitrary boundaries than to its transitional geographic position in the Desert West.

The prehistoric and historic aboriginal occupations of the region must be interpreted in terms of this environmental diversity. Even the groups that farmed along the Colorado River had to structure their lives in reference to available raw materials and wild resources, as well as the unpredictable fluctuations of the river itself. The distribution, relative densities, and seasonal availability of natural resources influenced the nature of subsistence, settlement decisions, social organization, travel, and trade. In a less obvious sense, these factors also influenced the nature of social interaction among groups as well as the eventual demise of ancient lifeways in the face of American frontier expansion.

This descriptive review of the regional environment will address the character and distribution of natural resources available for aboriginal use. Basic descriptions of physiography and geology, hydrology, climate, vegetation, and wildlife will be followed by a review of exploitable resources. The final portion of the chapter will address issues concerning paleoenvironmental reconstruction and historic environmental changes.

PHYSIOGRAPHY AND GEOLOGY

The four major physiographic zones incorporate a mosaic of mountain ranges, basins, plateaus, mesas, escarpments, canyons, and river valleys (Maps 2-2 and 2-3). The progression of these zones from west to east corresponds to a general increase in elevation. Elevations in the eastern half of the study area generally exceed 4000 feet (1200 m) (Map 2-4).

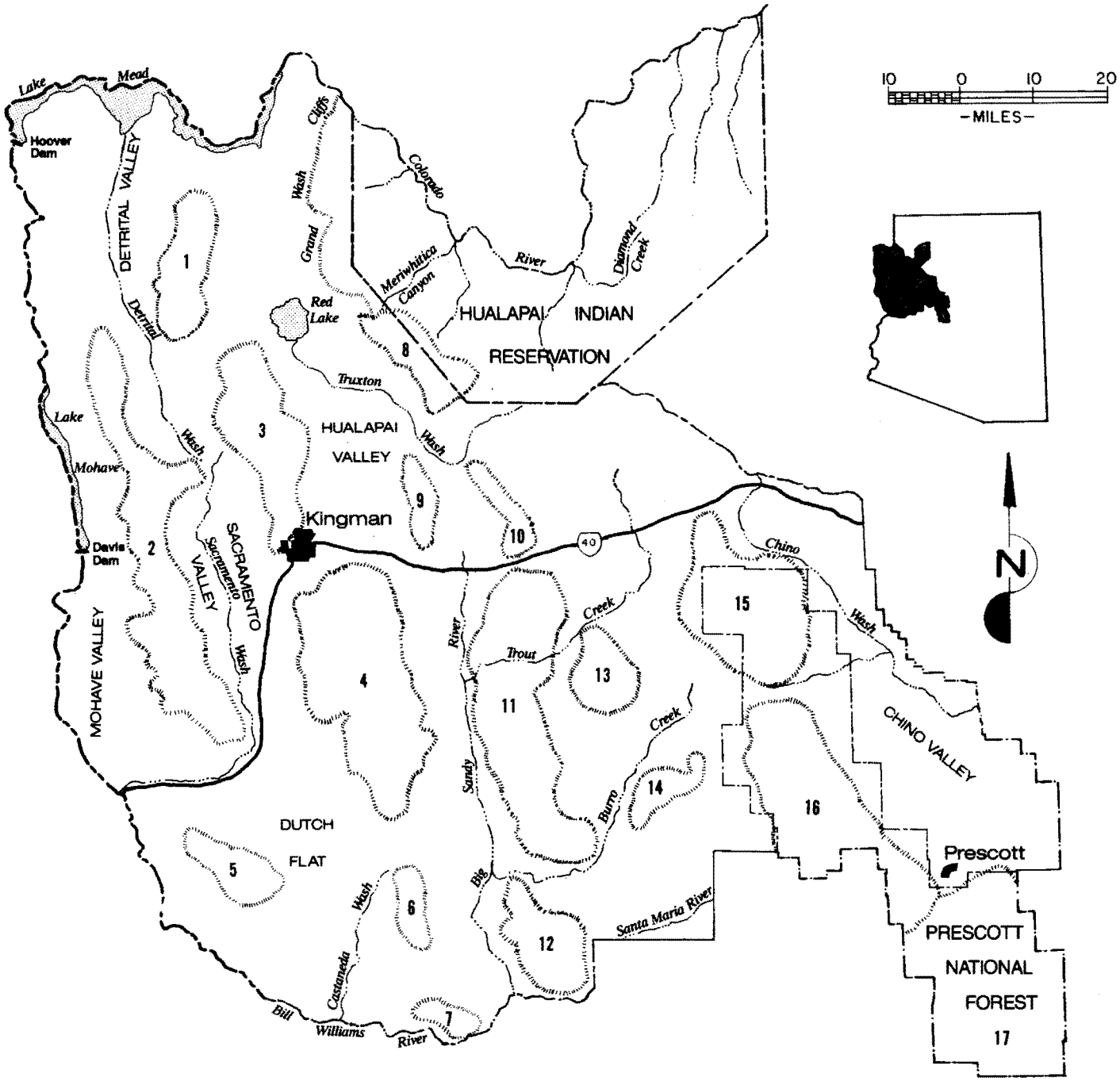
If one were to draw an imaginary line bisecting Arizona from northwest to southeast, the Basin and Range Province would lie roughly to its south and the Transition Zone and the Colorado Plateau to its north (Map 2-1). These physiographic provinces differ in their geologic structure. Less faulting activity has occurred north of the Mogollon Rim, a natural escarpment which approximates the imaginary line.

In the Basin and Range Province, elongated subparallel mountain ranges rise abruptly to heights up to several thousand feet above vast, relatively flat desert valleys. These intermontane basins cover an average 75% of the land surface (Bryan 1925; Rowlands et al. 1982). The long narrow mountain ranges are generally oriented north-south or northwest-southeast. The topographic contrast between mountains and basins is the most distinctive aspect of the landscape.

Four major geomorphic processes have shaped this landscape: normal faulting, volcanism, wind erosion, and soil deposition and erosion by running water. Faulting is the vertical movement of fractures in the earth's crust. After the fault block mountain ranges were thrust upward, the subsided basins were filled with soil and gravel carried by running water and winds. The basins are bowl-shaped in cross-section. They encompass landforms known as pediment and bajada slopes. These are formed by series of coalescing alluvial fans radiating from the base of mountain ranges (Bloom 1969; Bryan 1925). The relatively steeper pediment slopes merge almost imperceptibly with the lower, more gently sloping bajadas. Pediments become increasingly narrow as their lower portions are buried by rising bajada alluvium. The central portions of basins can appear to be virtually flat.

The Desert Region of the Basin and Range Province incorporates vast basins or "plains" in southwestern Arizona. The mountain ranges are more pronounced and less extensive than those in the higher Mountain Region, where the base elevations of ranges generally exceed 3000 feet (900 m) (Wilson 1962:86-90). The Desert Region extends northward from southwestern Arizona, incorporating the mountain ranges and basins bordering the lower Colorado

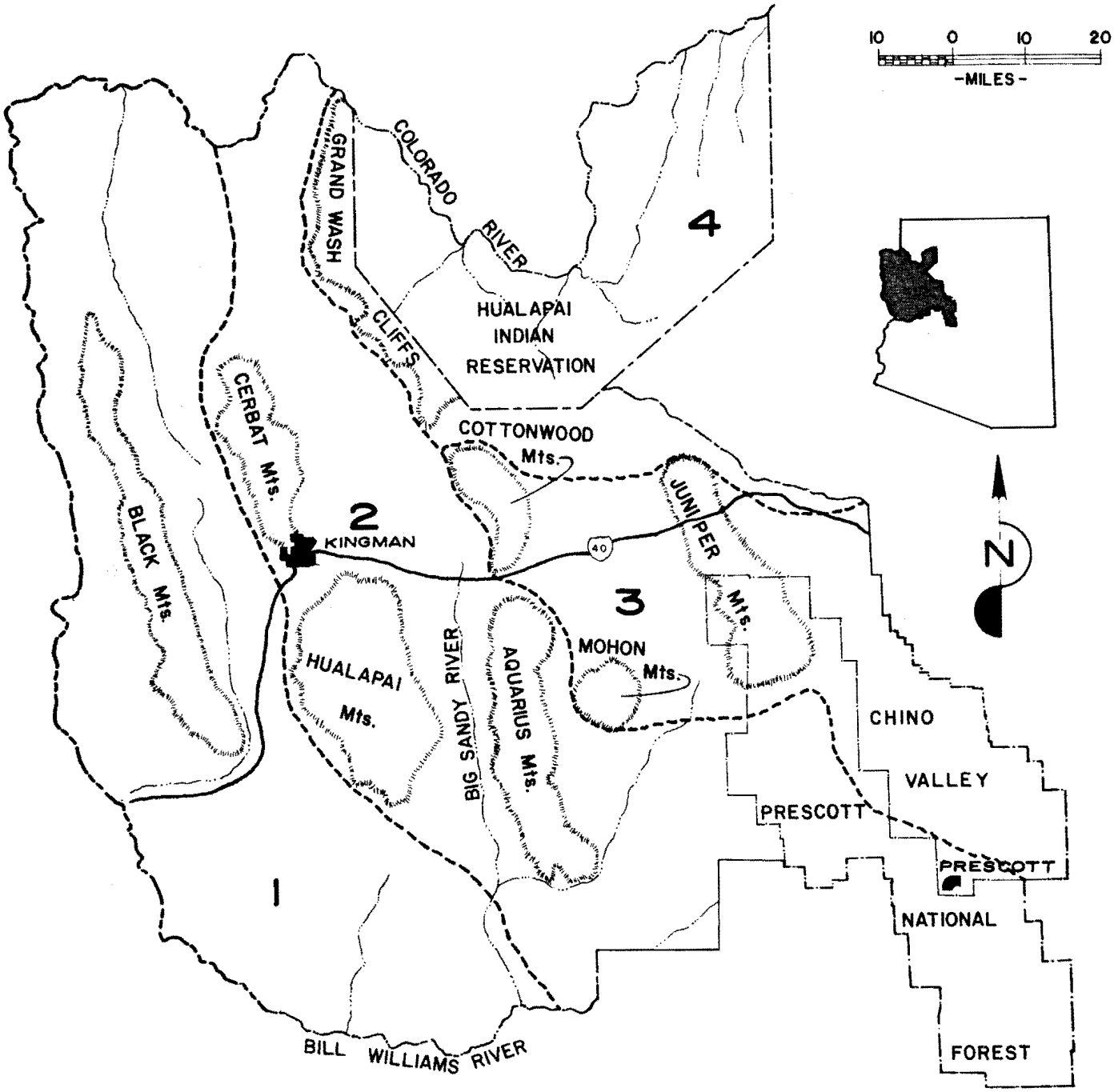
MAP 2-1: PHYSIOGRAPHIC PROVINCES IN ARIZONA
(FROM WILSON 1962:86)



MOUNTAIN RANGES

1. White Hills
2. Black Mountains
3. Cerbat Mountains
4. Hualapai Mountains
5. Mohave Mountains
6. McCracken Mountains
7. Rawhide Mountains
8. Music Mountains
9. Peacock Mountains
10. Cottonwood Mountains
11. Aquarius Mountains
12. Arrastra Mountains
13. Mohon Mountains
14. Bozarth Mesa
15. Juniper Mountains
16. Sierra Prieta
17. Bradshaw Mountains

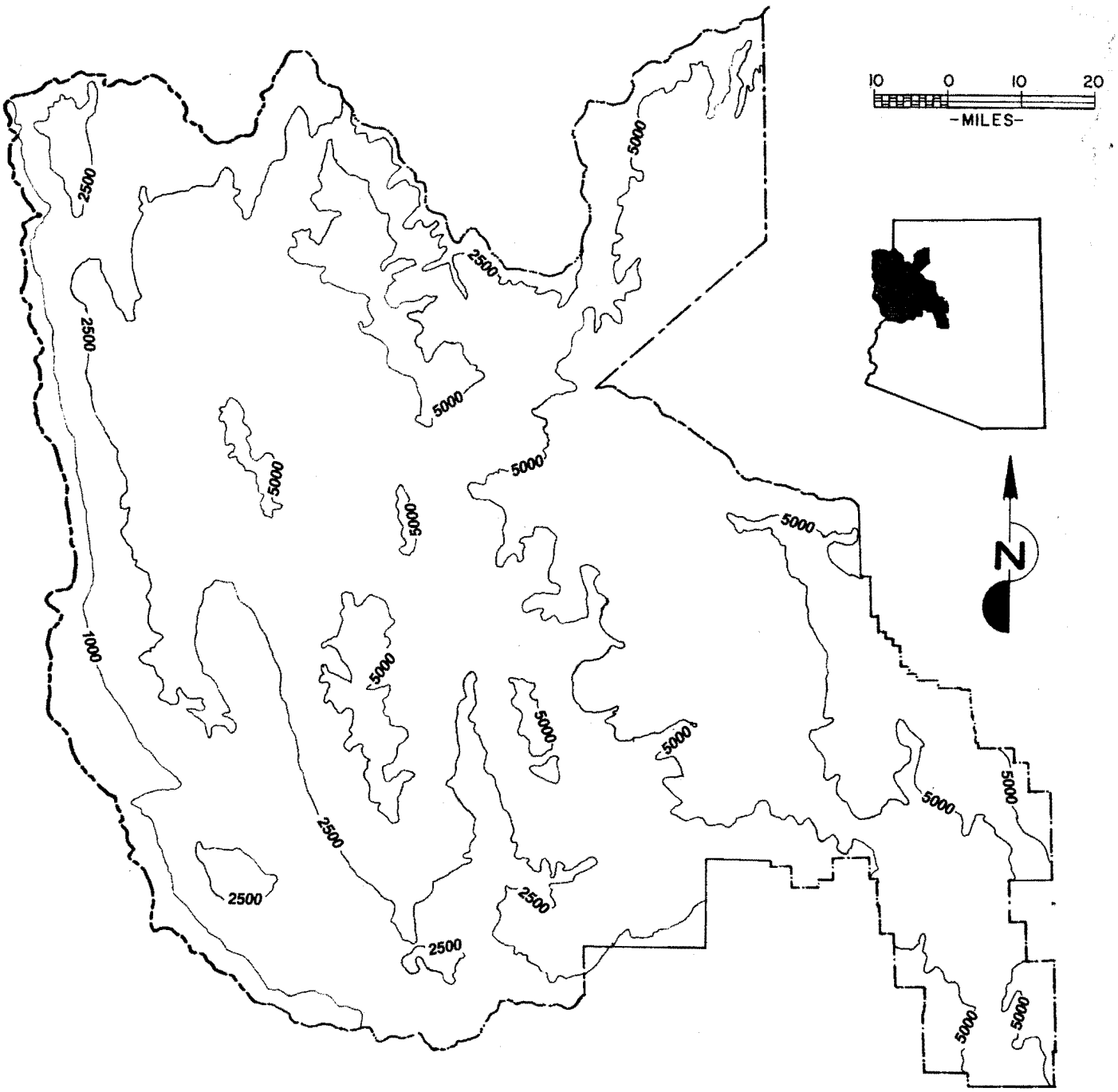
MAP 2-2: THE KINGMAN WEST CENTRAL OVERVIEW AREA



Key: - - - - - Zone Boundaries

1. Desert Region of Basin and Range
2. Mountain Region of Basin and Range
3. Transition Zone
4. Colorado Plateau

MAP 2-3: PHYSIOGRAPHIC ZONES IN THE OVERVIEW AREA



MAP 2-4 : ELEVATION CONTOURS

River valley. The terraces and bajadas bordering the river often consist of a stable layer of highly compacted cobbles known as desert pavement. The Black Mountains, a long north-south trending range, parallel the Colorado River north of Interstate Highway 40. The highest peaks are Mt. Perkins at 5456 feet (1650 m) and Mt. Nutt at 5216 feet (1580 m). In the remote country bordering the Colorado River's great southward bend, the broad Detrital Valley is drained by Detrital Wash. At its south end, this basin merges with the Sacramento Valley. Together they form an elongated plain which separates the Black and Cerbat ranges. The distinction between the Detrital and Sacramento valleys reflects drainage patterns. Detrital Wash and its tributaries drain northward to the Colorado River, while Sacramento Wash turns southward and then westward toward the river. To the south of Interstate 40, desert ranges include the Mohave Mountains and the Rawhide Mountains. The latter range borders the Bill Williams River. Dutch Flat, drained by Castaneda Wash, is the broad basin between the Mohave and Hualapai mountain ranges.

The Mountain Region incorporates much of southeastern Arizona. To the west of Globe, it extends northwestward to Lake Mead as a band of territory 25 to 50 miles (40-80 km) wide, incorporating the towns of Prescott and Kingman. The Cerbat and Hualapai ranges essentially form an elongated mountain chain which parallels the Black Mountains to the west. Kingman is situated in the pass which separates the two ranges. In the Cerbats, Mt. Tipton reaches 7148 feet (2160 m). Hualapai Peak, at 8417 feet (2550 m), is the center of a "mountain island" at the northern end of the Hualapais. The Hualapai Valley, north of Interstate Highway 40, is a broad depressed basin bounded by the Cerbat range to the west, the Grand Wash Cliffs to the east, and the Peacock Mountains to the southeast. To the south of Interstate 40, the Mountain Region encompasses a series of extensive mountainous areas largely unbroken save for the Big Sandy River valley between the Hualapai and Aquarius ranges. This is a zone of rugged mountain wilderness and broad mesas. From northwest to southeast, mountain ranges include the Aquarius range, the Santa Maria Mountains, the Sierra Prieta or Prescott Mountains, and the Bradshaw Mountains. Several peaks in the Sierra Prieta and Bradshaw ranges exceed 7000 feet (2100 m).

In the Basin and Range Province, most mountain ranges were created during the Precambrian Era, the earliest of the major geologic eras. From over two billion to a half billion years ago, there were alternating periods of faulting, sedimentation, intrusive volcanic activity, and erosion. Geologic features composed primarily of Precambrian granite, granite gneiss, and schist include the Cerbat, Hualapai, Mohave, Peacock, Arrastra, Prescott, and Bradshaw ranges and the western face of the Aquarius Mountains (Wilson 1962; Wilson, Moore, and Cooper 1969).

During the later Tertiary period of the Cenozoic Era, from about seventy million to one million years ago, there was extensive volcanic activity in the form of eruptions from vents and dikes (Wilson 1962:74). Volcanic processes were particularly intense in the San Francisco volcanic field on the Coconino Plateau to the east. Tertiary andesite and rhyolite deposits, also known as the "Gold Road volcanics", are concentrated in the Black Mountains (Wilson, Moore, and Cooper 1969). During the Tertiary period, erosion acted to form modern drainage patterns (Wilson 1962:74).

Relatively recent volcanic activity in the Quaternary period produced extensive deposits of basalt and tuff. These occur in the Black Mountains and the Kingman area. The major zone of Quaternary basalt incorporates areas in the vicinity of Bagdad and Burro Creek: the Aquarius and Mohon ranges and Bozarth Mesa (Wilson, Moore, and Cooper 1969).

Basin and floodplain soils consist of Quaternary sand and gravel sorted and deposited by alluvial processes. Stabilized dunes exist in the Hualapai Valley (BLM 1978).

Known concentrations of gold, silver, and copper exist in the mountains surrounding Kingman, Bagdad, and Prescott. Lead, zinc, and molybdenum also have been mined in the region. Known occurrences of nonmetallic minerals include turquoise in the Cerbat Mountains near Kingman, amethyst and rose quartz in the Hualapai Mountains near Kingman, and mica in the Hualapai and Bradshaw ranges (McCrory and O'Haire 1961).

The westernmost section of the Transition Zone, another of the major physiographic provinces, extends into the overview region. Named for its intermediate position between the Basin and Range Province and the Colorado Plateau, the Transition Zone is more rugged than the Plateau but similar in its underlying geologic structure (Wilson 1962:96). Its higher relief can be attributed to a greater incidence of faulting activity and to headward erosion by tributaries of the Gila, Salt, and Bill Williams rivers. In Arizona, it extends from southeast to northwest, in an band of territory about 50 miles (80 km) wide, from the White Mountains to the Cottonwood Mountains east of Kingman (Wilson 1962:86). The zone includes three great "valleys" created by downfaulting: the Tonto Basin, the Verde Valley, and Chino Valley.

From east to west in the study area, the Transition Zone incorporates the Chino Valley, the Juniper, Mohon, and Cottonwood mountain ranges, and intervening mesas and plateaus. These areas exceed 4000 feet (1200 m) in elevation. The Juniper Mountains are composed of Martin and Redwall limestones deposited as marine sediments during the Paleozoic Era between five hundred million and two hundred million years ago (Wilson 1962:21; Wilson, Moore, and Cooper 1969). These limestones are part of the "Tonto Group" of sedimentary deposits exposed in the rock strata of the Grand Canyon.

The Grand Wash Cliffs, imposing in sight as well as in name, form an abrupt break between the Basin and Range Province and the Colorado Plateau. Suggestive of the Grand Canyon, the cliffs drop 3000 feet (900 m) from plateau to plain. This west-facing escarpment immediately south of the Colorado River is the only place in Arizona where these two physiographic provinces are juxtaposed (Wilson 1962:86). The Colorado Plateau, which exceeds 5000 feet (1500 m) in elevation, encompasses individually named plateaus cut by deep canyons. South of the Grand Canyon, the terrain is broken by the San Francisco Peaks and by isolated buttes and mesas. The Plateau is composed of horizontal sedimentary rock strata, well-defined series

of Paleozoic sandstone, shale, and limestone formations (Wilson 1962:21). Their sequence is revealed in the Grand Canyon.

In the overview area, the Hualapai Indian Reservation covers this western section of the Colorado Plateau. The Grand Wash Cliffs and the Music Mountains form the western border of both the province and the reservation. The reservation, which rests on Redwall and Martin limestone formations, is cut by numerous deep, spring-watered canyons which drain northward to the lower portion of the Grand Canyon (Wilson, Moore, and Cooper 1969).

This region of west central Arizona thus represents an environmental microcosm of the entire state. In a distance of less than a hundred miles, it is possible to travel through a broad river valley, vast scrubby desert plains, high plateau grasslands, and mountaintop pine forests. Geographic patterns in average precipitation and temperatures also cover the range of climatic variations within Arizona.

CLIMATE

Climatic patterns in Arizona are affected by elevational gradients and by large-scale meteorological systems which create weather in western North America. In relation to the broader weather systems, a biseasonal pattern of precipitation characterizes the Arizona situation (Sellers and Hill 1974). Winter rains occur in December through March when the westerlies move moist Pacific air masses eastward. These rains take the form of widespread gentle downpours. Summer monsoon rains, concentrated in July and August, are created when moist air masses from the Gulf of California and the Gulf of Mexico move northward into the state. Rapid cooling and condensation occur as the moist superheated air rises over mountainous terrain. Summer rains tend to form as localized heavy thunderstorms of short duration. Spring and fall are periods of relative drought (Lowe 1964:8).

The character of the biseasonal rainfall pattern varies across the state. In general, as one moves eastward, an increasingly greater proportion of the annual precipitation occurs during the summer. In southeastern Arizona, dependable summer rains contribute up to 70% of the annual total (Hastings and Turner 1965:15). In the Kingman region in western Arizona, summer rains account for about 33% of the annual precipitation. Further west in parts of the California desert, winter-dominant rainfall provides up to 95% of the annual total (Rowlands et al. 1982).

Increases in elevation generally correlate with greater average amounts of precipitation. The high and dry Colorado Plateau, robbed of moisture by surrounding high elevation areas, is an exception (Sellers and Hill 1974: Fig. 3). In general, each 1,000 foot (300 m) increase in elevation is accompanied by an additional 5 inches (13 cm) of rainfall (Lowe 1964:10).

Average annual precipitation contours in the study area are shown in Map 2-5, adapted from Sellers and Hill (1974: Fig. 3). In general, the western zone that constitutes the Desert Region of the Basin and Range Province receives less than 10 inches (25 cm) of rainfall per year. The Colorado River valley is particularly arid. Extremely arid zones also incorporate the Hualapai Valley, the westernmost section of the Colorado Plateau, and the Colorado River canyon bottoms extending up into the Grand Canyon.

To the east of the low desert country, precipitation increases along the elevational gradient. A zone of average annual precipitation in the range of 10 to 15 inches (25-38 cm) incorporates the Cerbat Mountains, the Grand Wash Cliffs, the Peacock and Music mountain ranges, lower elevations of the Hualapai and Aquarius ranges, and the Chino Valley. Higher areas in the Hualapai Mountains receive up to 20 inches (50 cm) of annual precipitation. The Hualapais constitute a northwestern extension of Arizona's "sky islands", a series of high peaks that rise abruptly from expanses of arid land (Heald 1951). These moist highlands sometimes support unique assemblages of plants and animals (Carothers 1986).

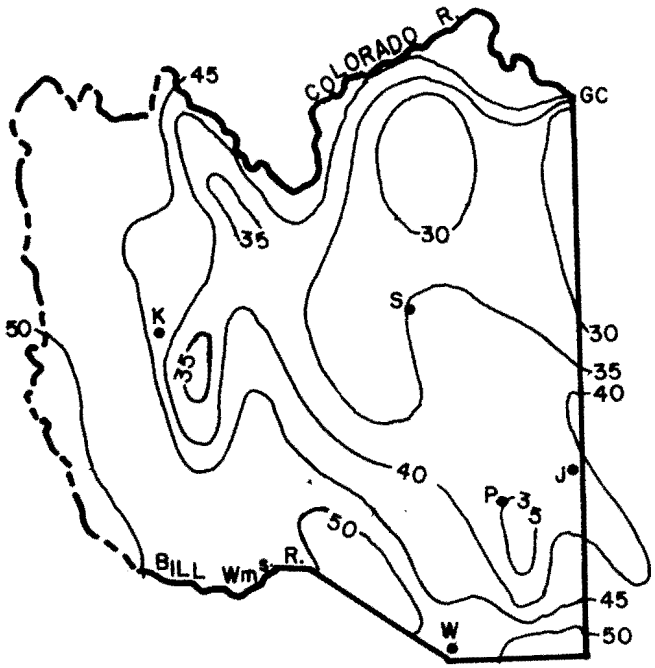
Portions of the Aquarius, Santa Maria, Sierra Prieta, and Bradshaw mountain ranges receive 15 to 20 inches (38-50 cm) of annual precipitation, some of which occurs as snow. The same interval characterizes the eastern portion of the Hualapai Indian Reservation.

The massive Bradshaw Mountains and the mountain ranges of the Transition Zone are the most humid zones in the region. The Juniper and Mohon ranges receive an average 20 to 25 inches (50-64 cm), and annual precipitation in the highest reaches of the Bradshaws often exceeds 25 inches. The Crown King area in the Bradshaw Mountains receives precipitation comparable to that of Arizona's wettest areas: the North Rim of the Grand Canyon, the San Francisco Peaks, the White Mountains, and the sky islands of southeastern Arizona (Sellers and Hill 1974: Fig. 3).

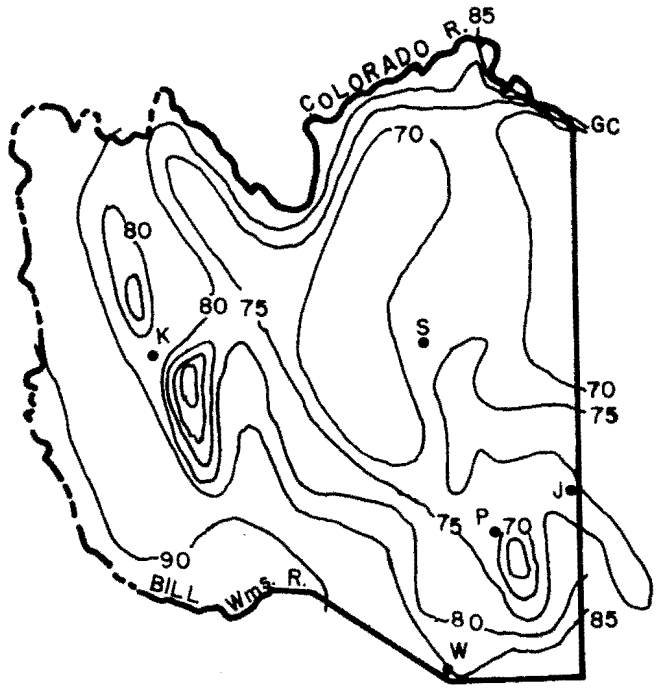
As is true of many arid regions, the amounts and spatial distribution of rainfall can vary widely and unpredictably from year to year (Sellers and Hill 1974). The average annual precipitation at Kingman is 10 inches (25 cm). However, only 38% of the annual totals from seven decades have fallen within the range of 8 to 12 inches (20-30 cm). Although Hastings and Turner (1965:10) note that the summer monsoons are more dependable than the winter rains, despite their spatial variability, this generalization is less valid for northwestern Arizona than for southern areas of the state, given its peripheral position relative to the monsoon systems.

Temperatures, as well as average annual amounts of precipitation, also follow elevational gradients. Thus more mesic areas tend to be cooler. In general, for every 1000 foot (300 m) rise in elevation, temperatures decline 3 to 4 degrees Fahrenheit (Carothers 1986:21). Map 2-5, based on Sellers and Hill (1974: Fig. 11a, b), depicts average daily temperatures during January and July. Average July temperatures range from over 90 degrees Fahrenheit along the lower Colorado River down to 60 degrees in the Hualapai and Bradshaw mountain ranges. In January, they range from over 50 degrees at the lower Colorado River down to 25 degrees on the Colorado Plateau.

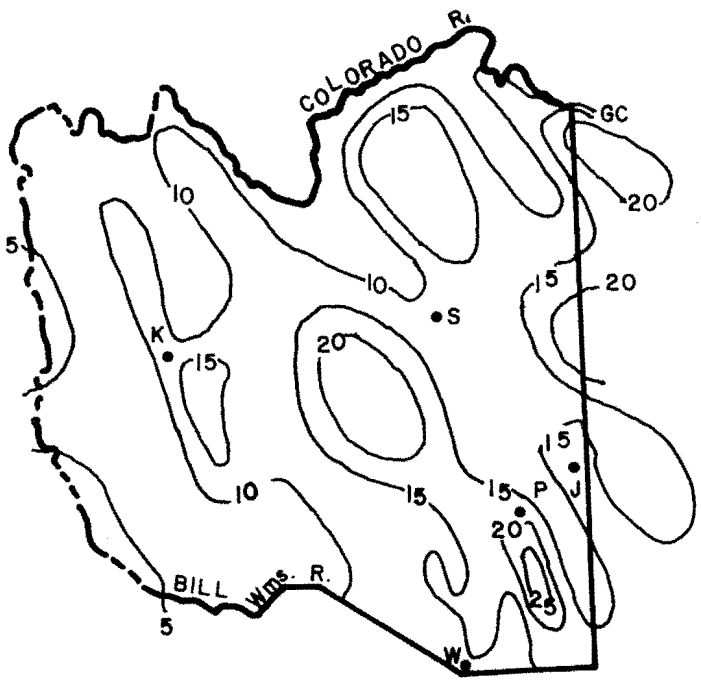
In climate as in other aspects of the environment, this is once again a region of contrasts. Summer temperatures of 115 to 120 degrees at Bullhead City, a town by the Colorado River, are often cited as the highest in the nation. Yet 50 miles distant at Hualapai Peak, cool breezes might cause



AVG. JAN. TEMPERATURE
(degrees F°)



AVG. JULY TEMPERATURE
(degrees F°)



KEY:

GC: Grand Canyon Nat'l Park

K: Kingman

S: Seligmen

J: Jerome

P: Prescott

W: Wickenburg

0 10 20 30 40 50
MILES

AVG. ANNUAL PRECIPITATION
(inches)

MAP 2-5: AVERAGE TEMPERATURE & PRECIPITATION

campers to cluster around a fire. In the winter, that peak might be blanketed by snow, while waterskiers navigate the Colorado River. Environmental contrasts undoubtedly presented challenges and opportunities to prehistoric inhabitants of the region. However, their primary concern may have focused on a key limiting factor: the distribution of water sources in an arid land.

HYDROLOGY

Western Arizona is located in the southwestern portion of the Colorado River basin. The flow of the Colorado River, which drains an area of over 244,000 square miles, originates primarily from precipitation in the Rocky Mountains. Thus the volume and timing of its annual floods are unpredictable from the perspective of its lower course (Castetter and Bell 1951:2). Prior to the construction of dams, extensive floods reached their peak levels during late spring and early summer. The river carried large loads of silt which were deposited along its lower course, hence its designation as the "Colorado" (red) River (Castetter and Bell 1951:12).

The Colorado River enters the Basin and Range Province west of the Grand Wash Cliffs. The cliffs terminate the lower portion of the Grand Canyon, within which the sheer canyon walls are broken only by deeply cut side canyons. West of the Grand Wash Cliffs, the river passes through dissected mountain ranges and steep canyons. Hoover Dam was constructed in Black Canyon, 2000 feet (600 m) deep and over 20 miles (32 km) long (Swarthout 1981:13). Further downstream, south of Cottonwood Island, the lower Colorado passes through a series of broad alluvial valleys separated by short canyons. Now tapped heavily for irrigation and delivery to urban areas, the river adds little to delta sediments at the head of the Gulf of California.

The Bill Williams River, the southern boundary of the study area, flows westward to join the Colorado River north of Parker. It begins at the confluence of the Santa Maria River, which drains the mountains west of Prescott, and the Big Sandy River, which flows southward between the Hualapai and Aquarius ranges. These three rivers are "perennial interrupted" streams (Wolcott, Skibitzke, and Halpenny 1956). Certain segments have permanent flows, while surface flows are intermittent along other reaches. The Bill Williams River, perennial at its point of origin, formerly went dry a few miles downstream during periods of drought or seasons of low rainfall. The construction of Alamo Dam in 1968 created a reservoir extending to the confluence area during high water stages (Stone 1977). The Big Sandy River historically sustained a perennial flow south of the present town of Wikieup, to the ghost town of Signal (Manners 1974:67).

Major tributaries of these rivers, located in the Mountain Region of the Basin and Range Province, also sustain segments of permanent or nearly permanent flows, particularly in their upper reaches. These include Burro Creek and Trout Creek, tributaries that drain the mountain ranges to the east of the Big Sandy River (BLM 1981:49; Linford 1979:7). Permanent streams also exist in the upper reaches of the Hualapai Mountains (BLM 1978:II-24). Flows vary through the year in conjunction with precipitation patterns. Streams tend to carry water in the winter, early spring, and late summer. Low flows and dry segments occur during periods of relative drought in May, June, September, and October (BLM 1981:49; White and Garrett 1984).

In the Desert Region of the Basin and Range Province, normally dry washes carry water for only short periods following rains. These flows generally infiltrate alluvial deposits at the bases of mountain ranges. Runoff seldom reaches basin floors, due to decreased flow velocity and dissipation through evaporation or sheet flooding (Geo/Resource Consultants 1982). Major washes traverse the following desert basins: Castaneda Wash on Dutch Flat; Sacramento Wash in the Sacramento Valley; Detrital Wash in the Detrital Valley; and Truxton Wash in the Hualapai Valley.

In the eastern portion of the study area, drainages are incorporated into the Gila and Verde watersheds. The Hassayampa River, an intermittent tributary of the Gila River, drains the western face of the Bradshaw Mountains. Runoff from the eastern Bradshaws contributes to the Agua Fria River, another Gila tributary. Chino Valley is located in the upper watershed of the Verde River.

In the Plateau country, a series of streams on the Hualapai Indian Reservation have cut deep canyons draining northward to join the lower Grand Canyon. These spring-fed canyons include Meriwhitica Canyon, Peach Springs Canyon, and the canyon of Diamond Creek.

The principal aquifers are the alluvial fill deposits of the basins, within which groundwater generally occurs at depths of several hundred feet (Geo/Resource Consultants 1982). Springs tap groundwater stored in rock fractures (Bryan 1925:161). Their distribution in mountainous zones is localized and complex. Fracture springs occur in most rock types, and tuff beds and solution channels in sedimentary formations also can yield water (Geo/Resource Consultants 1982:5).

In his examination of documentary and ethnographic sources for the Hualapai country, Manners (1974:56) stated that springs were most abundant in the Mohon Mountains, in canyon and cliff zones of the Plateau, and "along the flanks of the desert ranges". Large-scale topographic maps reveal at least 220 springs in the overview area (BLM 1978:II-25). This can be regarded as a minimum count. Springs tend to be concentrated in areas having relatively high precipitation. However, this relationship does not necessarily apply to the western mountain ranges and the Colorado Plateau, relatively arid zones in which local geologic conditions are a more important factor in their occurrence. In general, the highest recorded densities of springs occur in the following zones: canyons in the southern areas of the Black and Cerbat ranges and the northern canyons of the Hualapai range; Plateau canyons and cliff faces; and the Mohon, Juniper, Santa Maria, Sierra Prieta and Bradshaw ranges in the eastern part of the study area. Springs are particularly numerous within a 15 mile (24 km) radius of the town of Prescott. Not all springs are perennial; as with streams, flows may fluctuate in response to seasonal variations in rainfall. Few springs exist on the high plateaus or in the low desert basins.

Desert water sources include "tinajas" and playas. Tinajas are rock depressions which collect pools of rainwater or streamflow. They often form as "plunge pools" at the base of rock faces (Bryan 1925). Their reliability depends on their size and the variable amount of flow or rainfall available for catchment.

In the Southwest, the term "playa" generally refers to "a nearly level area at the bottom of a desert basin, sometimes temporarily covered with water", as defined by the American Heritage Dictionary. Playas generally form in closed basins having no external drainage. Such situations are more common in the Great Basin than in western Arizona. In the Arizona desert, major basins are linked into the Gila-Colorado watershed system (Ross 1923). A notable exception is the Hualapai Valley, where Truxton Wash and other intermittent streams drain into Red Lake, a playa at the center of the basin. Since streamflows rarely reach basin floors, Red Lake does not always contain water. The classical image of the mirage typifies such areas. Citing Gillespie and Bentley (1971), Schilz (1982:97) argued that Red Lake is a Holocene phenomenon that did not exist during the Pleistocene period, the Ice Age that ended 10,000 years ago. During that era, extensive lakes formed in Utah, Nevada, and southern California (Meinzer 1922). Red Lake does not exhibit the distinctive features associated with the Pleistocene lakes: ancient beach terraces, shorelines, and freshwater shell deposits. Nevertheless, it retains its Holocene status as the second largest playa in the state, the most extensive being Willcox Playa in southeastern Arizona (Lowe 1964:101).

VEGETATION

The topographic and climatic diversity within the region are mirrored by the diversity and distributional complexity of its plant species. At the regional level, this diversity reflects the transitions among three major subdivisions of the North American Desert: the Mohave, Sonoran, and Great Basin deserts. Within the region, local variations in elevation, substrate, hydrologic conditions, precipitation, and temperature affect the distribution and relative densities of plants and their coexistence in communities (Lowe 1964).

To an extent, the Mohave Desert itself is a transitional zone between the Great Basin Desert to the north and the Sonoran Desert to the south. However, it has its own endemic species in addition to vegetational elements from the other deserts (Rowlands et al. 1982). The smallest and driest of the desert subdivisions, it is centered in southeastern California. In northwestern Arizona, its eastern extension, winter-dominant precipitation gives way to a biseasonal pattern (Rowlands et al. 1982:110). The creosotebush (*Larrea tridentata*) and the Joshua tree (*Yucca brevifolia*) are the most conspicuous plants of the Mohave Desert. The former is among the oldest living plants on Earth (Stevens 1986:84). The Joshua tree is "a scarecrow-like tree of moderate elevations which provides little in the way of shade or wood" (Stevens 1986:72). Another common plant is the Mohave yucca (*Yucca schidigera*), which occurs at relatively lower elevations than the Joshua tree (Lowe 1964:33). Relative to the Sonoran Desert, there is a scarcity of both desert trees and cacti. Catclaw acacia (*Acacia greggi*) is the dominant type of tree, but trees are sparse even along large arroyos (Lowe 1964:35). Cacti are not as diverse or abundant due to relatively cold winter temperatures and a tendency toward winter-dominant rainfall. Prickly pear cacti (*Opuntia spp.*), which tend to be cold-hardy, are among the few common types of cactus (Stevens 1986:79).

Symbolized by the giant saguaro cactus, the Sonoran Desert extends over the Mexican states of Baja California and Sonora. In Arizona, it covers the southwestern quadrant, the Colorado River valley, and elevations under 3000 feet (900 m) in the southeastern part of the state. It also incorporates the Colorado Desert in extreme southeastern California (Nabhan 1985:2). Although it is the hottest of the North American deserts, its plant life is the most varied and lush. Cacti and arboreal species are abundant and diverse (Lowe 1964:30-35; Shreve and Wiggins 1964:33).

Two major subdivisions of the Sonoran Desert extend into Arizona (Shreve and Wiggins 1964). The Lower Colorado Valley Province incorporates the most arid zones at elevations below 1,500 feet. Creosotebush and bursage (*Franseria dumosa*) are the dominant plant species. Higher elevations in the Arizona Upland Province receive greater amounts of precipitation. Its vegetation exceeds that of the Lower Colorado subdivision in stature, density, and diversity (Shreve and Wiggins 1964:57). Characteristic plant species include saguaro cacti (*Cereus giganteus*), palo verde trees (*Cercidium spp.*), creosotebush, cholla and prickly pear cacti (*Opuntia spp.*), ocotillo plants (*Fouqueria splendens*) and species of *Yucca* and *Agave*. Palo verde, mesquite (*Prosopis velutina*), and ironwood (*Olneya tesota*) trees tend to concentrate along desert washes. In general, the density, size, and height of riparian plants are proportional to the size of the wash (Ohmart and Anderson 1982:434; Shreve and Wiggins 1964:59).

Grasses and shrubs of low stature, such as big sagebrush (*Artemisia tridentata*), blackbrush (*Coleogyne ramosissima*), and shadscale (*Atriplex confertifolia*), dominate the Great Basin Desert (Lowe 1964:37). Pure stands of these plants, as well as a lack of trees, create a relatively monotonous landscape. This high, cool desert extends into Arizona from the north.

In the region under study, the Sonoran Desert extends northward along the Colorado and Big Sandy rivers. It incorporates much of the Big Sandy valley, lower Burro Creek, the Arrastra, Rawhide, and Mohave mountain ranges, and the Mohave Valley. The Mohave Desert covers the rest of the low territory west of the Big Sandy Valley and the Colorado Plateau (Rowlands et al. 1982). A finger of the Great Basin Desert borders the lower Grand Canyon on the Hualapai Reservation (Brown and Lowe 1980).

There are no clear demarcations among the three deserts. Where they overlap, transitional areas support a mixture of characteristic species. This phenomenon of transitional diversity is particularly evident in the Hualapai Mountains:

> The Hualapai Mountains are located very near the apparent "boundaries" of three large desert ecosystems: Mojave, Sonoran, and Great Basin. The vegetation on the slopes of the Hualapais serves as a prime example of how difficult it sometimes is to

categorize natural systems. The rolling plains of the western side of the Hualapais are almost exclusively covered by creosotebush which blends slowly into rather dense stands of Mojave yucca on the lower slopes; these two species typify the vegetation of the Mohave Desert. On the southern and eastern flanks and bajadas, however, we find paloverde trees, an occasional saguaro, scattered cacti and shrubs—all indicators of the Sonoran Desert . . . On the northern slopes are chaparral and pinyon-juniper woodlands comprised of species all typical of the Great Basin Desert of northern Arizona and southern Utah lowlands [Carothers 1986:31].

Map 2-6, based on the map of Southwestern biotic communities produced by Brown and Lowe (1980), depicts vegetation zones in the Kingman-Prescott region of west central Arizona. The eastward progression of desertscrub, semidesert grassland, and woodland zones parallels the general eastward increase in elevation and precipitation.

Desertscrub communities exist at elevations below 4000 feet (1200 m). The Lower Colorado Valley subdivision of the Sonoran Desert borders the Colorado River as far north as the southern point of Nevada. Other areas of the Sonoran Desert fall within the Arizona Upland subdivision. Along the Bill Williams, Santa Maria, and Big Sandy rivers, the Sonoran-Mohave transition is apparent in the coexistence of palo verde, saguaro, ocotillo, and Joshua trees (Lowe 1964:32-33). Dense stands of mesquite, known as mesquite bosques, cover the lowlands along the rivers. Riparian plants also include cottonwood trees (*Populus fremonti*), cattails (*Typha domingensis*), and non-native tamarix (*Tamarix*) trees. Rushes and reeds formerly grew in extensive marshes along the Colorado River.

Characteristic plants of the Mohave Desertscrub community grow in the Black Mountains and the Detrital, Sacramento, and Dutch Flat valleys. This zone also extends eastward into the Grand Canyon along the Colorado River. Creosotebush and bursage, with catclaw acacia along washes, dominate the lower portions of the basins. At higher elevations on bajadas and pediment slopes, Mohave yucca, prickly pear cacti, snakeweed (*Gutierrezia sp.*), and brittlebush (*Encelia farinosa*) are additions to the flora. On the coarse soils of mountain slopes, cacti include buckhorn and Mohave cholla (*Opuntia acanthocarpa* and *Opuntia echinocarpa*), beavertail prickly pear (*Opuntia basilaris*), and barrel cacti (*Echinocactus acanthodes*). Shadscale and saltbush (*Atriplex canescens*) grow on the saline soils surrounding Red Lake playa. Stands of blackbrush, interspersed with banana yucca (*Yucca baccata*) and Joshua trees, exist at elevations above 2500 feet (750 m) in the Hualapai Valley (Lowe 1964:35). Joshua tree "forests" are particularly dense north of Red Lake at the base of the Grand Wash Cliffs (Lowe 1964:32-40).

Unusual plant associations exist in the Music Mountains where the Mohave Desert meets the Colorado Plateau. These include an association of creosotebush and pinyon pine (*Pinus edulis*); a wolfberry (*Lycium sp.*) — Whipple's cholla (*Opuntia whipplei*) community; and a Mohave thorn (*Canotia holecantha*) community with subdominant grasses and Mohave yucca (BLM 1978:II-36).

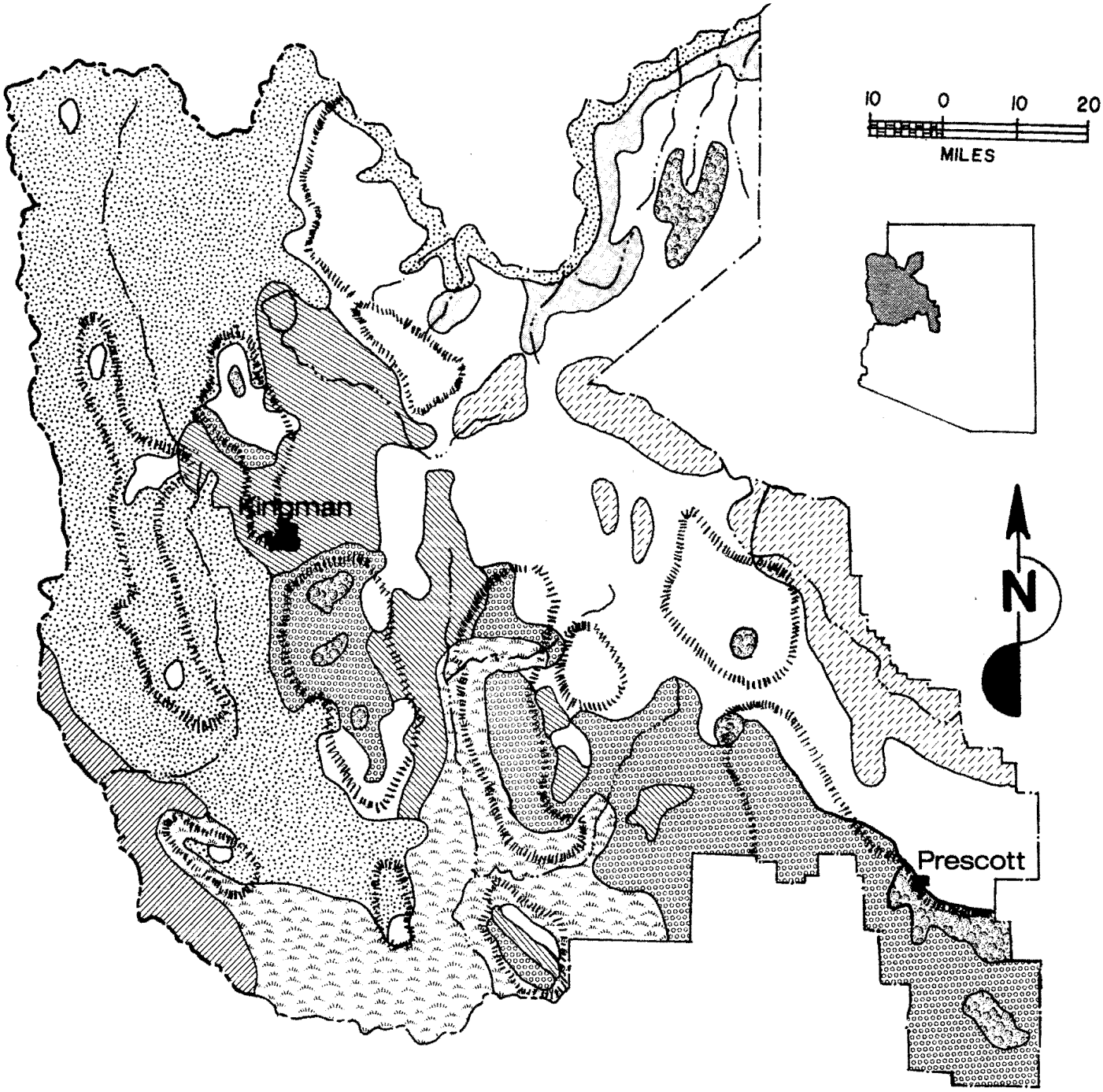
Great Basin Desertscrub associations border the lower Grand Canyon on the Hualapai Indian Reservation. In northern Arizona, the principal associations include nearly pure stands of sagebrush, shadscale, and blackbrush (Lowe 1964:37). The latter two species are also common in the Mohave Desert of western Arizona.

The Semidesert Grassland community exists where elevations between 3500 and 5000 feet (1000-1500 m) receive 10 to 15 inches (25-38 cm) of annual precipitation. In Arizona, these areas are concentrated in the southeastern part of the state, except for a large northwestern zone in the vicinity of Kingman (Lowe 1964:40). Arid grasslands exist in the Hualapai Valley south of Red Lake; in the Sacramento Valley at the base of the Cerbat Mountains; along the Big Sandy River north of Wickieup; and on the mesas in the Bagdad-Burro Creek area (Brown and Lowe 1980). The major grasses, big galleta and tobosa (*Hilaria rigida* and *H. mutica*), are "bunch growth" grasses which grow in clumps separated by bare ground. Grama grasses (*Bouteloua spp.*) grow on the deeper soils. In much of the Semidesert Grassland, soils are gravelly and shallow, and grasses are mixed with shrubs, yucca, and cacti (Lowe 1964:42).

Plains Grassland, at elevations above 5000 feet (1500 m), consists of a nearly continuous cover of grama grasses with muhly (*Muhlenbergia sp.*) dropseed (*Sporobolus sp.*) and other grasses (Lowe 1964:43). Interstate Highway 40 and its predecessor, U.S. Route 66, pass through such areas south of the Hualapai Reservation. The largest expanse of upper elevation grassland exists in the Chino Valley.

Dense perennial evergreen shrubs dominate the Chaparral community, a zone which separates arid grasslands from higher woodlands. It exists at elevations between 3500 and 6000 feet (1050-1800 m), with annual precipitation ranging from 13 to 20 inches (33-50 cm) (Lowe 1964:48). Vast areas of the Bradshaw Mountains and the rugged country west of Prescott consist of chaparral. It extends westward along Burro Creek and into the Aquarius Mountains. The dominant shrubs include scrub oak (*Quercus turbinella*), mountain mahogany (*Cercocarpus breviflorus*), buckbrush (*Ceanothus greggi*), squawbush (*Rhus trilobata*), and manzanita (*Arctostaphylos spp.*).

The Great Basin Conifer Woodland is "among the simplest vegetations in the Southwest, as far as dominant plants are concerned, and juniper-pinyon is perhaps the simplest of the woodlands" (Lowe 1964:56). In west central Arizona, these woodlands exist at elevations between 4500 and 7000 feet (1350-2100 m). Juniper trees are nearly always more prevalent than pinyon pines, particularly at the relatively lower elevations. The most common evergreen species are Utah juniper (*Juniperus osteosperma*), one-seed juniper (*Juniperus monosperma*), Colorado pinyon (*Pinus edulis*), and singleleaf pinyon (*Pinus monophylla*). Subdominant understory plants include big sagebrush, scrub oak, and blackbrush. The juniper-pinyon woodland incorporates Prescott and extends northwestward through the Juniper and Mohon mountain ranges onto the Colorado Plateau. From the Plateau, it continues southward into the Peacock and Hualapai ranges. The Cerbat Mountains contain substantial areas of woodland. In the other mountains of the Basin and Range Province, small and isolated patches of juniper-pinyon woodland exist on high slopes. Such areas occur in the Aquarius, Arrastra, Mohave, and Black ranges. In the relatively arid



MAP 2-6: VEGETATION ZONES

(From Brown & Lowe 1980)

LEGEND

Sonoran Desert, Lower Colorado		Plains Grassland	
Sonoran Desert, Arizona Upland		Chaparral	
Mohave Desertscrub		Great Basin Conifer Woodland	
Semidesert Grassland		Ponderosa Pine Forest	
Great Basin Desertscrub			

Black Mountains, desertscrub species grow at the lower margins of the woodland "islands". The Black Mountains also support a different species of juniper, *Juniperus californica*, that can withstand more xeric conditions (BLM 1978:II-40).

Riparian or streamside areas within the chaparral and conifer zones support such broadleaf deciduous trees as cottonwood, willow (*Salix spp.*), sycamore (*Platanus wrightii*), walnut (*Juglans major*), and Emory oak (*Quercus emoryi*) (Lowe 1964:62). Lush riparian growth often exists in deep canyons.

Forests of ponderosa pine (*Pinus ponderosa*) generally exist in open park-like stands on fairly level expanses of the Colorado Plateau (Lowe 1964:65). These forests grow in relatively moist zones above 6000 feet (1800 m). Ponderosa forests have a limited and patchy distribution within the study area. The largest forests exist in the Bradshaw and Sierra Prieta (Prescott) mountain ranges and on the high Plateau at the eastern edge of the Hualapai Reservation. Isolated "sky islands" of pine forest also exist in the Juniper, Hualapai, and Cerbat mountain ranges (Lowe 1964:65). These cool high oases cap a landscape of harsh and rugged diversity.

WILDLIFE

Faunal diversity parallels the diversity of environmental zones within the region. The density and distribution of wildlife species are influenced by the availability of food, water, cover, breeding areas, and space. In arid western Arizona, the distribution of scarce water sources is a powerful limiting factor for many species.

Large mammals include three artiodactyls: mule deer (*Odocoileus hemionus*), bighorn sheep (*Ovis canadensis*), and pronghorn antelope (*Antilocapra americana*). A small herd of elk (*Cervus canadensis*) inhabits the high reaches of the Hualapai Mountains (BLM 1981:50). White-tailed deer (*Odocoileus virginianus*), black bears (*Euarctos americanus*), gray wolves (*Canis lupus*), and mountain lions (*Felis concolor*) were historic inhabitants of the woodlands and forests (Davis 1973; Jeter 1977:34-35). Carnivores presently include coyotes (*Canis latrans*) and bobcats (*Lynx rufus*).

Mule deer populations are highest in the chaparral, juniper-pinyon woodland, and ponderosa forest zones. Populations are low in the Black Mountains due to a lack of water sources and preferred forage. A drastic reduction in the deer population during the late nineteenth century has been attributed in part to overhunting by settlers. Although numbers have fluctuated since that time, the enforcement of game laws reversed that drastic decline (BLM 1978:II-70-72; BLM 1981:51).

Bighorn sheep were once common in most of the desert mountain ranges of western Arizona. Their numbers decreased drastically between 1860 and 1960 due to mortality and stress from livestock-introduced diseases, overhunting, and competition with livestock and feral burros (Cooperrider 1985:476). In general, desert bighorns inhabit rough terrain in the desertscrub zones, entering the basins only to travel between mountain ranges. Very rugged areas are favored for lambing. In the Kingman region, bighorn sheep fill a void in the distribution of mule deer; their numbers are greatest in the Black Mountains (BLM 1978:II-86).

The range of pronghorn antelope has decreased drastically over the past 150 years (Davis 1973). A decline in native grasslands may have contributed to their diminishing presence (Davis 1973:200; Hastings and Turner 1965). Areas of antelope habitat include Goodwin and Bozarth mesas and the Chino Valley. Pronghorn were consistently sighted in other valley grasslands prior to 1860 (Davis 1973:218).

Feral burros, the descendants of animals brought to the desert by miners and settlers, are natural competitors of deer and bighorn sheep. They have "an unsurpassed ability to use resources" at the expense of the other animals (BLM 1978:II-69). Burro populations are particularly high in the Black Mountains and in the mountains adjacent to the Bill Williams River. In order to reduce adverse effects on the natural environment and native wildlife, in the late 1970s the BLM instituted a program to capture and offer burros for public adoption.

Small mammals include cottontail rabbits (*Sylvilagus spp.*), jackrabbits (*Lepus californicus*), packrats (*Neotoma spp.*), and rock squirrels (*Spermophilus variegatus*) (BLM 1978, 1981; Jeter 1977). The Hualapai Mountain meadow vole is a creature unique to that locality. Unique localized species are often found on the mountain "sky islands" of Arizona, where "several thousands of years of isolation have given time for natural selection and genetic isolation to work their magic" (Carothers 1986:27). The meadow vole's habitat is threatened by stock grazing and by a possible long-term trend toward a warmer, drier climate. Such a climatic trend could eventually reduce the extent of the ponderosa forest and its meadows (Carothers 1986:32).

Common birds include Gambel's quail (*Lophortyx gambelii*), mourning doves (*Senaida macroura*), and turkey vultures (*Cathartes aura*). At least 20 species of raptors include four threatened or endangered species: the bald eagle (*Haliaeetus leucocephalus*), the peregrine falcon (*Falco peregrinus*), the zone-tailed hawk (*Buteo albonotatus*), and the black hawk (*Buteogallus anthracinus*). Bald eagles winter along the Big Sandy River, Burro Creek, and the Santa Maria River (BLM 1981:54). Turkeys (*Meleagris gallopavo*) inhabit the high woodlands and forests (Davis 1973; Jeter 1977:34). Various ducks, geese, and other waterfowl stop along the Colorado River and its major tributaries during the course of their migrations. Waterfowl sighted near the Santa Maria and Bill Williams rivers include great egrets (*Casmerodius albus*), snowy egrets (*Egretta thula*), and black-crowned night herons (*Nycticorax nyucticorax*) (Monson and Phillips 1964). In the mid-nineteenth century, "thousands" of waterfowl were sighted in marshy areas along the Bill Williams River (Davis 1973:115).

Snakes and lizards are numerous and diverse, but there are relatively few species of amphibians (BLM 1978:II-84). Rare or declining species are the Gila monster (*Heloderma suspectum*), the only poisonous lizard in Arizona, and the desert tortoise (*Gopherus agassizi*).

At least 25 species of native fish once inhabited Arizona's streams. Competition with introduced species, the disruption of river flows by dam construction, the disappearance of springs and marshes, stream entrenchment, and

water pollution have all contributed to a drastic reduction in native fish populations (Cole 1981:477).

Large fish species native to the Colorado River included the Colorado River salmon or squawfish (*Ptychocheilus lucius*) and the humpback sucker (*Xyrauchen texanus*). Smaller native species existed in the more marginal pool habitats of springs and interrupted or nonpermanent streams. The longfin dace (*Agosia chrysogaster*), desert pupfish (*Cyrinodon macularius*), and other diminuitive fishes could tolerate extreme environmental conditions such as flash floods and periodically low water levels (Minckley 1973). Many of these species persist in perennial and wilderness streams.

EXPLOITABLE RESOURCES

To aboriginal groups, the region offered a rich diversity of natural resources. For thousands of years, people were sustained primarily by the collection and use of wild food resources and raw materials. Away from the Colorado River, the scarcity of reliable water sources in conjunction with arable land limited the development of farming. However, the Indians apparently took advantage of situations suitable for farming (McGuire 1983:32-33). Use of this arid region demanded stamina, ingenuity, flexibility, and considerable knowledge of its resources. These qualities would have facilitated responses to the patchy distribution of resources and to seasonal and year-to-year variations in their availability. Anthropologists have found that dispersed, seasonally available wild resources having variable and unpredictable yields are most efficiently exploited by small mobile groups that can readily change their size and composition. Food storage and the pooling of risk through widespread visiting and resource sharing also tend to be important aspects of subsistence strategies (Dyson-Hudson and Smith 1978; Gould 1980; Wiessner 1982; Williams and Hunn 1982). According to the ethnographic references, these characteristics were true of the upland Yuman groups who inhabited the region (Gifford 1936; Kroeber 1935; Manners 1974; Mariella and Khera 1983; Martin 1973; McGuire 1983). Cavalry officers described stored provisions of wild foods (U.S. Senate 1936), and the storage of food in hermetically sealed vessels was one of the traits used to define a major prehistoric cultural tradition (Schroeder 1957).

In arid lands, the distribution and reliability of water sources are key factors governing human settlement. Away from the Colorado River, areas of perennial flow exist along the Big Sandy and Bill Williams rivers and some of their tributaries. Military accounts indicate that the flowing portion of the Big Sandy supported a large number of Hualapai settlements (U.S. Senate 1936). Springs are numerous, although the most reliable ones tend to be concentrated in certain areas while vast areas have few or none. Ethnographic information indicates that many of the more substantial base camps were situated near springs. Soldiers apparently used this knowledge in their campaign against the Hualapai (U.S. Senate 1936). However, historic accounts also indicate that water was sometimes transported to camps located far from springs. At a camp in the Hualapai Valley, Garces observed that women traveled four hours daily to bring water from springs in the Peacock Mountains (Coues 1900; U.S. Senate 1936:6). Springs and streams can dry up during droughts; even the Colorado River did not always yield enough water, at the right time, for successful harvests from aboriginal floodwater farming (Castetter and Bell 1951). The unpredictable nature of water sources reinforced the importance of flexibility in strategies of settlement and resource use.

Stone tools were an important component of the technology used to exploit wild resources. Lithic raw materials include a variety of rock types suitable for the manufacture of implements. The bottoms and terraces of streams, limestone deposits, and areas of extensive volcanic activity are particularly good sources for lithic materials (Foose 1979). Cobbles or veins of workable chert, chalcedony, rhyolite, quartzite, and basalt are available at rock outcrops and as scattered nodules transported by erosion along streams and mountain pediments. Rocks of coarser grain, such as granite and vesicular basalt, are less suitable for flaked implements but usable for grinding implements, anvils, and hammerstones. Such materials are present in many of the regional mountain ranges and drainages. Lithic raw materials are relatively scarce on the valley flats.

There have been no comprehensive surveys of lithic raw material distributions. However, Burro Creek and the Alamo Lake area are known to have an abundance and variety of lithic raw materials (Linford 1979; Stone 1977). Burro Creek is a source area for small obsidian nodules known as "Apache tears". A major concentration occurs near the Burro Creek campground maintained by the BLM. Geochemical characterization analyses have been conducted on Burro Creek obsidian (Brown 1982; Shackley 1986). Gifford (1936:279) reported that the Yavapai obtained obsidian nodules in the Bradshaw Mountains. To the east of the study area, visually distinctive deposits of non-nodular obsidian occur at Mt. Floyd in the San Francisco volcanic field.

Linford (1979:206) examined the selective use of lithic raw materials at prehistoric sites along Burro Creek. The local abundance of particular materials was the primary factor in their selection, although quality or workability was also an important consideration. Linford did not relate the use of raw materials to particular intended tool functions.

The region contains a variety of minerals which could have been used for ornaments, pigments, or ceremonial items. Occurrences of rare or particularly colorful minerals include the various blue and green types associated with copper deposits, "Kingman turquoise" in the Cerbat Mountains, and amethyst and rose quartz in the Hualapai Mountains. Mica, used by the Indians as a tempering material in pottery, occurs in the Hualapai and Bradshaw ranges (McCrory and O'Haire 1961).

Sources of clay for pottery manufacture include homogeneous alluvial deposits along the Colorado River and coarser deposits of sandy residual clays near springs and cliff bases in the uplands (Dobyns 1956; Rogers 1936). According to Dobyns, an important Hualapai clay source existed at the western base of the Cerbat Mountains.

Landforms can be considered as resources. Caves, rockshelters, and large boulders provide areas for shelter and storage. Bedrock surfaces can be transformed into grinding areas. Peaks, mountain ridges, and isolated hills are vantage points from which it is possible to survey weather

patterns and the movements of game animals and humans over a wide area. Distinctive topographic landmarks can be used to orient trails. Mountain passes, such as those through which modern routes traverse the Black Mountains, facilitate travel over massive ranges.

Botanical resources include numerous plants which the Indians used as foods, medicines, fuels, structural materials, and raw materials for manufacturing clothing and implements. Table 2-1 presents information on edible and economic plant species. Although it illustrates the variety of utilized resources, it does not represent the totality of exploited species. Some of the listed resources, such as saguaro cacti, have a relatively limited distribution within the study area, while others are more widely distributed. The geographic distribution, yields, reliability, and seasonal availability of plants influenced decisions concerning when and where to exploit resources, when to move from one area to another, and how to resolve scheduling conflicts.

More detailed information on nutritional qualities, the organization of collecting groups, and processing methods can be found in the ethnobotanical literature for the region. Basic ethnographic references contain much of this information (Gifford 1936; Kroeber 1935; Spier 1928). Castetter and Bell (1951), pioneering Southwestern ethnobotanists, authored a detailed analysis of native subsistence along the lower Colorado River. They also synthesized information on the exploitation of tall cacti, mesquite, yucca, and agave in the American Southwest (Castetter and Bell 1937a, 1937b, 1938; Castetter, Bell, and Grove 1938). Relevant information on the Hualapai also can be found in historic and land claims documents (Dobyns 1956; Manners 1974; U. S. Senate 1936). Martin (1973) analyzed the composition of Pai task groups.

Recent ethnobotanical field studies were conducted by Charline Smith (1973) and Marsha Gallagher (1977). Smith's study focused on the identification of "*sele*", an important pre-conquest food rarely used by modern Hualapai. She interviewed and observed people who still used the plant. It was identified as *Mentzelia albicaulis*, an annual which produces seeds high in fat and carbohydrates. Smith argued that *sele* seeds were the "grass seeds" mentioned in historic documents as an important resource. She noted that although its availability had declined within the past century, "the value of *Mentzelia albicaulis* as a reliable prehistoric food source must have indeed been great" (Smith 1977:109). Kroeber (1935:10) stated that *sele* seeds were particularly abundant around Red Lake.

Gallagher (1977) interviewed Apache and Yavapai residents in the upper Verde region near Clarkdale, across the mountains east of Chino Valley. She produced a comprehensive report on Western Apache ethnobotany which describes many of the resources used by upland Yuman groups as well. The report contains a wealth of useful information.

As an aspect of its bilingual education program, the Hualapai tribe has perpetuated ethnobotanical knowledge by involving tribal elders in teaching and demonstrations. The program has generated publications on Hualapai ethnobotany and specific resources (Hualapai Bilingual Program 1982; 1983 a,b,c).

Although a variety of plants were used, certain qualities conferred a special importance to particular resources. High productivity, reliability, storability, and a capacity for efficient harvesting enhanced the value of resources. Additional considerations were nutritional value, palatability, multiple uses, and availability during the lean seasons of winter and spring. The various references list the following resources as particularly important foods: agave, mesquite beans, amaranth, *Mentzelia* seeds, banana yucca fruits, prickly pear cactus fruits, juniper berries, and pinyon nuts. Many of these resources produce reliable yields from year to year. Juniper berries and pinyon nuts are less dependable. Thus they were not staple resources used every year, but they apparently were used whenever available. Good yields of juniper berries are produced every two to five years (Jeter 1977:175). Pinyon pines produce delicious, nutritious nuts as well as pitch useful for medicinal, adhesive, and waterproofing purposes. The Hualapai harvested the nuts every four years. The Hackberry area was a favored gathering locality (Hualapai Bilingual Program 1983a).

Table 2-1 shows that food resources were relatively abundant during the summer and fall, while winter and spring were lean periods. Foods stored at winter base camps and caches enabled survival during periods of seasonal shortages. Dried cactus fruits and berries, nuts, seeds, and tree legumes kept well in storage. Foods stored by the Yuman groups included agave, saguaro and prickly pear fruits, *Mentzelia* seeds, mesquite beans, yucca fruits, pinyon nuts, walnuts, sunflower seeds, and acorns.

Basic processing methods were applied to a wide variety of foods. The consumption of raw foods was supplemented by sun-drying, boiling, pit-baking, and parching with hot coals. Seeds, nuts, and berries were ground for use in breads and stews. Fruits and berries were also steeped to produce beverages. A single resource could be processed by different methods. For example, banana yucca fruits were either sun-dried or roasted. Both processes enabled storage for future consumption (Hualapai Bilingual Program 1983b).

Citing historic descriptions of native subsistence, Gallagher (1977:124-125) suggested that the dietary importance of tubers and seeds has been underemphasized by ethnobotanists. After the period of Anglo-American settlement, seed-bearing grasses declined due to grazing, prolonged periods of dry weather, and competition with introduced plants. At the same time, seeds were supplanted by flour obtained from white settlers and merchants. In her discussion of *Mentzelia*, Smith (1973) also noted the historic decline in the use of seeds.

As the final portion of her study, Gallagher assessed the overall nutritional quality of the aboriginal Western Apache diet. This task was speculative in that "the quantitative data needed for a truly adequate assessment, data that would indicate how much of a food was eaten, how dependent a group or groups were on a particular food or foods, are lacking" (Gallagher 1977:129). Gallagher estimated average contributions of 40% meat, 40% wild plant foods, and 20% cultivated foods. It was an apparently healthy low fat diet with an emphasis on polyunsaturated fats obtained from seeds and nuts. Greens would have provided vitamin A, and vitamin C was obtained from

TABLE 2-1
WILD PLANTS USED BY YUMAN GROUPS

PLANT	PART	USE	SEASON	LOCATION
Chenopods *(Chenopodium spp)*	Greens	Food	Spring, Summer	Widespread
Stick Leaf *(Mentzelia albicaulis)*	Seeds	Food	Spring, Summer	Valley flats
Chia *(Salvia Columbariae)*	Greens, seeds	Food	Spring, Summer	Valley flats xeroriparian
Wild Onion *(Allium spp)*	Bulbs	Food	Spring	Uplands, grasslands
Wild Turnip *(Cyrnopterus)*	Root	Food	Spring	Upland slopes
Agave *(Agave spp)*	Heart Shoots Leaves	Food Food Fiber	All Spring	Rocky slopes, 3,000'+
Mesquite *(Prosopis juliflora)*	Pods Wood Wood Sap	Food Implements Fuel Dye	Summer	Riparian, xeroriparian
Saguaro Cactus *(Cereus giganteus)*	Fruit	Food	Summer	Bajada and slopes in Sonoran Desert
Cholla Cactus *(Opuntia spp)*	Fruit	Food	Summer	Bajada slopes
Prickly Pear Cactus *(Opuntia spp)*	Fruit Sap	Food Medicine	Late Summer	Rocky slopes, grasslands
Screwbean *(Prosopis pubescens)*	Pods Roots	Food Implements	Summer	Riparian
Mulberry *(Morus spp)*	Berries Wood Twigs	Food Implements Basketry	Summer	Riparian
Squawberry *(Rhus trilobata)*	Berries, Roots Twigs Leaves	Food Dye Basketry Snake Repellent	Late Summer	Chaparral & higher zones
Barberry *(Berberis Fremontii)*	Berries Roots Roots	Food Medicine Dye	Summer	Chaparral & higher zones
Acacia *(Acacia greggi)*	Pods Wood	Food Implements	Summer	Xeroriparian
Manzanita *(Arctostaphylos spp)*	Berries Leaves	Food Medicine	Late Summer	Chaparral & higher zones
Amaranth *(Amaranthus palmeri)*	Greens, seeds	Food	Summer	Riparian, xeroriparian
Pinyon Pine *(Pinus edulis)*	Nuts (seeds) Bark Wood Pitch Pitch	Food Medicine Fuel Adhesive Waterproofing	Fall	Woodlands
Banana Yucca *(Yucca baccata)*	Fruit Shoots Leaves Roots	Food Basketry Fiber Shampoo	Fall	Rocky slopes
Mohave Yucca *(Yucca schidigera)*	Fruit Leaves	Food Fiber	Fall	Bajada
Walnut *(Juglans major)*	Nuts Hulls	Food Dye	Fall	Woodlands, upper riparian

TABLE 2-1 (Continued)
WILD PLANTS USED BY YUMAN GROUPS

PLANT	PART	USE	SEASON	LOCATION
Scrub Oak *(Quercus turbinella)*	Acorns Wood	Food Fuel	Fall	Chaparral & higher zones
Gambel Oak *(Quercus gambelii)*	Acorns	Food	Fall	Woodlands, riparian 5,000'+
Juniper *(Juniperus spp)*	Berries Leaves Wood	Food Medicine Fuel	Fall	Uplands
Sunflower *(Helianthus spp)*	Seeds Seeds	Food Dye	Fall	Valley Flats, grasslands
Netleaf Hackberry *(Celtis reticulata)*	Berries	Food	Fall	Riparian
Wild Tomato *(Physalis spp)*	Berries	Food	Fall	Valley flats, riparian
Wild Grape *(Vitis spp)*	Berries	Food	Fall	Riparian
Cottonwood *(Populus Fremontii)*	Bark Shoots	Medicine Basketry		Riparian
Reeds *(Phragmites comminus)*	Reeds	Arrows, Flutes, Fiber		Riparian
4-Winged Saltbush *(Atriplex spp)*	Leaves	Medicine		Valley flats
Cattail *(Typha spp)*	Roots Shoots Leaves	Food Food Fiber		Marshes, riparian
Arrowweed *(Pluchea sericea)*	Stems Stems	Construction Implements		Riparian
Arizona Ash *(Flaxinus velutina)*	Wood	Implements		Riparian
Black Willow *(Salix spp)*	Stems Wood Bark	Basketry Fuel Medicine		Riparian
Desert Willow *(Chilopsis linearis)*	Wood Stems	Implements Basketry		Xeroriparian
Seep Willow *(Baccharis glutinosa)*	Stems Leaves	Construction Medicine		Riparian
Beargrass *(Nolina spp)*	Leaves Leaves	Fiber Construction		Rocky slopes
Ocotillo *(Fouqueria splendens)*	Branches	Construction		Rocky slopes
Creosote *(Larrea tridentata)*	Leaves Lac	Medicine Adhesive		Valley flats
Big Sagebrush *(Artemisia spp)*	Leaves	Medicine		Sandy soils
Yerba Santa *(Eriodictyon angustifolium)*	Leaves	Medicine		Disturbed areas
Ponderosa Pine *(Pinus ponderosa)*	Bark Wood	Medicine Fuel		Pine forests 6,000'+

greens, berries, and cactus fruits. Gallagher noted a possible deficiency of vitamins during the winter, considering the lack of fresh vegetal foods and the destruction of much vitamin C by processing methods (Gallagher 1977:130). Carbohydrates dominate the modern diet of Southwestern Indians (Miller 1970:205). However, many groups still make supplemental use of important traditional foods (Castetter and Bell 1951; Gallagher 1977; Hualapai Bilingual Program 1982, 1983 a,b,c; Nabhan 1985).

Historic documents describe abundant faunal resources prior to 1860. After that time, competition with livestock, possible overhunting, periods of drought, and the deterioration of riparian zones apparently contributed to a decline in wildlife populations (Davis 1973; Dobyns 1981). According to Kroeber (1935:37), hunting was as important as gathering to the Hualapai. The Hualapai and Yavapai, occupants of the basins, canyons, and uplands, hunted deer, mountain sheep, pronghorn antelope, jackrabbits, and cottontail rabbits. Supplemental resources included various species of rodents and lizards, desert tortoises, wild turkeys, quail, doves, and caterpillars (Gifford 1936; Kroeber 1935).

The Mohave of the Colorado River valley relied on fish, waterfowl, and rabbits. Big game was scarce along the river. However, hunting parties pursued deer and bighorn sheep in the desert mountain ranges during the winter (Castetter and Bell 1951).

For the upland groups, hunting was a particularly important activity during the winter when few fresh plant foods were available. Meat and hides also were important trade commodities. Deer provided a staple protein source as well as bone and antler for tools and hides for clothing. The distribution and predictable behavior of big game species influence the effectiveness of hunting techniques. Deer and bighorn sheep use established game trails, and they do not stray far from water sources (Ough, Miller, and DeVos 1980). Deer have predictable bedding and foraging areas within defined territorial ranges. During the winter rutting season, these behavioral patterns are disrupted as they congregate in larger groups (Martin 1973:1450; Swank 1958:20). Ambush techniques were effective for hunting deer and bighorn sheep. Individuals or groups ambushed animals near trails and springs. The most successful technique, the drive ambush, involved the coordinated efforts of four to six men (Gifford 1936:264; Martin 1973:1451). One or two men would hide in a blind constructed near a game trail, while others rousted bedding areas and herded the animals toward the blind. The animals were surrounded and killed in the narrow canyons. Individuals sometimes wore stuffed deer head masks to stalk their prey. Martin (1973:1450) observed that individual stalking must have been "quite a feat", since the effective range of bows was less than 50 meters.

Both stalking and drive techniques were used to hunt antelope (Kroeber 1935:65). "*Wekepaka*", experts in the use of fire in hunting, led Yavapai antelope drives (Gifford 1936:265). Ten or more hunters lit fires around the antelope herd, circled the animals, and shot arrows as the antelope milled around.

Big game animals provided a large quantity of meat at one time, so hunters shared their prey. Meat was divided among the hunters and band members according to prescribed procedures (Kroeber 1935:73). It was roasted, boiled, or dried for later use.

Traps and snares were used to obtain small game. The natives were adept at extracting rabbits, rodents, and lizards from their burrows. The Yavapai burned brush in order to drive rabbits to their burrows and extracted them by twisting sticks into their fur (Gifford 1936:266). Rabbits were surrounded and driven into nets by the Hualapai (Kroeber 1935:63).

The Yavapai baked desert tortoises in small pit ovens, and pieces of shell were preserved for "medicinal purposes" (Gifford 1936:268). The Hualapai collected tortoises in the Detrital Valley (Manners 1974:169). Many archaeological sites in the southern Great Basin contain tortoise remains, indicating that these animals were an important resource in the Mohave Desert (Schneider and Everson 1987: Fig. 2).

The Mohave used a variety of techniques to harvest fish from the Colorado River. Suckers and Colorado salmon or squawfish were abundant, palatable, and easily harvested from backwaters and stream margins (Castetter and Bell 1951; Minckley 1973). Scoops, basket traps, and drag nets were used; netting techniques in particular involved the cooperation of several fishermen (Stewart 1957; Wallace 1955).

For thousands of years, native groups relied on the diverse resources of the region. Their survival strategies may have changed periodically in response to changes in the natural environment which affected the distribution and character of natural resources.

RECONSTRUCTING THE PREHISTORIC ENVIRONMENT

Environmental changes can be viewed from different perspectives. Meteorological processes and climatic changes can be characterized at regional and global scales. Changes in climate, flora, and fauna can vary in geographic scale, overall magnitude, and periodicity. Changes can occur in the form of long-term trends or cyclical fluctuations. It is difficult to track the range of events and processes which have transformed the natural environment over time. Even more difficult is the question of how such changes affected human strategies for survival. Major changes, such as the end of the Pleistocene period or "Ice Age", undoubtedly influenced human settlement and subsistence strategies. Cyclical changes or trends encompassing hundreds or thousands of years may have promoted migrations, regional abandonments, technological innovations, or the use of new or more diverse resources. The Indians may have responded to short-term cyclical fluctuations through flexibility in decisions regarding scheduling, travel, and resource use. As Bayham (1986:379) noted, "it is unlikely that short-term changes will substantially change a well-developed human adaptive strategy or effect a range extension".

In the American Southwest, alternative paleoenvironmental reconstructions have generated controversies based on their different assumptions and methods as well as their disputed implications for human adaptation. The

common goal is the tracking of climatic changes which in turn affected flora, fauna, and the availability of water sources. To this end, researchers have examined many types of data. Geomorphological data reveal the history of erosional cycles and the fluctuation of southern Great Basin lake levels. Floral data include fossil pollen as well as macrobotanical remains from fossilized packrat nests. Dendroclimatology is the study of changes in tree-ring widths associated with changes in temperature and precipitation. As Cordell (1984:35) stated, "each of these provides data appropriate at slightly different levels of precision and each has inherent weaknesses and strengths. Ideally, generalized schemes should include information from many sources".

The major reconstructions begin with the Pleistocene period. The last major glacial advance, known as the Wisconsin, reached its maximum extent at about 20,000 B.C. and fully retreated by 9000 B.C. Although the continental ice sheets did not extend much south of the present Canadian border, glaciers formed in the Rocky Mountains and the Sierra Nevada. In Arizona, a cooler climate than that of the present supported woodlands and grasslands inhabited by now extinct or rare animals like mammoths, bison, ground sloths, and California condors (Stevens 1986:77-78).

The first major paleoenvironmental model, applied over the Southwest and Great Basin, was based on fieldwork by Ernst Antevs and Kirk Bryan (Antevs 1948, 1952, 1955; Bryan 1941). Their geomorphological studies of modern and fossil arroyos focused on the definition of alternating episodes of erosion and alluviation extending back to the late Pleistocene period. Antevs (1955:317) argued that droughts and associated reductions in plant cover resulted in heavy runoff and arroyo cutting, while alluviation or redeposition occurred during wetter pluvial periods. He proposed a sequence of climatic phases known as the late Pleistocene Pluvial, Anathermal, Altithermal, and Medithermal phases.

According to Antevs (1948:168), the southward movement of continental glaciers resulted in a displaced storm pattern, causing wetter and cooler conditions during Pleistocene glacial advances. Lakes formed in the Great Basin and California desert, but this was a relatively rare occurrence in western Arizona (Meinzer 1922). Plant communities were displaced downward in elevation, and they supported now extinct fauna. The earliest cultural level at Ventana Cave, an important archaeological site in south central Arizona, yielded extinct jaguar, ground sloth, tapir, and horse remains dated to approximately 9000 B.C. (Haury 1950:141).

The post-Pleistocene Anathermal phase began at about 8000 B.C. and ended by 5000 B.C. (Antevs 1948:9-11). As the glaciers withdrew, the climate remained more moist than at present but became increasingly warmer and drier toward the end of the phase.

The Altithermal phase between 5000 and 2500 B.C. was much warmer and drier than today's climate, according to Antevs (1948:12). He cited as evidence the dessication of lakes, arroyo cutting, and the formation of caliche (calcium carbonate) deposits.

The subsequent Medithermal phase, extending to the present, was milder and wetter than the Altithermal. Evidence for climatic change included the reappearance of playa lakes and mountain glaciers in the Great Basin and the redeposition of silts and clays in arroyos (Antevs 1948:12-15). Antevs noted a trend of increasing aridity toward the present.

The Antevs sequence has generated controversy centered on the relative severity of the Altithermal phase and its effects on human occupation of the deserts (Aschmann 1958; Baumhoff and Heizer 1965; Fry and Adovasio 1976). Other researchers have questioned the link between arroyo cutting and aridity. These criticisms focus on changes in the seasonal distribution of rainfall as a primary factor in arroyo cutting (Cordell 1984:36).

Paul Schulz Martin (1963 a,b) used fossil pollen data from southeastern Arizona to challenge Antevs' scheme. He agreed that the late Pleistocene was a cool moist period with a downward shift in life zones of as much as 3000 feet (900 m) (Martin 1963a:vi). Yet to Martin, the fossil pollen record did not indicate drier conditions during the Altithermal or middle Holocene period. He suggested that Antevs mistook fossil evidence of riparian conditions for evidence of pluvial conditions. Periods of arroyo cutting were attributed to shifts toward summer-dominant rainfall, since summer monsoon storms tend to create heavier localized runoff. Changes in the composition of plant species indicated that periods of arroyo filling were associated with winter-dominant precipitation (Martin 1963b).

Antevs (1962), Sayles (1965), and Haynes (1968) criticized Martin's study, arguing that sediments of Altithermal age were missing from his soil profiles. Schoenwetter and Dittert (1968) emphasized the connection between channel entrenchment and summer-dominant rainfall. Evidence from packrat nest studies offers some support for Martin's interpretation (Van Devender and Spaulding 1979).

The analysis of fossilized packrat nests is a recent approach to paleoenvironmental reconstruction (King and Van Devender 1977; Wells 1976). Packrats (*Neotoma spp.*) construct nests from fragments of vegetation obtained within a 100 meter radius of the den. The nests are cemented with urine, and these indurated masses can survive for thousands of years in rockshelters and caves. The organic constituents provide samples for radiocarbon dating, while paleoclimatic conditions are assessed with reference to the ecological requirements and physiology of plants. Packrat nests represent a local index of environmental conditions, in contrast to pollen samples which can contain windborn specimens from a broad region. Interpretive problems include complex nest stratigraphy and the probability that packrat nest remains represent preferred plant species rather than an unbiased sample of the local environment.

In western Arizona, fossilized packrat nests have been collected and analyzed from the lower Grand Canyon, Artillery Mountain near Alamo Lake, and mountain ranges in the vicinity of Yuma (Burgess and Nabhan 1983; Cole and Van Devender 1984; King and Van Devender 1977; Phillips and Van Devender 1974; Van Devender and King 1971; Van Devender and Mead 1976; Van Devender and Spaulding 1979). Middens from Rampart Cave, Peach Springs Canyon, and Shinumo Creek in the Grand Canyon

region were dated to the late Pleistocene period between 20,000 and 10,000 B.C. (Phillips and Van Devender 1974; Van Devender and Mead 1976). Plant species existed down to 3000 feet (900 m) below their modern distribution. Juniper, blackbrush, and Whipple's cholla grew where creosote and brittlebush now thrive. At the end of the Pleistocene, hackberry and ash trees were replaced in riparian zones by acacia and mesquite.

Van Devender and Spaulding (1979) synthesized packrat nest data to construct a record of Quaternary environmental conditions. They inferred that the late Pleistocene climate was one of cool summers, mildwinters, and winter-dominant precipitation. Woodlands incorporating juniper, scrub oak, beargrass, ceanothus, and yucca existed down to 1500 feet (450 m). A xeric open woodland of juniper and yucca species existed at elevations between 1000 and 1500 feet (300-450 m). The Colorado River valley, a "desert refugium" for desertscrub species, hosted creosote and Joshua trees (Cole and Van Devender 1984).

The slow glacial retreat during the early Holocene period, from about 9000 to 6000 B.C., inhibited the development of summer monsoon rains and the expansion northward of desert plant species. Joshua trees, big sagebrush, and other plants now typical of the Mohave and Great Basin deserts slowly retreated northward from southwestern Arizona. Juniper-scrub oak woodlands persisted, but creosote increased its range.

After 6000 B.C., the retreat of the early Holocene woodlands appears to have been relatively widespread, synchronous, and rapid. The pattern of biseasonal rainfall, incorporating summer monsoon rains, became established. Woodland and chaparral plants retreated upward and northward and were replaced by modern desertscrub species. 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). In the southern Great Basin, packrat nest studies, fossil pollen records, and stratigraphic and geochemical analyses of lake sediments provide a similar picture (Weide 1982).

Bayham et al. (1986:378-381) recently argued that periods of relatively higher global temperatures have been times of summer-dominant precipitation in the Southwest. He found that prehistoric use of a marginal desert zone in south central Arizona increased during relatively warm periods, when greater summer rainfall may have enhanced the reliability of water sources and the productivity of desert basins. Warm periods were defined from global reconstructions of changes in Holocene temperatures, solar activity, and glacial advances (Denton and Karlen 1973; Eddy 1977; Goudie 1985). Such periods apparently spanned from 5000 to 3500 B.C.; 2700 to 1400 B.C.; 300 B.C. to A.D. 1400; and post-A.D. 1900. The intervening cooler periods were associated with generally higher lake levels in the southern Great Basin, although local conditions varied (Mehringer 1977; Weide 1982). In the western Mohave Desert, a zone of winter-dominant rainfall, cooler average temperatures apparently were associated with pluvial conditions. Major population movements or cultural changes may ultimately be linked to such climatic cycles and their consequences within different regions. The complex interrelationships of climatic fluctuations, natural ecology, and human ecology require further study.

Holocene climatic fluctuations may have influenced human land use patterns, perhaps accounting for changes in the archaeological record. For example, pollen profiles from the Boulder Springs rockshelter in the Hualapai Mountains indicated a cooler period of winter dominant precipitation between A.D. 800 and 1050 (Hevly 1974). In the relatively stable record for west central Arizona, this seems to have been a period of change and cultural expansion (Euler 1963; Jeter 1977; Schroeder 1961; Waters 1982). However, factors other than environmental changes can account for changes within human societies, and the record of environmental fluctuations is sparse and speculative. There is a need for the refinement of interpretive techniques and for interdisciplinary studies incorporating different types of data. Such an approach has been undertaken on the Colorado Plateau (Euler et al. 1979).

HISTORIC AND MODERN CHANGES

Widespread changes in the Arizona landscape have occurred within the past century. These changes include soil erosion and arroyo cutting, the loss of riparian habitat, and shifts in the composition of plant communities. In southern Arizona, Hastings and Turner (1965) documented specific changes by comparing historic and modern photographs taken at the same localities. In the late 1800s, an increase in soil erosion contributed to stream channel entrenchment, reduced streamflows, and the disappearance of marshes and riparian vegetation (Dobyns 1981). At the same time, the semiarid grasslands were invaded by shrubs, and there was a general decline in the density of vegetation in desertscrub zones.

Hastings and Turner noted that it was difficult to isolate the separate effects of human and climatic factors, particularly since changes in land use practices and climate seem to have occurred simultaneously. Prior to their study, erosion and shrub invasion had been attributed primarily to the reduction of vegetation through overgrazing. Although they did not discount this factor, Hastings and Turner (1965:43) noted that grazing by large Spanish-owned herds in the previous century had produced relatively little alteration of the landscape. Moreover, channel entrenchment had taken place over the entire Southwest, including ungrazed areas, in the late nineteenth century. They concluded that a combination of grazing, higher temperatures, and reduced precipitation transformed the southern Arizona landscape (Hastings and Turner 1965:280-285). The cutting of massive quantities of wood to fuel mining operations, a drastic increase in the cattle population, and consecutive years of severe drought intensified the process of arroyo cutting and riparian deterioration (Dobyns 1981; Nabhan 1985:65-66). A shift toward summer-dominant rainfall, and thus more intense storms, also may have been a contributing factor (Bayham 1986:380).

Similarities in the natural environment and historic land use patterns indicate that changes in the study area probably paralleled those in southeastern Arizona. Army expedition documents from the 1850s indicate that although the semidesert grasslands were sensitive to

drought, they could recover rapidly (U.S. Senate 1936). However, a combination of droughts, grazing, and the clearing of vegetation for mining operations caused erosion and the deterioration of grasslands. Davis (1973) documented that the Sacramento Valley, now desertscrub, was once an open grassland. In addition to the reduction in their range, semidesert grasslands became dominated by formerly minor shrubs such as snakeweed, rabbit brush, and turpentine bush (*Haplopappus laricifolius*) (BLM 1978:II-45). Prickly pear and juniper extended their range and density into upper elevation grasslands (Gasser 1982:93). Additional factors in the deterioration of grasslands were fire suppression and a declining trend in rainfall since 1930 (BLM 1978:II-45).

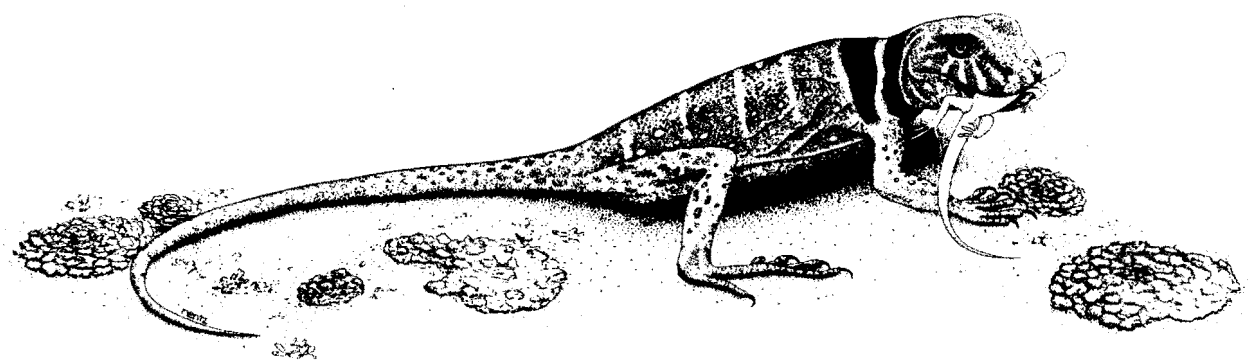
Increasing aridity and the decline of grasslands apparently contributed to a decline in the range and density of fauna. During the 1850s, explorers documented a territory rich in game (Davis 1973). The Sacramento Valley "abounded in pronghorn", according to Sitgreaves and Beale (Davis 1973:99, 123). Antelope and deer were also abundant in the Hualapai and Chino valleys and on the Plateau. Additional factors contributing to the decline in fauna were overhunting by settlers and competition with livestock and feral burros (BLM 1978, 1981; Davis 1973).

Much of the rangeland in the study area is presently in poor condition due to overgrazing. Erosion and biomass reduction are most severe in the riparian zones and basin valleys. Areas in the Black and Hualapai ranges also have been impacted heavily. Zones in better condition are the upper elevation woodlands, the chaparral, the upper elevations of the desertscrub, and the relatively isolated mesa grasslands (BLM 1978, 1981). However, these zones have been subjected to the removal of pinyon and juniper by chaining, woodcutting, and controlled burns.

Away from the Colorado River, the deterioration of riparian zones has resulted from erosion and livestock damage. There have been reductions in water flows, marshes, and the density and diversity of flora and fauna. In 1854, Whipple observed marshes, willow swamps, beaver dams, and abundant waterfowl along the Bill Williams River and the lower reaches of the Big Sandy River (Davis 1973:203).

The most drastic changes to a riparian environment have occurred in conjunction with the damming and diversion of the Colorado River. Major dams constructed between 1930 and 1970 include the Glen Canyon Dam above the Grand Canyon; Hoover Dam in Black Canyon at the great southward bend; and Davis and Parker dams along the lower Colorado. The dams tamed the annual floods which formerly carried huge sediment loads. Beach erosion is now a more serious problem due to the lack of sedimentation (Miller 1986:70). Less fluctuation in river levels has contributed to a decline in marshes and mesquite bosques have been replaced by willows and introduced salt cedar trees (*Tamarix spp.*) (Swarthout 1981:29). Changes in water flows and aquatic temperatures, as well as the introduction of non-native fish species, have adversely affected native fish populations (Cole 1981).

In summary, the magnitude of changes within the past century may well have exceeded any that occurred within the past two or three millenia. Had the Indians regained their ancient territories and skills in the middle of the twentieth century, they would have faced great difficulty in sustaining a traditional subsistence economy. Prehistoric and early historic aboriginal groups probably occupied a more hospitable environment than that of the present.



CHAPTER 3
PEOPLE OF THE DESERT, CANYONS, AND PINES

The area of western Arizona bounded by the Colorado and Gila rivers was occupied during historic times by Yuman subgroups of the Hokan language family. The Yuman speakers inhabited much of western Arizona, southern California, and Baja California. According to Kendall (1983:5), "Yuman languages, and to some extent Yuman cultures, form a recognizable continuum across their geographical spread". A major distinction has been drawn between river and upland groups (Kendall 1983; Kroeber 1943). River Yuman groups, such as the Mohave, settled and farmed the floodplains along the lower Colorado River and its delta. The upland Yumans of western Arizona incorporated three ethnic groups commonly labeled as separate "tribes": the Hualapai, Havasupai, and Yavapai. These "Pai", a designation for "person" or "people", spoke a common language, Northern Pai. Gifford (1936:247) suggested that "these three peoples branched from a common stock at no distant date, as the Yavapai themselves assert". Manners (1974:46) echoed that opinion: "the Walapai may originally and for a relatively long period of time have been a part of a larger ethnic identity which included several of the 'tribe's' now reckoned neighbors". Subtribal dialectical differences sometimes exceed those between "tribes". For example, there is more divergence among Yavapai dialects than there is between Hualapai and Havasupai dialects (Kendall 1983:5). The Havasupai, who cultivated crops in the Grand Canyon, were likely a group of Hualapai who became "distinct and somewhat specialized" (Kroeber 1935; Manners 1974:37; Martin 1973; McGuire 1983; Spier 1928). Dialectical differences were apparently associated with subtribal or regional groups whose geographic ranges posed different problems and possibilities for subsistence strategies and intergroup relations (Kendall 1983; Manners 1974).

Tribal and regional ranges of the Hualapai, Yavapai, and Mohave are depicted in Map 3-1. In comparison to the desert country south of the Bill Williams River, which the Yavapai and Mohave also inhabited, this land was "relatively abundant in plant and animal resources and diverse in physiographic features", and springs were more common (McGuire 1983:25).

THE HUALAPAI

The Hualapai inhabited an area of over five million acres bounded by the Colorado River to the north; the Aubrey Cliffs, Chino Valley, and upper Burro Creek to the east; the Santa Maria and Bill Williams rivers to the south; and the mountains bordering the Colorado River to the west (McGuire 1983). "Walapai" is the conventional spelling used by most anthropologists (Kroeber 1935; Manners 1974). Dobyns (1956) used the alternative version, which also serves to designate the Hualapai Reservation, the Hualapai Mountains, and the Hualapai planning unit of the BLM. Either term is acceptable; to maintain consistency, the latter version will be used in this document.

The standard ethnographic reference on the Hualapai was based on eight weeks of fieldwork in 1929 by Alfred Kroeber and four graduate students (Kroeber 1935). Ethnographic information also appeared in historical documents. The *Walapai Papers* is a collection of military and historical documents prepared at the request of Senator Carl Hayden (United States Senate 1936). Later, Henry Dobyns and Robert Euler compiled and published the manuscripts of Henry Ewing, the reservation agent between 1895 and 1903 (Ewing 1960, 1961).

The Hualapai tribal land claims suit against the federal government generated ethnographic and archaeological fieldwork during the 1950s. Dobyns and Euler assembled information to support the tribe's case, while Robert Manners prepared documentation for the United States government. All three anthropologists conducted fieldwork through informant interviews and tours. Dobyns and Euler also employed archaeological evidence in their arguments for continuity between prehistoric populations and the historic Hualapai (Dobyns 1956; Dobyns and Euler 1956, 1960; Euler 1958; Euler and Dobyns 1956).

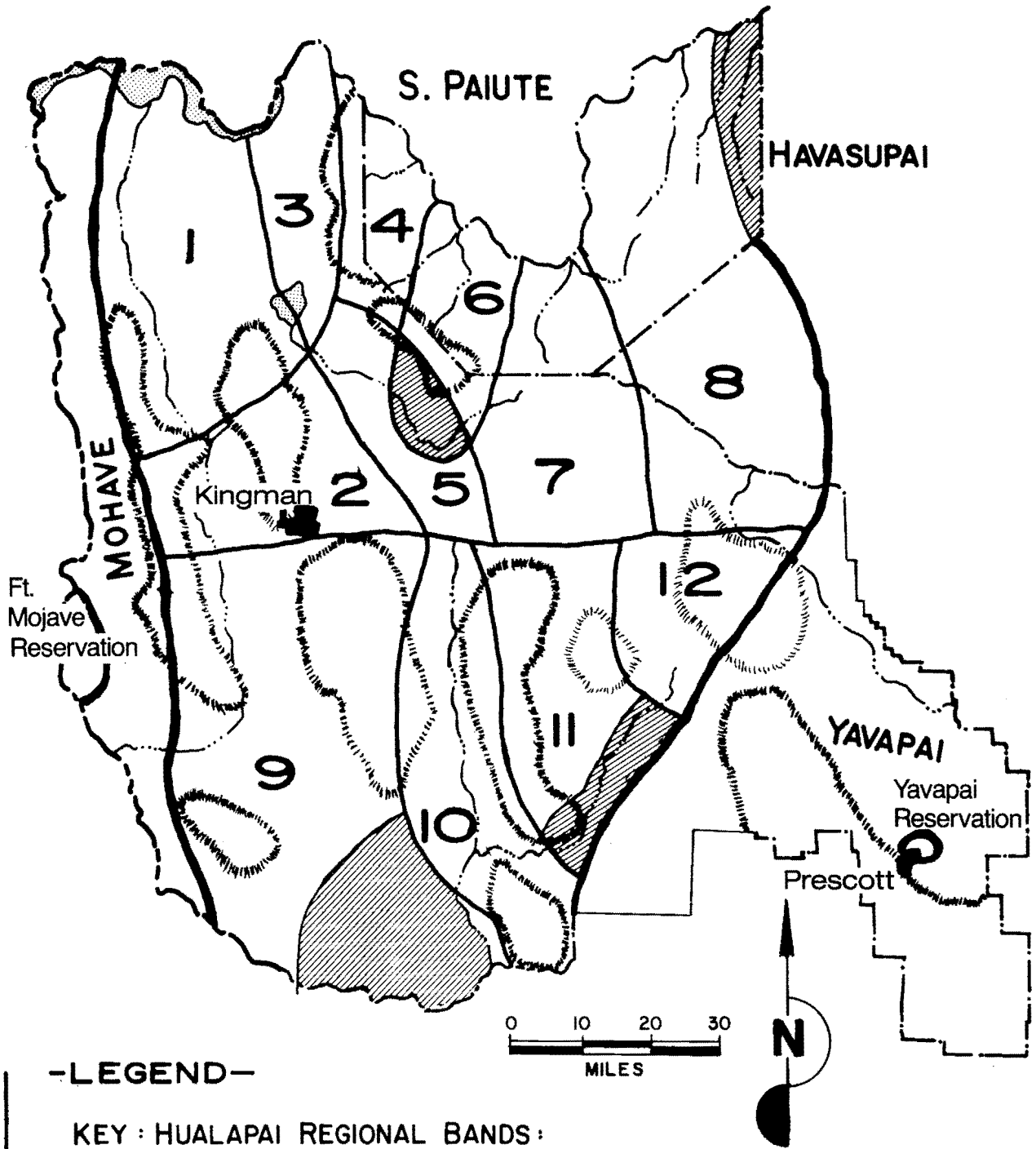
In the land claims case, a major issue was the Hualapai status as a "tribe". Manners, a student of the cultural ecologist Julian Steward, argued that regional bands were "the real and functional unit of political and social organization" (Manners 1974:20). He concluded his report with the following passage:

> Walapais were a hunting and a gathering people whose technology and natural environment largely determined their social and political groupings. These groupings appear to have been land-owning and autonomous, recognizing no obligation to other groups or to a centralized leadership. From this it follows that there was no single political entity which included all of the people who called themselves Walapai . . . If they never joined forces to defend their territory from attack or to prosecute an attack or campaign of reprisal against an enemy they thereby demonstrated their unconcern for 'what was not theirs anyway'. What makes it 'theirs' now? [Manners 1974:176-177).

Dobyns testified that the Hualapai consisted of three primary divisions, or "congeries", whose chiefs acted together as a council in conducting tribal affairs (Dobyns and Euler 1970; Manners 1974:224). During the period of conflict with Anglo-American settlers, the people were led by a series of influential chiefs.

The Indian Claims Commission granted that the economics of hunting and gathering fostered a loose political organization as described by Manners. It also noted that "white contact, war, and the government's desire to deal with centralized authority did greatly strengthen the tribal structure" (Indian Claims Commission 1962:448). The Commission ultimately affirmed the Hualapai legal status as a tribe:

> Assuming for the moment that the Hualapai were not a tribe in a political sense we have a people who all ethnologists agree spoke the same language, had a common culture, intermarried,



-LEGEND-

KEY : HUALAPAI REGIONAL BANDS :

1. Red Rock
2. Cerbat Mtn.
3. Clay Springs
4. Grass Springs
5. Hackberry
6. Milkweed Springs
7. Peach Springs
8. Pine Springs
9. Hualapai Mtn.
10. Big Sandy River
11. Mohon Mtn.
12. Juniper Mtn.

-- Zones of Overlap

Lake

--- Regional Bands Approx. Boundary

--- Tribal Boundary Approx. Boundary

MAP 3-1: HISTORIC TRIBAL AREAS

made common use of the lands away from their settlements, shared their own territories, engaged in common economic activities and considered themselves one people. Such factors make the Hualapai an identifiable group and a land-owning entity under the *Nooksack, Muckleshoot*, and *Washoe* decisions [Indian Claims Commission 1962:474].

At the time of Kroeber's study, the Hualapai incorporated about 40 "camps" each averaging 25 members, a total population of 900 to 1000 individuals (Kroeber 1935:45). These figures represent a population reduced by disease and warfare during the late 1800s (McGuire 1983). Camps consisted of three or four families linked through the male line. Since the Hualapai employed a simple technology to exploit primarily wild resources, the variability and unpredictability of the natural environment favored organizational flexibility (Kroeber 1935:142; Manners 1974). Camps could change in membership composition, periodically disperse into separate families, or aggregate into larger groups as circumstances dictated. Factors related to the efficiency of male and female task group sizes favored an average camp size of about 25 members. Changes in overall population size affected the numbers, rather than the sizes, of individual camps (Martin 1973).

At higher levels of organization, camps were incorporated into regional bands and subtribes. Following Kroeber (1935), Manners (1974) identified seven bands. McGuire (1983) summarized the Dobyns and Euler (1970) framework of thirteen regional bands organized into three subtribes. Map 3-1 (based on McGuire 1983:26), depicts the approximate ranges of the regional divisions defined by Dobyns and Euler. These bands can be correlated with those identified by Kroeber and Manners.

The Middle Mountain subtribe ranged over the Cerbat and Black Mountains and portions of the Hualapai, Detrital, and Sacramento valleys. The Red Rock and Cerbat Mountain bands respectively inhabited the northern and southern portions of this area. According to Manners (1974:77), these were the *Soto'lve-kopai* or "West People". Most settlements were located near springs along the eastern slopes of each mountain range.

The subtribe known as the Plateau People incorporated seven bands in the plateau and canyon country east of the Grand Wash Cliffs. This area included the current Hualapai Reservation as well as the Cottonwood Cliffs, the Peacock Mountains, and the eastern portion of the Hualapai Valley. From west to east were the Clay Springs, Grass Springs, Hackberry, Milkweed Springs, Peach Springs, Pine Springs, and Cataract Canyon bands. The Cataract Canyon designation refers to the Havasupai. The Clay Springs and Grass Springs bands can be correlated with the *Mata'va-kopai*, or "North People" described by Manners (1974:77). They occupied villages along the edge of the Grand Wash Cliffs. The Hackberry and Milkweed Springs bands probably represent the *Ko'o'u-kopai* or "Mesa People" (Manners 1974:79). The largest settlements were located near Milkweed Springs and Truxton Canyon. The Peach Springs and Pine Springs bands were the *Nyav-kopai* or "East People" of the Colorado Plateau (Manners 1974:79).

The Yavapai Fighter subtribe occupied the southern half of the Hualapai country. From west to east, its four regional bands were the Hualapai Mountain, Big Sandy River, Mohon Mountain, and Juniper Mountain bands. The first group inhabited the Hualapai Mountains west to the Colorado River valley. Their camps were concentrated near springs and streams at the northern end of the range. They were known as the *Hual'la-pai* or "Pine People" (Manners 1974:81). The Big Sandy River band occupied the reach of permanent river flow between Wikieup and Signal, although its range also included adjacent mountain slopes. The Big Sandy people were the *Kwe'va-kopai* or "South People". The Mohon and Juniper bands inhabited rugged mountainous country. According to Manners (1974:79), the two groups were incorporated into the *Hakia'tcepai* or "Mohon Mountain People".

Six regional dialects corresponded geographically to the regional bands (Kendall 1983:5). These dialects were "centered" near the present communities of Chloride, Kingman, Hackberry, Peach Springs, Seligman, and Big Sandy. Although regional bands appear to have "owned" their territories (Kroeber 1935:23), among hunter-gatherers in arid regions, territorial ownership rarely involves exclusive use or the defense of boundaries (Williams and Hunn 1982). Hualapai bands were identified as the residents of certain areas, and they claimed rights to resources within those areas. They could also allow access to non-residents, and permission to use resource areas was rarely denied. Fowler's (1982) description of Northern Paiute regional bands may typify the Hualapai situation as well. In the case of the Paiute, elevational diversity (and thus resource diversity) was maximized within band territories, and bands based in less productive or more arid regions traveled and visited other territories with greater frequency.

The Hualapai country was a land of great diversity in elevations, topography, and vegetation zones. Most regional territories incorporated diverse zones, and each contained reliable springs or streams. They varied in size, possibly in response to differences in the density, diversity, and distribution of resources. The relatively arid western territories were comparatively large, as was the Pine Springs territory on the eastern portion of the current Hualapai Reservation. In comparison to other territories, the Pine Springs range contained a less diverse array of biotic communities (Brown and Lowe 1980). The smallest band territories, located in the north central portion of the Hualapai country, encompassed the great topographic and floral diversity of the Grand Wash Cliffs, Music Mountains, Cottonwood Cliffs, and Truxton Plateau. This area also contained tributary branches of the Grand Canyon, including Meriwhitica Canyon, the Hualapai mythical heartland (McGuire 1983:26). This western range of the Plateau subtribe was apparently rich in natural resources, thus it may well have been one of the major centers of prehistoric occupation.

McGuire (1983:26) mapped several areas of overlap, or unclear boundaries, among regional territories (Map 3-1). These included the lower Big Sandy River, upper Burro Creek, and the Music Mountains. That these zones were specifically mapped indicates that they were areas of shared use. Valued resource areas having variable or unpredictable yields, such as pinyon groves, are rarely defended and generally shared (Dyson-Hudson and Smith 1978). Unusual environmental situations or rare but productive resource areas might also be shared, particularly if

defense is difficult and if conflict avoidance is a consideration. The mapped areas of territorial overlap appear to conform to these characteristics. Upper Burro Creek, which traverses the interface of desert and mountains, and the Music Mountains are areas of exceptional floral diversity. The Musics, located at the transition between desert and plateau, contain pinyon pine, agave, and cacti as well as an unusual creosote-pinyon association (BLM 1978). Saguaro cacti and other Sonoran Desert resources exist along the southern portions of the Big Sandy River and its major tributaries. In addition to the areas mapped by McGuire, other shared zones were Round Valley and Red Lake. Groups periodically aggregated in Round Valley to collect pinyon nuts (Manners 1974:223). Red Lake is an ephemeral playa in a valley basin. Such features are common in the Great Basin but relatively rare in western Arizona. It was a resource area for edible seeds (Manners 1974:78; Schilz 1982). It is interesting to note that on McGuire's map, the boundaries of five regional bands intersected near Red Lake.

Just as there were shared resource areas in Hualapai land, there were other zones that received relatively little use. The extreme northwestern area in the vicinity of Lake Mead was "too rough to live in . . . Indians only visited there" (Manners 1974:168). Other sparsely inhabited areas included the arid southern portions of the Hualapai Mountains and Sacramento Valley; the area known as Dutch Flat; and plateau areas far from canyons and springs (Dobyns 1956; Manners 1974).

Fowler (1982:134) commented on aboriginal patterns of settlement and subsistence in the Great Basin: "on one level—the actualized level—they were quite varied and variable, while on another—the generalized level—they were all also basically the same". The same could be said of the Hualapai. The generalized Hualapai pattern of hunting, gathering, and seasonal mobility probably incorporated many regional variants. In general, important food resources included pinyon nuts, juniper berries, agave, grass seeds, saguaro and prickly pear cactus fruits, mesquite beans, yucca fruits, walnuts, and small and large game (Kroeber 1935). The summer and fall seasons offered relatively abundant resources, while winter and early spring were seasons of relative scarcity. The Hualapai stored portions of the wild harvests in order to survive the lean months (Kroeber 1935:23; Swarthout 1981:67).

The generalized Hualapai settlement pattern included winter base camps, the largest and most substantial settlements of the annual round, where people lived on stored foods and game. Swarthout (1981:70) suggested that these camps probably housed relatively large groups due to cooperative hunting and pinyon collecting and the presence of stored harvests. In the spring, small groups moved to the foothills to exploit agave and game. These resources were also present in the canyons above the Grand Wash Cliffs (McGuire 1983:32; Swarthout 1981:73). In the early summer, the population shifted to the valley floors to exploit seeds and small game. In the late summer, groups began a slow trip back to the upper elevations, on the way harvesting saguaro, prickly pear, or yucca fruits. In the fall, pinyon nuts, walnuts, and juniper berries were harvested from the mountains and plateaus. Late summer and fall resources were gathered for storage. Hunted game included deer, bighorn sheep, antelope and rabbits.

Cultivated crops, varieties of corn, beans, and squash, evidently provided a small proportion of Hualapai subsistence. The extent of reliance on farming has been controversial. Kroeber (1935:58) viewed agriculture as a small-scale intermittent enterprise: "It is clear that even the pitiful attempt at farming consistently made at Matewitide impressed the imagination of the whole tribe far beyond warrant of the actual economic results". Dobyns and Euler (1970:53) disputed that opinion and argued that farming had been a more important activity prior to contact. Since it was undertaken near the most reliable water sources, it would have been one of the first activities disrupted by Anglo-American settlement. Mariella (1983) suggested a similar post-contact shift in Yavapai subsistence. There is little direct evidence to support either argument. To the extent that farming fit into the seasonal economic round, crops were probably planted at favorable locations near springs and streams. Such locations, scattered and limited in area, included Meriwhitica (Matewitide) Canyon, Diamond Creek Canyon, Clay Springs, upper Trout Creek, reliable springs in the Cerbat and Hualapai ranges, Burro Creek, and the Big Sandy River between present Wikieup and Signal (Manners 1974:58). Farming was always a risky endeavor in this arid unpredictable environment, and wild resources likely maintained their status as the staples of existence.

The generalized Hualapai subsistence and settlement system covered a diverse landscape of plateaus, canyons, mountains, and desert valleys. Regional bands inhabited areas that differed in the types, abundance, and distribution of particular resources. Regional subsistence and settlement patterns probably varied in the following respects: relative emphases on the use of particular resources; details of seasonal scheduling; overall degrees of mobility; extent of reliance on storage; and extent of farming. Manners (1974:160-170) documented some differences, and others can be suggested. The western and north central bands of the Grand Wash Cliffs and the Black, Cerbat, and Hualapai ranges could access a variety of vegetation zones. Grass seeds, obtained in the valleys, were an important summer resource, and other significant foods were agave and bighorn sheep. To the south, the Big Sandy River band was unique in its occupation of a riparian valley. Farming and the use of Sonoran Desert resources, such as saguaro and mesquite, were probably important economic pursuits. The northeastern bands, inhabitants of the Colorado Plateau, may have followed a pattern similar to that of the Havasupai: canyon bottom farming in the summer and a fall/winter shift to wild resources on the plateaus (Spier 1928). Finally, the Mohon and Juniper mountain ranges provided abundant upper-elevation resources including pinyon nuts, walnuts, and deer. Given the longer cooler winters and abundant fall resources, the eastern Hualapai bands may have devoted greater efforts to storage.

Economic systems and exchange relationships influenced social relations among regional bands. In general, people from other bands were viewed as outsiders despite intermarriage, resource sharing, and a common language. This sense of difference was sometimes expressed in terms of physical appearances and food habits. For example, the people of the Detrital Valley area were known as the "tortoise eaters" (Manners 1974:169). Yet interaction among bands and tribes probably conferred economic or social

advantages that outweighed any sense of difference. The western Hualapai who lived in the Black and Cerbat ranges interacted frequently with the Mohave. They traded wild products for agricultural produce, and small groups sometimes overwintered with the Mohave (Kroeber 1935:44). The Cerbat people historically exerted a strong political influence over other bands (Manners 1974:78). This situation may have reflected their strategic position in intertribal trade networks (McGuire 1983:31). The inhabitants of the Black Mountains and Detrital Valley, on the other hand, were said to interact rarely with other Hualapai, and they were regarded as "different" (Manners 1974:167). This may have been the remote backwoods of the Hualapai country, where groups maintained relations with the Mohave but did not act as intertribal trade brokers. Moving eastward, the "East People" on the Colorado Plateau interacted most frequently with the Havasupai (McGuire 1983:33). To the south, close relations were maintained between the Big Sandy band and groups in the Mohon and Aquarius Mountains (Manners 1974:80). Factors contributing to frequent interaction may have included the sharing or exchange of desert riparian and mountain resources. Cooperative defense against Yavapai attacks may have been another factor.

This rather complex picture of regional variants and interaction networks is offset by a shared material culture incorporating the simple but effective tools which characterized Great Basin aboriginal technology (Kroeber 1935; McGuire 1983). Various lithic tools were employed for grinding and pounding native foods, and manos were valued possessions (Euler and Dobyns 1983). Baskets and other perishable tools made from plant products were an important component of material culture. Ceramic pots, rare in comparison to baskets as containers, were nonetheless valued items (Dobyns 1956; Rogers 1945). More exotic possessions included shell necklaces obtained from the Mohave. Shelters or structures included caves and rockshelters, brush shades and wickiups, and thatched winter houses sometimes covered with juniper bark.

Pai religious practices were dominated by shamanism, curing rituals, and myths linked to geographic features. Cremation was the favored form of death ritual. In the historic period, when the U. S. Army pressed for burials instead, the Hualapai switched to burials in cairns or rocky talus slopes. Most personal property was destroyed at death, a common practice among Yuman peoples.

THE YAVAPAI

The Yavapai were generally similar to the Hualapai in patterns of subsistence, settlement, social organization, material culture, and religion. Speakers of a major upland Yuman dialect, they inhabited a vast and varied territory of over nine million acres. Mariella (1983) described this area as a triangular zone with its apex near the town of Seligman in the north and its western and eastern base points near Yuma and the Pinal Mountains south of Globe. In the overview region, Yavapai territory encompassed Chino Valley and the Santa Maria, Sierra Prieta, and Bradshaw mountain ranges. The Yavapai also occupied areas along the Santa Maria and Bill Williams rivers at the southern edge of the region.

In the historical literature, the Yavapai have been designated as Apache, "Apache-Mohaves", and "Apache-Yumas" (Mariella and Khera 1983:53). Even though they spoke different languages, the similar material culture and lifestyles of the Yavapai and Apache may have contributed to this confusion in nomenclature. East of the Verde River, their territories overlapped, and they temporarily coresided at the San Carlos Apache Indian Reservation following their military defeats by General George Crook. The "Mohave" and "Yuma" portions of the above terms may reflect the common linguistic heritage and close intertribal relations with river Yuman groups.

William Corbusier, an army physician, observed and reported on the Yavapai at Fort Verde during the 1870s (Corbusier 1886). The basic ethnographic references were produced by E. W. Gifford of the University of California during the 1930s (Gifford 1932, 1936). Albert Schroeder reviewed historical documents and produced maps of territorial ranges for land claims studies (Schroeder 1959). Recent studies have been conducted by anthropologists working out of Arizona State University. Sigrid Khera documented Yavapai oral history through interviews with tribal elders (Mariella and Khera 1983; Williams and Khera n.d.). Patricia Mariella's (1983) doctoral dissertation examined the economic transition from aboriginal land use patterns to settled reservation life in terms of resettlement theory.

The Yavapai were highly mobile people who followed an annual subsistence cycle of wild resource exploitation with a limited amount of farming. Gifford (1936:252) estimated the total population at 1500, for an average density of one person per 13 square miles. However, according to Mariella (1983), this was a low estimate based on historic observations of a population decimated by warfare, disease, and forced displacement.

Like the Hualapai, the Yavapai were organized into a series of subtribes, regional bands, and local groups or "camps". Subtribes were differentiated by minor dialectical variations. Gifford (1932, 1936) defined three subtribes, each consisting of several regional bands. Mariella and Khera (1983) described four subtribes recognized by the Yavapai: the *Yavepe, Wipukpaya, Tolkepaya*, and *Kewevkepaya*. The *Yavepe* occupied the area surrounding present-day Prescott and Jerome. The *Wipukpaya* lived in the Bradshaw Mountains, middle Verde Valley, and Sedona red rock country south of Flagstaff. Gifford incorporated the *Yavepe* and *Wipukpaya* into the "Northeastern Yavapai", the subtribe that inhabited the wooded eastern uplands of the overview region. The *Tolkepaya*, Gifford's "Western Yavapai", occupied the area west of the Bradshaw and White Tank Mountains over to the Colorado River between the Bill Williams and Santa Maria rivers to the north and the Gila River to the south. Finally, the *Kewevkepaya*, or "Southeastern Yavapai", ranged over the lower Verde Valley, Tonto Basin, and Superstition Mountains.

The diversity and dispersed locations of seasonally available resources required a great degree of mobility, often over long distances. Small groups occupied a succession of temporary or seasonal base camps. These local groups, which consisted primarily of nuclear or extended families, included up to 10 households (Gifford 1936:297). The composition and size of local groups changed through

time in response to personal conflicts, kinship and marriage obligations, and changes in the relative abundance and concentration of food resources. Groups would periodically coalesce or split into smaller family units in response to changing circumstances (Mariella 1983). Local groups were advised by headmen who gained their status through prowess in warfare and hunting, wisdom, generosity, and the ability to mediate conflicts. Older leaders supervised the annual subsistence round, deciding where to move and camp as well as when and where to exploit certain resources. However, headmen served a strictly advisory role: "people went where they liked, did not necessarily accept his advice" (Gifford 1936:298).

Regional bands, composed of several local groups, were associated with particular geographic areas. These tracts of land incorporated their customary range, but boundaries overlapped and outside groups were generally welcome in the territories of other regional bands. The *Wikutepa* and *Wikenichapa*, two regional bands of the Northeastern Yavapai, had overlapping ranges (Gifford 1936:250). The *Wikutepa* or Granite Peak band occupied the area surrounding present-day Prescott, incorporating Chino Valley, the high grasslands east of Prescott, the Sierra Prieta, and the northern portion of the Bradshaw Mountains. The *Wikenichapa* or Crown King band ranged over the southern Bradshaws south to the Wickenburg area and the middle Agua Fria River.

Since the vast range of the Yavapai covered a variety of environmental zones, there were regional variations in subsistence patterns and the extent of reliance on specific resources. The Northeastern Yavapai of the Prescott region harvested a rich variety of wild plant foods (Gallagher 1977; Gasser 1977; Gifford 1936; Mariella 1983). Agave (mescal), the staple food, was available year-round. The primary harvest occurred during the winter months when few other resources were available. Tubers were also exploited in winter. Spring resources included leafy greens, berries, and stored agave hearts. The summer season prompted a move to lower desert elevations, where resources included mesquite and palo verde beans and saguaro cactus fruits. Autumn offered a relative abundance of food sources, such as acorns, walnuts, pinyon nuts, sunflower seeds, and yucca and prickly pear cactus fruits found in the chaparral and woodland zones.

Wild resources were supplemented by cultivated corn, beans, squash, and melons. Seasonal mobility limited the time and effort devoted to farming. Mariella (1983) argued that farming may have been a more important pursuit prior to the disruptions of nineteenth century intertribal and intercultural conflict. She noted that the degree of emphasis on agriculture reflected geographic variations in climate, water sources, and available personnel. In the entire Yavapai range, the Verde Valley was probably the most favorable area for farming. The Northeastern Yavapai planted at Big Bug Creek east of present-day Prescott (Gifford 1936:262). They also farmed at Castle Hot Spring east of Wickenburg, where they could obtain summer desert resources as well.

Faunal resources included deer, pronghorn antelope, rabbits, rodents, birds, and lizards. Deer provided not only venison but also raw material for clothing and tools. Small groups of men cooperatively stalked and ambushed deer. Larger drives occasionally were staged in narrow canyons (Gifford 1936:264). Antelope were hunted in Chino Valley. Gifford (1936:265) described a large drive led by hunters from the Sedona region who were apparently experts in the use of fire in hunting drives. For unclear reasons, the Yavapai avoided eating fish, frogs, and waterfowl (Gifford 1936:268). Since aquatic resources were relatively scarce, that taboo posed little hardship.

Gifford's informants described the typical annual round for local groups of the *Wikutepa* regional band (Gifford 1936:254-256). In the winter, they subsisted on stored foods, agave, and game while residing in caves in the Mayer-Cordes area of the northern Bradshaws. If the food ran out, they moved roughly 50 miles (80 km) east to exploit agave in the mountains north of Perry Mesa. In the spring, greens and berries were harvested in the Mayer-Cordes area. In mid-June, groups made a long journey to Cave Creek in Southeastern Yavapai territory. After remaining there for the two weeks of the early saguaro harvest, they returned north, harvesting saguaro fruits and mesquite and palo verde beans along the way. In late summer and early autumn, they harvested manzanita berries, acorns, walnuts, and juniper berries in the Granite Peak area. Before returning to the Mayer-Cordes area for the winter, they gathered pinyon nuts in the Prescott area woodlands. Several resources, including agave, saguaro fruits, and acorns, were processed or cached and transported to winter quarters. Like nearly all Yavapai bands, the Wikutepa relied on both upland and desert resources.

Domiciles included rockshelters and caves, huts, and shades. According to Gifford (1936:269), the Yavapai favored the former. Northeastern Yavapai huts were oval in shape, with a thatch of juniper bark or bear grass.

Domestic implements included wooden and bedrock mortars used with stone "mullers" for grinding, crushing, and pounding. Grinding implements of "unknown ancient people" were found and used, minimizing the necessity for manufacture (Gifford 1936:280). Pottery vessels, usually tempered with fine gravel, included canteens, globular water jars, shallow serving dishes, and cooking bowls. The Yavapai also produced a variety of basketry containers including twined pitched water jars, burden baskets, and parching trays; coiled water bottles, trays, and serving dishes; and wicker seedbeaters (Gifford 1936:283). Raw materials for cordage and basketry included yucca and agave fiber. Arrows were tipped with pressure-flaked chert and obsidian points of the type known as Desert Side-notched, with serrated edges (Pilles 1981:170).

Yavapai religious practices were dominated by shamanism and curing rituals. Detailed myths concerned supernatural beings associated with geographic features. Sacred areas were centered in the Sedona and middle Verde regions, although spirits also were said to inhabit Granite Peak (Gifford 1936:307). The dead were cremated on pyres, and their personal property was destroyed.

THE MOHAVE

The Mohave were the northernmost group of the Yuman tribes residing along the lower Colorado and lower Gila rivers. Other river Yuman groups included the Quechan or Yuma, the Cocopa, and the Maricopa and related Halchidoma and Kaveltcadom groups. The heartland of the

Mohave tribe was the Mohave Valley west of the Black Mountains, between the present towns of Bullhead City and Topock. The Mohave also used the area south of Topock to the Bill Williams River. Known as the Chemehuevi Valley, this zone was occasionally occupied by the Chemehuevi, a Southern Paiute group from eastern California. In the early 1800s, combined Mohave and Quechan forces drove the Halchidhoma and other groups from the Parker Valley south of the Bill Williams River (Spier 1933). This defeat was followed by a southward expansion of Mohave settlements (Forde 1931:103). Kroeber (1925) argued that population growth led to the displacement of other groups. According to a Mohave informant, "there was starvation, and the Maricopas (Halchidhomas) had better crops. They were not as crowded as the Mohaves, who were living clear up to Hardyville. So they decided to run out the Maricopas" (Stewart 1969:267). Kroeber (1951:141) summarized the extent of land use south of the Mohave Valley:

> Mohave references to places on the Colorado River are numerous for the stretch of two-days' journey between the foot of Mohave Valley and Williams River; fairly full for several days' travel below; begin to thin out in the vicinity of Yuma; but go on through Cocopa country to the mouth. It is evident that the river served as a great highway, though only for foot travel along it.

Ethnographic studies of the river Yumans were first conducted in the early 1900s by anthropologists from the University of California at Berkeley. 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, 1951) studied the Mohave between 1900 and 1911, and C. Daryll Forde (1931) conducted fieldwork among the Quechan. Leslie Spier (1933) wrote the basic ethnographic description of the lower Gila River groups. These researchers produced comprehensive reports addressing subsistence, social organization, religious practices, and folklore. William H. Kelly continued this scholarly tradition in his ethnography of the Cocopa, based on fieldwork during the 1940s (Kelly 1977).

Later researchers focused on more specific aspects of river Yuman culture. George Devereux, a French anthropologist, reported on Mohave "ethno-psychiatry", manners, and religion (Devereux 1937, 1950, 1951, 1961). Kenneth M. Stewart, William J. Wallace, and George Fathauer worked among the Mohave during the 1940s and 1950s. They contributed to land claims studies 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). Archaeologists contributed to studies of pottery manufacture (Kroeber and Harner 1955; Rogers 1936). Ethnobotanists Edward Castetter and Willis Bell (1951) produced a comprehensive summary of Yuman agriculture and subsistence practices.

Recent studies include Robert Bee's (1981) work on the history and consequences of changing federal policies on the Quechan. A study of Maricopa social organization and ethnohistory, the doctoral research of Henry Harwell (1979), 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 electric transmission lines. They also stressed the kinship and cultural unity among river Yuman groups (Bean et al. 1978; Harwell and Kelly 1983).

The Colorado River tribes—the Mohave, Quechan, and Cocopa—shared a generalized subsistence and settlement pattern, social organization, and religion. Subsistence was gained through a combination of farming, fishing, hunting, and wild plant gathering. The shared cultural system accommodated some differences in subsistence scheduling and external social relations. Positioning along the river undoubtedly affected resource availability, intertribal contacts, and exchange relations. For example, the Cocopa of the delta had access to coastal and estuarine resources not available to the Mohave and Quechan (Kelly 1977). Within the generalized river Yuman culture, the socioeconomic implications of such regional variations merit further investigation.

The Colorado River groups occupied dispersed, low density settlements consisting of sets of related families. Most settlements probably incorporated 100-500 people (Bee 1981:5). Households were composite families, groups of nuclear families linked through parental and sibling ties. Household members routinely cooperated in economic tasks. Settlement and organizational patterns changed frequently: "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" (Bee 1981:4). This flexibility enabled these floodplain farmers to cope with unpredictable variations in the timing and volume of the annual floods. An additional factor in residential instability was the temporary abandonment of farm plots and dwellings after the death of family members.

Kelly suggested that the Cocopa were organized into separate subtribal "bands", but he found it difficult to understand their role in the organizational system: "it is my present opinion that I was trying to force my informants to give me a classification and identification of bands that would fit my preconceived notion of such things" (Kelly 1977:80). The river Yumans did recognize a series of clans incorporating members related through male ancestors. Each clan was linked symbolically to a particular plant, animal, or natural phenomenon. Due to a tendency toward patrilocal residence, clans tended to be localized. However, they did not lay claim to particular teritories. Bee (1981:6) suggested that the historic Anglo-American encroachment and military threat increased tribal cohesion at the expense of clan autonomy, thereby diminishing the traditional role of clans in the sociopolitical system.

The tribe was "not a continually obvious grouping" (Bee 1981:7). Tribal members recognized a common identity, and they cooperated in ceremonies, harvest festivals, and war expeditions against other tribes. Yet tribal leaders had limited authority. The most influential leaders were local headmen who gained prestige by their age, social conduct, talents, generosity, and oratorical ability (Bee 1981:9; Kelly 1977:112; Stewart 1983:55). Despite a "loose internal social organization", Kroeber (1902:279) noted a strong feeling of tribal solidarity among the Mohave. Intense intertribal warfare and the Anglo-American military threat during

the nineteenth century may have transformed a sense of unity into tribal "nationalism".

Subsistence strategies influenced settlement patterns and promoted organizational flexibility. Cultivated crops incuded corn, beans, squash, melons, and grasses. The spring floods of the Colorado River deposited large quantities of silt on the floodplain, constantly renewing the fertility of the soil. Floodwater farming techniques involved an initial clearing of brush prior to the flood, followed by the removal of debris and the planting of seeds after the floodwaters receded. The residual moisture matured the crops, which grew rapidly in the hot sun. In this extremely arid zone, rainfall provided little sustenance to growing crops. Although some of the harvest was stored in elevated granaries for the winter, much of it was consumed immediately. Green corn was eaten in large quantities. During the harvest season, people ate three or four daily meals instead of the usual two, and they even kept food nearby at night so that they could eat if awakened (Kelly 1977:32).

Gathered resources were not mere supplements to cultivated crops. Castetter and Bell (1951:179-209) compiled a long list of wild plant foods utilized by the river groups, including 37 seed varieties, 16 types of greens, 16 varieties of berries and cactus fruits, and 7 types of roots and tubers. Most of these resources were present in the riparian environment of the floodplain and terraces, although many were available only in the outlying desert (Driver 1957). Among staple resources, mesquite beans were one of the few wild foods still used in the twentieth century. Mesquite was "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).

Fish and small game were the major sources of protein, because large game was scarce along theriver. In the winter, small hunting parties pursued deer and bighorn sheep in the desert mountain ranges. However, rabbits, wood rats, and ducks were the most important game in terms of their continuous contribution to the diet. Fish constituted the primary protein source, although their availability fluctuated seasonally. Native food species included the humpbacked sucker and the Colorado salmon or squawfish. Fish trapped in sloughs and lagoons were harvested with nets employed by small teams of fishermen.

An annual lean period of short supplies occurred in the spring, when few wild plant resources were available and fish were relatively scarce. The duration and severity of this lean time depended on the amount and rate of consumption of stored foods from the previous seasons.

Early observers of the Colorado River tribes described successful agricultural harvests (Coues 1900:170-174). Castetter and Bell (1951:66) stressed that the large areas of fertile and periodically inundated soil were highly productive. Yet these and other observers 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). Kelly (1977:1) and Castetter and Bell (1951:249) noted that the surplus of arable land would have enabled an increase in production. Despite this production potential, the Indians rarely stored enough food to last through the winter and early spring.

Early observers attributed this agricultural deficit to indolence. Castetter and Bell (1951:69) rejected that value judgment and directed attention to environmental and economic limiting factors. Stone (1981) reviewed economic limitations on agriculture along the lower Colorado River. The planting season was a short period of peak labor demand, the busiest time of the year. Planting had to be accomplished quickly in order to take advantage of floodwater moisture, since there was little summer rainfall. At the same time, since planting coincided with the end of the lean season, efforts were also devoted to mesquite gathering and fishing for daily subsistence.

The massive volume of the spring floods, often as much as four miles (6.4 km) wide, inhibited the construction of food storage facilities close to fields. Storage thus involved the costly transport of harvests to peripheral areas of the valley. The floods also threatened to destroy any canals or water control systems designed for crop irrigation. However, the Cocopa did construct levees and ditches on a small scale, a practice which Kelly (1977:27) viewed as ancient and not inspired by contact with Anglo-American farmers.

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 volume and timing (Castetter and Bell 1951; White 1974). The unpredictability derived from the remote source of most of the Colorado River flow, runoff from melting snow in the Rocky Mountains. 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 1951:8). 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 were a more dependable resource and 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 long-distance trade. Much of the supply was consumed at harvest time. Mesquite was diligently stored each year, with consumption spread over several months.

Among the river tribes, Castetter and Bell (1951:74) suggested an increasing dependence on agriculture as one moved northward along the Colorado River. Differences in population density, intertribal trade relations, or access to wild resources might account for such variation. Established trade relations with the Hualapai may have induced or enabled the Mohave to produce a relatively greater proportion of cultivated crops for consumption or trade. The estimated proportion of cultivated food in the Mohave diet ranges from 30% to 50%. These figures are difficult to interpret; at any rate, the proportions varied from year to year. During poor harvests and the spring lean period, groups intensified their use of mesquite and ranged into the desert to exploit wild resources. They had "the custom of penetrating in small parties back into the desert mountains . . . to

advantageous centers for the gathering of wild plant harvests and the taking of game" (Castetter and Bell 1951:74). This pattern of land use may have involved the establishment of seasonal base camps away from the river (Swarthout 1981). In summary, the nature of subsistence patterns along the lower Colorado River is consistent with organizational flexibility and the role of the household as the primary, most stable economic unit.

River Yuman material culture consisted primarily of utilitarian household objects and subsistence implements. Household implements included paddle-and-anvil manufactured pottery, woven "bird's nest" storage baskets, manos and metates, and mesquite log mortars with stone or wooden pestles. Wooden digging sticks were the major agricultural tool. Hunting and fishing tools included willow bows, cane arrows sharpened or tipped with small triangular stone points, snares, drag nets, and woven scoops. Although painted designs were common on pottery, aesthetic expression reached its apex in personal adornment through body painting, tattooing, and hairstyling.

Willow log rafts were used for downstream river travel. Other facilities included elevated granaries placed on platforms of logs and thatch. Resting on these platforms were pots, baskets, or large "bird's nest" baskets constructed of woven willow stems to diameters exceeding a meter. Winter houses consisted of rectangular or square pithouses approximately 15 feet (4.5 m) on a side. Four upright posts supported roof beams overlaid by smaller branches and dirt, with walls of similar construction. For warmth, live coals were placed in a central floor depression. Summer shelters near fields were small round pole-and-thatch structures.

Ritual practices, a cultural ethic of generosity, and the destruction of possessions after death minimized the accumulation of property. Food and material items were distributed at commemorative mourning ceremonies sponsored by families capable of marshalling the necessary resources. According to Castetter and Bell (1951:251), these practices of destruction and redistribution resulted in "the permanent preclusion of any possibility for the family or the tribe to accumulate and build capital goods, resources, surplus food, storage facilities, and equipment from one generation to the next". They also perpetuated a relatively egalitarian and flexible social organization.

Other than the mourning ceremonies, which were held at least a year after a death, the river Yumans conducted few public ceremonies. Funeral rites incorporated speeches, dancing, and primary cremations. Shamans conducted private curing rituals but had little role in the few public ceremonies.

Concern with the supernatural was expressed through dreaming. Individuals acquired supernatural power, skills, and talents from dreams. Oratorical abilities were given expression through dream recitation, the singing of song cycles, and the verbalization of long detailed myths. Kelly (1977:138) viewed the importance of the dream experience as a manifestation of individual and family independence and self-sufficiency.

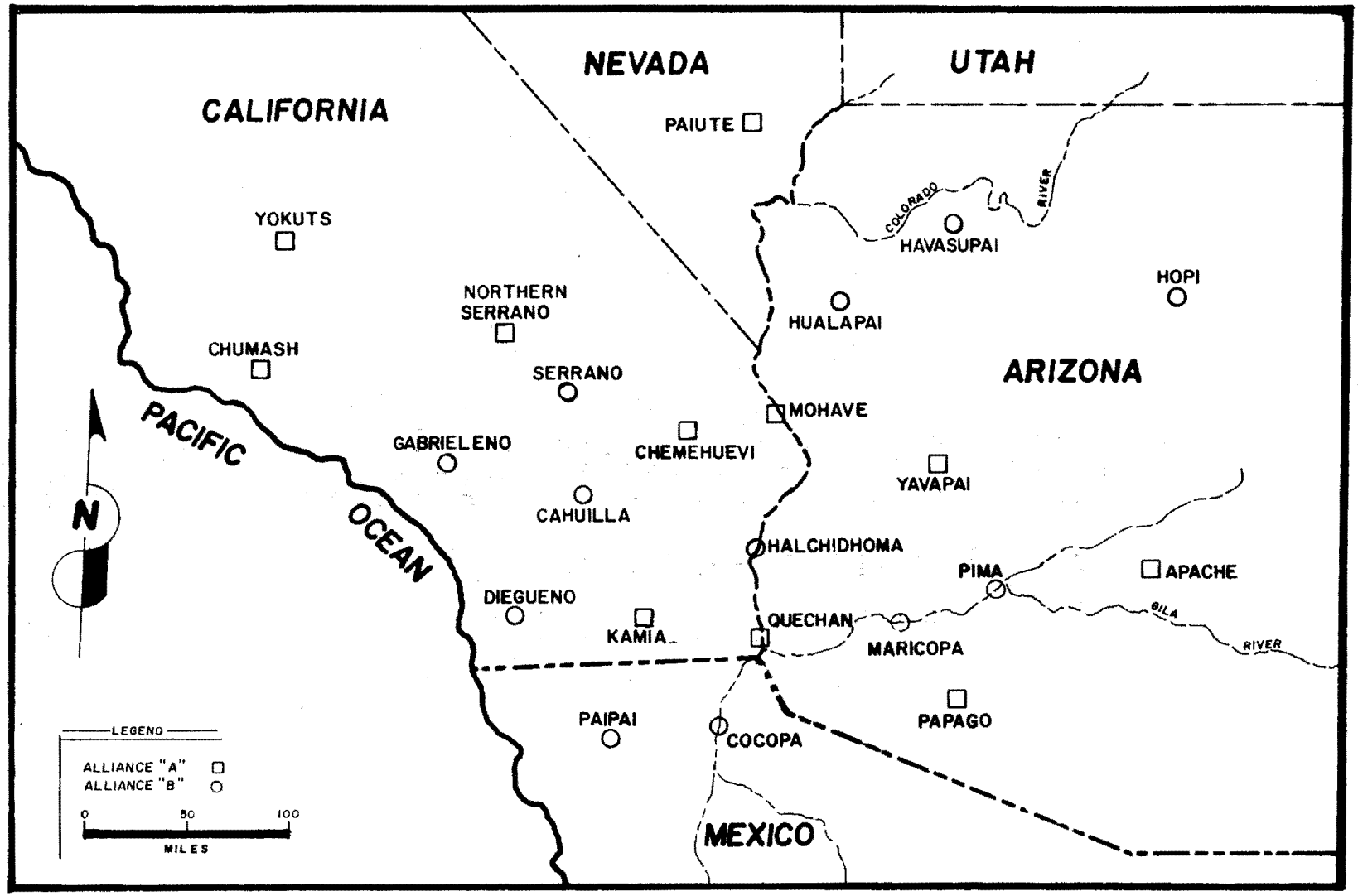
INTERTRIBAL RELATIONS

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; Schroeder 1981). The long-distance trade network 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 Yuman 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. Exchange relations between the Hualapai and Havasupai followed a similar pattern, reflecting the greater Havasupai reliance on canyon bottom farming. Meat and skins were traded to the Havasupai for crops. During the early period of Anglo-American settlement, the Hualapai used their trade links in the defense of their territory. They traded Pueblo woven goods to the Mohave for horses, and the horses in turn were traded to the Southern Paiute for guns that the Paiute had obtained from the Mormons of Utah and northern Arizona (McGuire 1983:31).

Two extensive tribal alliances existed during the historic period. 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). Map 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 these 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). The lucrative Spanish-instigated trade in horses and



MAP 3-2: HISTORIC TRIBAL ALLIANCES
(Based on White 1974:128)

native slaves probably intensified conflicts and promoted the formation of alliances (Dobyns et al. 1957; Forbes 1965; Schroeder 1981:203).

The Hualapai belonged to the Pima-Maricopa league, while the Mohave and Yavapai cooperated in the Quechan league (Forbes 1965:80). Traditional social and economic relationships, rather than trade links to the south, appear to have characterized the position of Hualapai bands in the overall alliance system. Foremost among these relationships was the traditional enmity between the Hualapai and Yavapai. The geographic position of the Yavapai effectively blocked direct Hualapai participation in the trade networks centered in southern Arizona and northern Mexico. However, the western Hualapai bands centered in the Cerbat Mountains continued to maintain trade relations with the Mohave, although personal relations were not necessarily friendly (Ewing 1961:14). It is interesting to note that the Cerbat bands were relatively well insulated from Yavapai attacks. The eastern and southern Hualapai bands which endured the brunt of Yavapai ambushes may have harbored greater enmity toward the Mohave. The eastern bands also were more closely linked to the Hopi, who were members of the Pima-Maricopa league, through traditional interaction systems incorporating the Havasupai (Davis 1961; Spier 1928).

Raids between the Hualapai and Yavapai usually took the form of pre-dawn ambushes. People were killed, and women or children were sometimes taken captive. War parties were apparently organized in conjunction with large feasts or ceremonial gatherings which brought together people from numerous bands (Gifford 1936:324). The rancor between the Hualapai and Yavapai is addressed in the Hualapai origin myth (Ewing 1961; McGuire 1983:26). According to this tale, the tribes of northern Arizona—the Pai groups, the Mohave, the Paiute, and the Hopi—originally occupied Meriwhitica Canyon. They shared this desert oasis, one of the spring-fed side canyons near the mouth of the Grand Canyon. The ancestors of the Yavapai were said to have stirred up conflicts. These "quarrelers" were driven from the canyon, and they moved southeast to the good hunting grounds in the mountain forests. The canyon eventually became overpopulated, and the other tribes migrated to their historically recognized regions while the Hualapai continued to live in Meriwhitica.

THE HISTORIC DISRUPTION OF NATIVE GROUPS

For Native American populations, the ultimate consequences of non-native contact were profound and irreversible, involving forced resettlement and reductions in population and territorial ranges. These changes in turn altered native economic systems, social organization, and the nature of intertribal relations (Spicer 1962).

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. The Espejo and Farfan expeditions, conducted respectively in 1582 and 1598, appear to have encountered the Yavapai in the Verde Valley (Bolton 1916:187; Forbes 1965:102; Hammond and Rey 1929:107; Schroeder 1959:50). In 1604, Juan de Onate traveled from New Mexico to the Verde Valley. He continued on to the Colorado delta by way of the Bill Williams River. Two Franciscan monks documented this journey, providing descriptions of the Indians who were friendly despite their consumption of several Spanish horses (Bolton 1916; Hammond and Rey 1953).

Father Garces, the Franciscan priest and explorer, traveled through Hualapai country in 1776. On his journey eastward from the Mohave to the Hopi, he visited Indian settlements in the Cerbat Mountains and the southern Hualapai Valley. He noted that "Cerbat" was the native term for bighorn sheep. Garces also observed unoccupied "rancherias", the remains of small dispersed settlements. The natives appeared to subsist on agave, grass seeds, and game (Coues 1900).

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 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 (Forbes 1965:225). However, they did attempt to restrain Yuman trade with the coastal tribes of southern California (Forbes 1965:240).

Anglo-American explorers ventured into the region during the 1800s. Mountain men and trappers were followed by U.S. Army expeditions. The Sitgreaves, Ives, Beale, and Whipple expeditions of the 1850s were charged primarily with the exploration of potential railroad routes. The surveys conformed closely to the eventual position of the Santa Fe line linking Flagstaff, Kingman, and Needles, California. Whipple took a detour along the Big Sandy and Bill Williams rivers, an interesting trip but a less suitable route for railroad construction (Foreman 1941). The Sitgreaves expedition of 1851 was plagued by drought and Indian ambushes, and Sitgreaves complained that the expedition botanist could find few specimens on the parched plains (U.S. Senate 1936:12-15). In contrast, Ives in 1857 noted an abundant growth of grasses, although he concurred with Sitgreaves that the region was "barren and devoid of interest" (U.S. Senate 1936:15). Hualapai Indians acted as guides for Ives; savvy traders, they claimed to be lost until they were offered beads and blankets (U.S. Senate 1936:18). Whipple described abandoned Indian camps along the Big Sandy and Bill Williams rivers. The remains included small hearths, brush wickiups, metates, woven nets, and forked poles used to harvest saguaro fruits (Foreman 1941:218-225). Whipple commented on the ephemeral nature of these sites: "heavy rains and freshets occur but seldom in this climate; but when they do, all vestiges of these abodes are swept away" (Foreman 1941:219).

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 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 near present-day Parker. Many Mohave remained in the Mohave Valley, their ancestral territory. The Fort Mohave Military Reserve, established in response to Indian attacks on wagon trains, was eventually designated a reservation for the Mohave (Stewart 1983). The river Yuman groups thus received reservations incorporating portions of their prime farming and gathering lands. However, low river levels during the 1880s and 1890s led to crop failures and famine, yet the Indians were not permitted to range into the desert to exploit wild resources (Schroeder 1959). These factors, the Anglo-American expropriation of resources, and the eventual damming of the Colorado River worked against the native economic system (Bee 1981). The loss of economic self-sufficiency and the government's policy of assimilation imposed further stress on native traditions.

As miners moved into Hualapai territory, the Indians engaged in guerilla warfare. Fear of Indian attacks, in addition to actual ambushes, led to the abandonment of mines set up at "considerable expense" (U.S. Senate 1936:40). The Cerbat bands were particularly militant in response to the mining boom in the Cerbat and Black mountain ranges. In 1866, truce negotiations fell through after a Hualapai leader, Wauba Yuma, was murdered by a mule skinner. After that event, the Hualapai were regarded by the military as "very hostile" (U.S. Senate 1936:42).

In the late 1860s, the Army conducted its own guerilla campaign against the Hualapai. Small mobile strike forces were assisted by Mohave scouts, a situation which heightened the enmity between the tribes. Rancherias were attacked during the fall and winter when stores could be destroyed and people could be tracked on the snow. Army raids were concentrated in the Cerbat, Hualapai, Aquarius, and Peacock ranges and the Big Sandy valley (U.S. Senate 1936:59). Along the Big Sandy River, the soldiers destroyed 19 rancherias including large villages with associated fields. Most settlements consisted of 6 to 8 wickiups housing a total of 25 to 60 people (U.S. Senate 1936:70). Large quantities of provisions, consisting of deer meat, processed agave, grass seeds, and mesquite beans, were found and destroyed at most of the rancherias (U.S. Senate 1936:46,59,90). At unabandoned camps, the men were killed, and the women and children were taken prisoner. The military strategy was effective in disrupting native subsistence. A broken people, the Hualapai ceased fighting.

In 1874, approximately 600 Hualapai were relocated to the Colorado River Indian Reservation. Although they attempted to farm, their crops failed due to an unpredictably low flood. Their distress was heightened by oppressive heat, illness, and insufficient beef rations (U.S. Senate 1936:97). Within the next few years, they returned to their old territory. During their absence, mines and settlements had proliferated. Stockmen had imported over 10,000 head of cattle into Mohave County. The Hualapai returned to a country of diminished resources. Anglo-Americans controlled the water sources for domestic use and grazing. Army officers consistently reported that stock grazing had reduced the numbers of wild game and the supply of edible grass seeds (U.S. Senate 1936: 122,126,148,151). The Indians were supported by wage labor in the mining camps and by rations issued by the government. In 1879, Colonel Willcox referred to them as "our friendly and faithful red children" (U.S. Senate 1936:124).

Mohave County citizens and Army officers urged that a reservation be established for the Hualapai in the northern part of their traditional territory. This area was judged to be of little economic value, and few whites had settled there (U.S. Senate 1936:135). In 1883, the Hualapai Indian Reservation was established by Executive Order. It incorporated 993,000 acres (400,000 ha) including the ancestral homeland, Meriwhitica Canyon.

Few Indians settled on the reservation. They stayed near towns and the railroad line, where they could work as laborers. Humanitarian groups and some Army officers suggested that the valley of the Big Sandy River would be a more appropriate location for a reservation. Captain John Bourke argued that the Hualapai Reservation was "entirely unsuited to the purpose intended, having no arable area worthy of mention and being as rough and precipitous as any section in the Andes or Himalayas" (U.S. Senate 1936:150). In their criticism of the existing reservation, the humanitarians received unwanted support from the citizens of Mohave County. In 1888, the county Board of Supervisors requested that the reservation be abolished for the following reasons: (1) the presence of "valuable though undeveloped mineral deposits"; (2) the lack of water sources which rendered the area "valueless" for Indian settlement; and (3) unclear boundaries and resulting confusion over jurisdiction by federal vs. territorial courts (U.S. Senate 1936:156). General Barber took a dim view of this proposition: "it is to be inferred that they simply desire them to be turned out into vagabondage even worse than now exists, with no recompense whatever for the 'valuable deposits of gold, silver, and lead' which the supervisors say its mineral lands contain" (U.S. Senate 1936:159). The county proposal was rejected by the federal government.

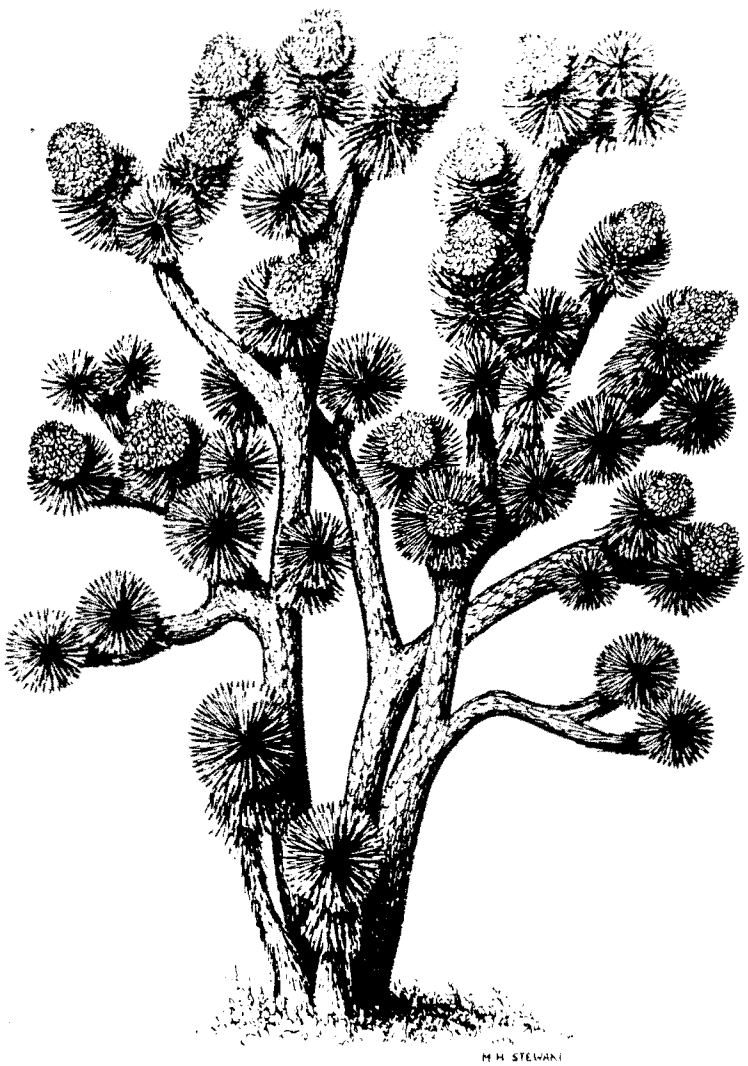
By 1900, the Hualapai were supported by wage labor, small-scale agriculture, and the sale of baskets to tourists. They gained a reputation as superior cowboys. By 1920, government rations had been phased out, and grazing fees collected from white ranchers were used to build a tribal cattle herd which became a profitable business (U.S. Senate 1936). Despite their hardships, the Hualapai held to many of their traditional customs. One of these was described by McClintock (1916:38):

> Till wood became scarce and valuable, the dead of the tribe were cremated and the house of death was burned. This custom of destroying the wickiups of brush was extended to a number of neat frame houses that had been built for the tribe by the government. It is probable the relatives exulted in thus furnishing the spirit an exceptionally fine mansion on high.

As mines were established in the vicinity of Prescott during the 1860s and 1870s, settlers intruded into Yavapai territory. Fort Whipple, established in 1864 near Prescott,

served as headquarters for General George Crook (Wallace 1975). Due to their peripheral position in trade networks, the Yavapai had few guns. Thus they generally avoided conflict, although they occasionally raided stock and supply trains (Mariella 1983). Some of the Yavapai attempted to settle on the Colorado River Reservation but left when crops failed (Schroeder 1959). The increasing population of settlers restricted access to water sources and other resources, and the number and violence of conflicts escalated.

In the 1870s, General Crook conducted the military campaign against the Yavapai. After the 1873 massacre of Yavapai at Skeleton Cave in the Superstition Mountains, most were forced onto a military reservation at Camp Verde. Since the Army classified them as Apache, they were forcibly relocated to the San Carlos Apache Indian Reservation in 1875. They were later allowed to return to their homeland (Schroeder 1959). Some returned to Camp Verde, while others settled near abandoned Fort McDowell on the lower Verde River. Small reservations were eventually established near Camp Verde, Fort McDowell, Prescott, and Clarkdale (Mariella and Khera 1983). Few Southwestern tribes suffered as drastic a reduction in territorial range; the Yavapai had inhabited some 20,000 square miles in central and western Arizona (Gifford 1936:247).



CHAPTER 4
HISTORY OF ARCHAEOLOGICAL RESEARCH

The history of research will be framed in terms of three areas differentiated by environmental, cultural, and administrative divisions. Much of the area adjacent to the Colorado River is incorporated into the Lake Mead National Recreation Area and the Grand Canyon National Park, both administered by the National Park Service. This area was occupied primarily by the Mohave and by prehistoric groups who focused on the use of arable land and riverine resources. The interior deserts, mountains, and mesas incorporate the Hualapai Indian Reservation, BLM-administered lands, and state and private holdings. The interior was occupied by the Hualapai and their predecessors. Finally, the wooded highlands at the eastern margin of the study area were home to the Yavapai and the prehistoric Prescott Branch. Most of this area is now incorporated into the Prescott National Forest.

THE COLORADO RIVER

The Grand Canyon has always attracted scientists and explorers. Downstream from the Canyon, the massive reclamation projects of the 1930s and 1940s spurred efforts at salvage archaeology which were rushed, unsophisticated, and poorly documented. This consequent loss of knowledge is one of the tragedies of Southwestern archaeology.

The poor condition of the lower Colorado River data base, however, cannot be blamed entirely on lost records, inadequate maps, and sketchy descriptions (Swarthout 1981). Even before sites were inundated by the major reservoirs, they were subjected to disturbance from alternating depositional and erosional episodes associated with the annual floods. Nevertheless, the reservoirs probably inundated sites of relatively high informational value such as base camps, field areas, and villages (Swarthout 1981:20).

Archaeological research along the lower Colorado River has been described in overviews written for the National Park Service (McClellan, Phillips, and Belshaw 1978) and the U.S. Bureau of Reclamation (Swarthout 1981). This summary will reflect the content and perspectives of those documents.

The earliest professional work was accomplished by Mark Harrington, who was affiliated with the Heye Foundation and later with the Southwest Museum in Los Angeles. Beginning in 1924, Harrington excavated two ancient pre-ceramic sites in southeastern Nevada, Gypsum Cave and Tule Springs (Harrington 1930, 1931, 1932, 1933, 1934, 1954; Harrington and Simpson 1961). At those sites, Harrington claimed an association between extinct Pleistocene mammals, including the giant ground sloth, and human artifacts. This association has been discredited, partly on the basis of inappropriate materials used for radiocarbon samples (Fowler, Madsen, and Hattori 1973:5; Shutler et al. 1967).

Additional work by Harrington on the Nevada side of the river defined the westernmost extension of the Anasazi tradition, the prehistoric pueblo culture centered on the Colorado Plateau (Harrington 1926b, 1928, 1953). He described the Virgin Branch of the Anasazi, named for the Virgin River, on the basis of excavations at Lost City and other pueblo sites. Harrington (1926a) also described prehistoric salt mines in Nevada.

Much of Harrington's work along the Colorado River took place between 1928 and 1935 when he directed Civilian Conservation Corps excavations at sites to be flooded by Lake Mead. Archaeological field studies were among the many Corps projects undertaken in northern Arizona (Malach 1984). Harrington (1937) tested the Willow Beach site, a stratified campsite later examined by 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 (Castetter, Bell, and Grove 1938:82). Unfortunately, much of the CCC work was "not technically controlled or properly reported" (Reed 1949), and collections and notes have been lost (McClellan, Phillips, and Belshaw 1978:34).

Gordon Baldwin directed surveys of the Lake Mohave basin 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, Lower Colorado Buffware pottery, and intrusive Anasazi and Hohokam pottery. Structural remains were rare. 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 (1937). 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 (24 km) south of Hoover Dam, sands containing artifacts, features, and charcoal were separated by 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 (8 km) 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 report. Numerous charred fish bones from native river species included the remains of a Colorado squawfish nearly two meters long. The cave also contained bones of bighorn sheep, beaver, and rabbits.

Albert Schroeder (1952), affiliated with the National Park Service, undertook a survey of the Colorado River from Davis Dam to the Mexican border. Since the survey took less than a month, it was characterized by the light and selective coverage of a general reconnaissance. Schroeder recorded 74 sites including "trail camp sites", "farm camp sites", intaglios, rock rings, trails, and petroglyphs. Large settlements were located at the edge of the floodplain in the Mohave and Parker valleys. Schroeder suggested that many habitation sites had been disturbed or destroyed by floods. His report presented a detailed description of Lower Colorado Buffware pottery types.

Little additional fieldwork took place until the 1970s after new federal environmental and antiquities legislation 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. In the Lake Mead National Recreation Area, surveys were undertaken in small areas slated for construction or land transfers.

Highway and transmission line surveys to the west of the Colorado River documented trails, rock rings, and lithic scatters ("chipping stations") (Brooks and Sedgewick 1971; Bondley and Brooks 1973). Similar sites were recorded during clearance surveys of areas designated for recreational developments on National Park Service land (Brooks et al. 1974). Additional surveys, concentrated on the terraces and alluvial ridges of the Nevada shore of Lake Mead, located lithic quarries, rock rings, and riverside "camps" (Dodge 1975; Quinn 1975, 1976). The Archaeological Research Center in Las Vegas surveyed portions of Black Canyon south of Hoover Dam. Six prehistoric sites included "Willow Beach #2", which contained buried features and artifacts (Brooks et al. 1977).

In conjunction with a proposed land exchange, in 1977 a Western Archaeological Center (NPS) crew surveyed 10,560 acres (4275 ha) south of Lake Mohave (Curriden 1977). This intensive survey documented 131 prehistoric sites. Located on the terraces and bordering bajada slopes were lithic scatters, rock rings, petroglyph areas, trails, a rockshelter, and a quarry for manufacturing grinding implements. Ceramics, consisting of Lower Colorado Buffware and Tizon Brownware, were found at only 12 sites.

Oil and gas lease surveys of approximately 9000 acres (3650 ha) in the Grand Wash confluence area north of the river revealed a dominance of low density lithic scatters. The surveyors recorded over a thousand chipping stations (manufacturing loci) and only four probable camps (McClellan and Phillips 1978).

The published overview of Lake Mead National Recreation Area cultural resources, prepared by the National Park Service, incorporated discussions of research problems and management recommendations (McClellan, Phillips, and Belshaw 1978). Research issues focused on the definition of the culture historical sequence and the study of human adaptation to arid lands. Management recommendations included 5% sample surveys of the busiest recreational zones in addition to planning surveys focused on the riverine and mountainous zones which had received generally lower intensive survey coverage than the desert bajada areas. A companion overview described the ethnography of the Lake Mead region (Ruppert 1976).

The BLM recently published the results of investigations at a grinding implement quarry near Bullhead City (Huckell 1986). BLM archaeologists had discovered an area that incorporated hundreds of manufacturing loci within perhaps 25,000 acres (10,000 ha) along the western bajada of the Black Mountains (BLM 1984). In conjunction with a proposed land transaction incorporating 5.75 sections, the BLM awarded a contract to Arizona State Museum for data recovery. 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 final report is an interesting and sophisticated example of scientific research.

THE INTERIOR

Early Southwestern archaeological surveys sought to define the boundaries of major cultural traditions: the Anasazi of the Colorado Plateau, the Mogollon of the mountains, and the Hohokam of the southern Arizona desert. In order to track the distribution of characteristic pottery types, surveyors ranged far and wide. These extensive reconnaissance surveys, which seem to have focused on relatively substantial sites pinpointed by local informants, served to orient researchers to the archaeological landscape of the Southwest.

The Gila Pueblo Foundation, a private research institution established by Harold Gladwin near the town of Globe, mapped the distribution of Red-on-buff pottery associated with the Hohokam tradition. The Gila Pueblo search for the western range covered an area roughly bounded by lines connecting Gila Bend, Yuma, Kingman, and Wickenburg (Gladwin and Gladwin 1930). At least 27 sites, primarily camp sites and rockshelters near springs, were recorded north of the Bill Williams and Santa Maria rivers. The Gila Pueblo site records and collections are now stored at the Arizona State Museum. These records do not indicate the exact locations of sites or surveyed areas.

The Gladwins (1934) had developed a classification system for prehistoric cultures which defined the "root" as the most basic inclusive category. Within cultural roots, major geographic divisions were "stems" which incorporated culture areas or "branches". Within branches, temporal and spatial variations defined "phases" (Cordell 1984:82). Sites in the western wilderness of the Kingman area were assigned to the "Yuman Root".

Another major early survey, conducted during the 1930s and 1940s, was undertaken from the perspective of California desert archaeology. Malcolm Rogers, affiliated with the San Diego Museum of Man, initially focused on the study of archaeological remains in the southern California desert. He later extended his survey into western Arizona in order to examine similarities and relationships between the two areas. Rogers defined a cultural sequence for western Arizona which spanned thousands of years (Rogers 1939, 1945, 1958, 1966).

Rogers' published articles were synthetic in nature, meaning that the details of his data and analyses were never published. As with the Gila Pueblo survey, the locations of sites and surveyed areas are uncertain, and little information exists concerning areas where sites were not found. Rogers employed a flexible approach to site definition, designating low density artifact scatters or numerous separate occupational loci as single large sites. This approach can be viewed as practical given the nature of many desert sites. However, many of Rogers' "sites" would be more aptly termed as archaeological districts. In the Kingman region, Rogers recorded and conducted limited excavations at 17 "sites". In the Secret Pass and Sitgreaves Pass areas within the Black Mountains, there were petroglyphs and pictographs, open artifact scatters, roasting pits, abundant grinding implements, lithic quarries, and at least 23 caves and rockshelters. Many of the latter had only shallow contents, but some contained deeply stratified deposits. According to Rogers, these sites in the Black Mountains contained "Pueblo, Mohave, and Walapai" pottery (Rogers n.d.). Lithic scatters and camp sites were recorded at Bridle Creek (tributary to the Santa Maria River), the lower Big Sandy River, and the Groom Spring area at the southern end of the Hualapai Mountains. Prescott Grayware pottery was found at many of these southern sites. Rogers also documented lithic quarries along Burro Creek. These "Mohon River" quarries yielded chalcedony and nodular obsidian as raw materials (Rogers n.d.).

In the 1930s, extensive reconnaissance surveys also were conducted by Harold Colton and Lyndon Hargrave of the Museum of Northern Arizona. The immediate purpose was a survey of the Santa Fe railroad route, but the ultimate goal was the classification of northwestern Arizona cultures in terms of the Gladwin taxonomic system. No descriptive summary report issued from these efforts; the information is contained within the Museum of Northern Arizona site files.

Colton (1939, 1945) objected to the "Yuman Root" designation, since it implied an undemonstrated prehistoric-historic continuity. He substituted the term "Patayan", a Hualapai word for "old ones". The Patayan Root incorporated several branches primarily defined on the basis of ceramic and architectural traits. The Cohonina Branch, located on the Coconino Plateau west of Flagstaff and south of the Grand Canyon, was defined by the distribution of San Francisco Mountain Grayware pottery. The Prescott Branch people of the Chino Valley region produced Prescott Grayware. For these groups, paddle-and-anvil manufacturing techniques were similar to the pottery production techniques of Patayan groups further to the west. However, their masonry structures, trade connections, and relatively greater reliance on farming have prompted some researchers to argue for stronger connections to Anasazi and Hohokam groups (Cartledge 1979; Euler and Green 1978; Jeter 1977). To the west of the Cohonina and Prescott branches, the Cerbat Branch was defined by the distribution of Tizon Brownware pottery. The Laquish Branch incorporated the lower Colorado River.

Colton's classification scheme was criticized and modified over the following decades. Rogers (1945) retained the "Yuman" term, as his study area extending into California incorporated the historic range of the western Yumans as well as the Arizona groups. The term also was used by Dobyns (1956). Schroeder (1957) introduced the term "Hakataya" to refer to archaeological materials in western Arizona. Hakataya traits included paddle-and-anvil manufactured pottery, percussion-flaked choppers rather than ground stone axes, stone-lined roasting pits, brush wickiups, cremation, and subsistence based on hunting, gathering, and where feasible, floodwater farming. At the 1956 Pecos Conference, archaeologists proposed that the term be adopted to refer to the culture of the Colorado River and adjacent areas in western Arizona. However, at the following Pecos Conference, they decided to retain the Patayan term. Schroeder (1960, 1979) later defined a broader formulation of the Hakataya that incorporated the Patayan, the Sinagua of central Arizona, and the early Hohokam. However, many archaeologists have objected to the Hakataya concept's broad inclusiveness, and the Patayan term has been used consistently in reference to western Arizona (Cordell 1984; McGuire and Schiffer 1982).

Work by Henry Dobyns and Robert Euler represented the next major phase of field investigations in the Kingman region. Their studies incorporated site excavations, field

surveys, ethnographic work, archival research, and the analysis and synthesis of previous survey data. This comprehensive regional approach generated a master's thesis for Dobyns (1956) and a doctoral dissertation for Euler (1958). However, the overall goal was to marshall scientific support for the Hualapai tribal land claims case against the federal government. In order to do so, the two researchers focused on the study of historic aboriginal sites, preferably those with prehistoric subsurface deposits, pinpointed by Hualapai informants. The crux of their case rested on the argument that the Cerbat Branch people, the makers of Tizon Brownware pottery, were the ancestors of the Hualapai. Since the Hualapai had stopped making and using pottery, it was difficult to demonstrate this link. Dobyns and Euler used their data to argue for continuity and to define Hualapai territorial limits indicated by the geographic distribution of Tizon Brownware.

Euler (1958) conducted excavations at eight locations: Mohawk Canyon, Meriwhitica Canyon, and Rattlesnake Rockshelter in Peach Springs Canyon, all on the Hualapai Reservation; Butcher House Canyon Rockshelter near Kingman; rockshelters at Artillery Peak and the Rawhide Mountains near the Bill Williams River; the Yolo site on Bozarth Mesa; and Turkey Creek Cave on the eastern face of the Bradshaw Mountains. He also studied historic sites in the vicinity of Mineral Park, Fort Rock, and Camp Hualapai in the Cerbat and Hualapai ranges. The presence of Tizon Brownware sherds was used to support the argument for cultural continuity. Euler presented a reconstruction of Cerbat-Hualapai prehistory that dispensed with Colton's (1939) end date of 1100 A.D. for the Cerbat Branch. He also argued that the Cohonina and Prescott branches should not be incorporated within the Patayan Root (Euler 1958:84).

With the help of Hualapai informants, Dobyns (1956) recorded sites that were entered into the Arizona State Museum site files. He examined the ceramics from those sites in addition to collections from earlier surveys. The regional distribution of Tizon Brownware and the percentages of ceramic wares at particular sites were used to define the Hualapai territorial range and peripheral zones of cultural interaction or shared use.

Additional publications by Dobyns and Euler have contributed to knowledge of the Cerbat Branch and the prehistory of west central Arizona (Dobyns 1957; Dobyns and Euler 1956, 1958, 1960, 1967, 1970; Euler 1975, 1982; Euler and Dobyns 1956, 1983). Following their fieldwork, Euler (1963) published a review of then existing knowledge and research problems in western Arizona prehistory.

True and Reinman (1973) described test excavations during the 1960s at "Kingman 17", a midden in a canyon of the Cerbat Mountains near Kingman. The diversity of artifacts and features indicated that the site was a base camp used from Archaic through Cerbat times. Hohokam-style projectile points, an incised disk, and a faceted hammerstone were found in direct association with a cremation. Due to the absence of burned artifacts of probable local origin, True and Reinman considered it to be an intrusive Hohokam cremation rather than a Cerbat cremation with "heirlooms". They suggested that 3/4 grooved axes at nearby turquoise sources indicated long-distance mining expeditions by the Hohokam. It is uncertain whether the Hohokam obtained their turquoise through expeditions or trade. It does appear that one Hohokam miner or trader may have met an unfortunate end near Kingman.

True and Reinman did little additional work in the area, but they urged Richard Matson, then a graduate student at the University of California at Davis, to focus his dissertation research on the Cerbat Mountains (Matson 1971, 1974). The orientation, design, and methods of Matson's study paralleled those of a concurrent study with which most archaeologists are familiar, the Reese River Valley investigations conducted by David H. Thomas (1973) in Nevada. In fact, Thomas assisted Matson in the design of the Cerbat study. The goal was to correlate archaeological and environmental variables "in an overall analysis of the ancient human ecology" (Matson 1971:18). Matson developed a subsistence and settlement model based on Hualapai ethnographic analogy which predicted the nature and distribution of archaeological materials. In order to test the hypotheses, he utilized quadrat sampling techniques borrowed from plant ecologists. The study area consisted of two major canyons and their surrounding slopes between the Cerbat ridge crest and the Hualapai Valley. The sampling strategy incorporated four strata based on vegetation and topographic zones. The sample consisted of 36 randomly selected quadrats, each 500 meters square, with canyon bottoms and pinyon-juniper zones sampled at higher intensities. The units were surveyed at 30 meter intervals, and multivariate statistical techniques were used to analyze the results. Cluster analyses of data on artifacts, features, and spatial distributions indicated six major site types: base camps or winter villages near springs; temporary pinyon processing camps; seed processing camps on the valley flats; low density scatters of retouched flakes in the canyons; lithic quarries; and hunting sites. In general, the results supported the subsistence and settlement model, and they indicated a considerable degree of adaptive stability over time. Although limited in areal extent, this study was an important contribution, one of the few modern research-oriented surveys within the region.

For her master's thesis from Northern Arizona University, Mary Lou Heuett (1974) excavated the Boulder Springs Rockshelter located in the Hualapai Mountains just south of Kingman. She was assisted by Paul Long Jr., an amateur archaeologist who had recorded Kingman area sites for the site files at the Museum of Northern Arizona. The site was excavated in arbitrary levels although natural stratigraphic differences were present. Radiocarbon samples were taken but "not yet processed" (Heuett 1974:17). Ceramics indicated a Cerbat occupation between A.D. 900 and 1150, with intrusive sherds dominated by Lower Colorado Buffware and graywares of the Cohonina and Prescott branches. Perishables included fragments of coiled basketry and yucca cordage. Floral and faunal remains indicated the exploitation of mesquite, prickly pear, banana yucca, rabbits, and rodents. The report contained an interesting pollen study by Hevly (1974).

A few areas have received relatively intensive scrutiny in connection with contracted projects or management-oriented surveys. Southwest Gas Corporation funded investigations in advance of the planned Pataya gas storage facility in the Hualapai Valley near Red Lake. Archaeologists welcomed the chance to investigate the playa, a unique environmental situation that may have

attracted people from the most ancient occupation of the region up to historic times. WESTEC Services, based in San Diego, surveyed 6 sections incorporating 3840 acres (1555 ha) and 41 miles (66 km) of pipeline corridor and access roads during 1980 and 1981 (Schilz 1982; Schilz, Breece, and Feuer 1981). The surveyors documented 67 prehistoric sites, primarily surface artifact scatters varying in size. Data recovery, focused on mapping and surface collection, took place at 20 sites, with excavations conducted at 6 of those sites.

Research problems at Red Lake focused on the nature of resource exploitation, the detection of pre-ceramic occupations, and the relative permanence of settlements on the valley floor. Generally low artifact densities and numerous small concentrations indicated that most of the sites were temporary camps and that the area was used repeatedly over a long period of time. At least eight sites appeared to be seasonal base camps (Schilz 1982:20). Grinding implements were very common. The small but diverse assemblages also incorporated sherds, projectile points, bifaces, utilized flakes, formal lithic tools, Olivella beads, and lithic debitage. Projectile points included Gypsum and Elko point types of the Archaic period, as well as Desert Side-notched and Cottonwood Triangular points probably manufactured after A.D. 1000 (Bettinger and Taylor 1974; Lyneis 1982; Thomas 1982). Ceramics were dominated by Tizon Brownware, with a diverse range of trade wares, dating as early as A.D. 500, from the Virgin and Kayenta Anasazi, Cohonina, and Prescott areas. Lower Colorado Buffware was rare, indicating the use of Red Lake by Plateau-based groups with ties to the north and east. Schilz (1982:106-109) concluded that environmental conditions were generally similar to those of the present and that the dominant activity was the exploitation and processing of wild seeds during the summer.

The Burro Creek area is another zone that has received a relatively intensive degree of archaeological scrutiny. In the mesa country south of the Aquarius Mountains, contracted studies were associated with a proposed expansion of the Cyprus-Bagdad Copper Mine near the town of Bagdad. McPherson and Pilles (1975), working for the Museum of Northern Arizona, recorded nine artifact scatters in a brief survey of areas slated for possible expansion of the open-pit mine. Arizona State Museum archaeologists surveyed a water pipeline route for the mine, a corridor 36 miles (58 km) long and 15 meters wide, between Bagdad and Wikieup (Hammack 1975). The State Museum was requested to develop a data recovery strategy for the six recorded sites, all located in proximity to Burro Creek and Kaiser Spring Wash.

Laurance Linford (1979) directed the data recovery effort. A research-oriented strategy focused on the prediction and analytical evaluation of site functions in the context of prehistoric subsistence and land use patterns. The six artifact scatters varied in size, overall density, local environmental context, and the composition and diversity of artifact assemblages. There were two apparent base camps, where multiple activities took place during periods of extended occupation or repeated use. Lithic manufacturing, camping, and plant processing took place at temporary sites. At one site, a rock alignment could have diverted stream water to a depressed area which yielded a single grain of corn pollen. Linford considered this to be slim but suggestive evidence for prehistoric farming along Burro Creek. One of the base camps was an Archaic site, while other sites yielded a combination of Tizon Brownware and Prescott Grayware pottery. The dominant occupation was attributed to the Cerbat Branch. In its attention to hypothesis testing and substantive analyses, Linford's study was a valuable research contribution despite the small survey area and the small number of investigated sites.

Additional surveys have established Burro Creek as an archaeologically rich zone. At least 90 sites have been recorded in areas adjacent to the creek. In the early 1970s, students from Prescott College recorded a few sites along upper Burro Creek during an unpublished "preliminary survey". The sites included a rockshelter containing corn cobs, bones of fish and small mammals, and parts of walnut, pinyon, mesquite, and agave plants. The combination of riparian and upland resources indicates that upper Burro Creek was a rich resource zone.

In conjunction with a mineral lease application, the Museum of Northern Arizona surveyed an area of approximately 600 acres (245 ha) bisected by the Mohave-Yavapai county line east of Burro Creek (Dosh 1984). The 35 recorded sites consisted primarily of low density lithic scatters related to the exploitation of local chalcedony and jasper sources. There were also nine camps with evidence of multiple activities as indicated by diverse artifact assemblages. Investigations were recommended at the two largest camps, which were adjacent to both Burro Creek and the largest lithic quarries. As at the Cyprus-Bagdad sites, there was a mixture of pottery types characteristic of the Cerbat and Prescott branches.

Additional sites in the Burro Creek area were recorded by the BLM during the course of regional Class II sample surveys and a brief purposive survey of Kaiser Spring Canyon, an area where hot springs indicated a potential for geothermal energy development. In addition to the typically diverse range of artifact scatters, other recorded sites included rockshelters, petroglyphs, roasting pits, and bedrock milling areas. A small Prescott Branch pueblo was found near upper Burro Creek.

In the desert south of Burro Creek, surveys have been conducted near the Bill Williams, Big Sandy, and Santa Maria rivers in the Alamo Lake area. Prior to the construction of Alamo Dam during the 1960s, Wasley and Vivian (1965) documented two rockshelter sites. Their brief unsystematic survey would have been judged as inadequate by current standards. In 1977, the U. S. Army Corps of Engineers awarded a contract to Arizona State University for a sample survey of the reservoir area, contained primarily within Alamo Lake State Park. The 10% survey, which incorporated 58 quadrats of 40 acres (16 ha), recorded lithic quarries, rock rings, and numerous isolated artifacts around the lake's perimeter. Small camps with grinding implements were found along the Santa Maria River (Stone 1977).

Long transect surveys and regional sample surveys have covered less than 1% of the region, but they have examined numerous environmental zones and geographic areas at a high intensity. A survey of the proposed Kingman-Mobile oil pipeline, funded by the Provident Company, was conducted by Arizona State University (Henss 1983). North of the Bill Williams River, the planned route commenced at a proposed pump station southwest of Kingman. It then

traversed the Sacramento Valley, Dutch Flat, and the McCracken and Rawhide mountain ranges. The purpose was to locate cultural resources, assess their significance, and offer recommendations for data recovery. The survey methods were particularly appropriate for this desert zone. A category of "field loci", intermediate between obviously discrete sites and "isolates" of fewer than six artifacts, incorporated small low density artifact scatters, isolated rock features, and single knapping stations or pottery breaks that could later be designated as sites singly or in combination. Since a no-collection policy was in effect, descriptive artifactual information was recorded in dispersed 2 x 2 meter sample units, selected either randomly or purposely to gain adequate information about sites. Hundreds of isolated artifacts, as well as 13 sites incorporating rock rings and low density lithic scatters, were concentrated near volcanic raw material sources in the McCracken and Rawhide foothills and the southern portion of Dutch Flat.

The Salt River Project's proposed Mead-Phoenix 500 Kv transmission line was surveyed recently by the Museum of Northern Arizona (Keller 1986). Commencing at Lake Mead, the 200 foot (61 m) right-of-way traversed approximately 150 miles (240 km) through the Detrital, Hualapai, and Big Sandy valleys. Again, the goal was to locate and assess cultural resources in order to generate recommendations for avoidance or data recovery. The 18 recorded prehistoric sites included artifact scatters ranging from probable base camps to limited activity areas, "sleeping circle camps" near the Colorado River, and lithic manufacturing areas. The sites were concentrated in three areas: Truxton Wash and the Peacock Mountains; the Big Sandy River valley between Wikieup and Burro Creek; and the borders of the Santa Maria River and its tributaries. The latter area incorporated several probable base camps. Other notable sites were an obsidian and rhyolite quarry near the BLM's Burro Creek campground and a Cerbat-Hualapai base camp near the confluence of the Big Sandy River and Trout Creek. The report presented site-specific data recovery recommendations, although avoidance was the primary advice for all but the most areally extensive sites. Research issues were discussed in detail.

During the late 1970s, the BLM conducted Class II random sample surveys of the Black Mountains, Cerbat, Aquarius, and Hualapai planning units within the Kingman Resource Area. The purpose was to gain basic information on the types and distribution of cultural resources. These inventories supplemented other resource analyses for the preparation of environmental impact statements for range management alternatives (BLM 1978, 1981).

The Black-Cerbat sample survey was designed and executed by BLM archaeologists, and the results were evaluated by archaeologists from the Museum of Northern Arizona (Fryman, Powers, and Aitchison 1977). The sample incorporated approximately 1% of BLM-administered lands, which in turn accounted for about 58% of the total acreage in the two planning units. A total of 126 quarter-section sample units, each covering 160 acres (65 ha) were randomly selected from 4 strata defined on the basis of vegetation zones. The Black-Cerbat sample survey located 69 prehistoric sites. Site types were classified as food processing stations, base camps, temporary camps, ceramic camps, and lithic manufacturing areas. Base camps with diverse artifact assemblages were found near springs, and their sizes generally exceeded 1,000 square meters. The Cerbat planning unit contained a larger proportion of base camps as well as a subtype that incorporated intrusive ceramics and the highest degree of assemblage diversity. The Black Mountains yielded a relatively higher proportion of lithic manufacturing sites, primarily located on the western foothills and bajadas. Fryman, Powers, and Aitchison (1977) attributed the distributional patterns to three environmental factors: (1) a higher density of reliable springs in the Cerbat Mountains; (2) a wider variety of microenvironments in the Cerbats, associated with more varied subsistence resources; and (3) a higher density of lithic raw materials at the base of the Black Mountains and along the terraces of the Colorado River and its tributaries. In general, the Detrital, Sacramento, and Hualapai valleys had relatively low densities of cultural resources, while the Cerbat and Black ranges and the Grand Wash Cliffs area were more favored zones.

An approximate 3% survey of BLM-administered lands in the Aquarius planning unit incorporated 62 quarter-section sample units (Kincaid and Giorgi 1979). Fifty-seven of the units were selected randomly from nine sampling strata defined by vegetation zones and accessibility to water sources. BLM archaeologists recorded 68 sites during the Aquarius sample survey. A graduate student at Arizona State University analyzed site types and microenvironmental distributions using cluster analytical techniques similar to those employed by Matson (1971) in his Cerbat Mountains study. The analysis defined base camps of several types, more temporary camps, food processing sites, and lithic manufacturing areas (Crocker 1979). The spatial correlation between water sources and sites was weaker than expected, although the more substantial camps were located consistently near springs. Distributional patterns were unclear in relation to vegetation zones. The Aquarius foothills, the upland mesas, and lower Burro Creek appeared to exhibit the highest relative densities of cultural resources.

Finally, an approximate 1% sample of BLM lands in the Hualapai planning unit incorporated 78 quarter-section sample units selected randomly from western, northeastern, summit, and southern strata. The survey recorded only 26 sites, primarily lithic scatters in the southern area. Kincaid and Giorgi (1979) suggested that the results may have reflected the "low sample rate and ineffective stratification scheme in an area with a highly specific settlement pattern", rather than an overall lack of cultural resources. If sites were concentrated in the northern canyons of the Hualapai range, as indicated by unpublished information, the sampling design may have been ineffective in detecting that distributional pattern.

Intensive surveys of narrow transects and small parcels have been conducted as clearances for legal compliance with cultural resource legislation. Surveys of proposed seismic exploration lines have covered 84 miles (134 km) of corridor, ranging from 30 to 50 meters wide, in the flats of the Detrital, Sacramento, and Hualapai valleys. They have recorded only a few isolated artifacts and lithic knapping stations (Bostwick and Dechambre 1984; Green and Effland 1981; Keller 1979).

H.D.R. Ecosciences (1977) conducted clearance surveys for geotechnical investigations for the U. S. Air Force. Proposed seismic lines and trenches, all less than 100

meters long, were examined at 30 locations in the Sacramento Valley and west of the Black Mountains. The few recorded isolates and knapping stations supported the observation that the locally abundant white quartzite was not a favored lithic raw material.

Surveys of materials pits and access roads totalling approximately 950 acres (385 ha) and 5 road miles (8 km) in the Detrital Valley and 130 acres (53 ha) and 4 road miles (6.4 km) in the Sacramento Valley have located only a small number of isolated artifacts (Fortier 1983; Perrine 1983; Rosenberg 1981; Rozen 1981).

In conjunction with the completion of Interstate Highway 40 near Kingman, Arizona State Museum investigated three small rockshelters (Bradley 1979). Excavations were conducted at the two sites with stratified deposits. The sites, probable temporary camps, contained projectile points, lithic debitage, grinding slabs, bifaces, rabbit bones, and Tizon Brownware sherds with intrusive Lower Colorado, Cohonina, Prescott, and Anasazi Black-on-white pottery types.

In 1978, the BLM awarded a contract to Arizona State University for the examination of sampling strategies for small parcels. Several small parcels in the Phoenix District were surveyed intensively at 15 meter spacing intervals. The resulting archaeological data were then entered into computer simulation analyses that examined the relative effectiveness of different sampling strategies (Burton et al. 1978). In the Hualapai Valley, five small parcels totaling about 1300 acres (526 ha) yielded only a small artifact scatter and 30 isolates. A square-mile parcel (640 acres or 259 ha) in the Bogle Ranch area in the Aquarius Mountains, a zone of agave and chaparral, contained numerous isolates, two "temporary food collecting camps", and a lithic quarry. The large size and low density of the sites suggested a pattern of repeated temporary use.

The BLM has conducted intensive (Class III) surveys for proposed projects and land exchanges, as well as field checks of reported sites. These efforts resulted in the recording of rock art localities in the Black, Peacock, and Rawhide mountain ranges and base camps in the Hualapai Mountains. Recent surveys of range management projects and proposed land exchanges in the Sacramento Valley revealed the presence of possible base camps and food processing sites near springs and major washes on the upper bajada and at the bases of buttes and hills (LaForge 1987). The surveys also tended to confirm the relative paucity of cultural resources in many other areas of the western basins.

The BLM recently provided logistic support for investigations at Bighorn Cave, a large deeply stratified site in the Black Mountains. This impressive site, which contains perishables, split-twig figurines, and an occupational sequence possibly extending back to 3000 B.C., is threatened by vandalism. In 1986, archaeologists from Northern Arizona University and the Museum of Northern Arizona conducted test excavations to assess the significance and integrity of the cultural deposits. They were assisted by the BLM, members of the Arizona Archaeological Society, and individuals from the Fort Mohave and Colorado River Indian communities. A summary report on the testing and analysis is in preparation.

An additional recent contribution to the regional prehistory is Swarthout's (1986) doctoral dissertation on settlement and subsistence strategies. The BLM regional sample survey data was incorporated into this study. The document was not yet available for review as of this writing.

THE EASTERN HIGHLANDS

The presence of impressive Sinagua pueblo sites in the Verde Valley has tended to draw the attention of archaeologists eastward away from the Chino Valley and the forests surrounding Prescott. Avocational archaeologists, on the other hand, have been avid researchers, and they have contributed much of the information in the regional site files.

Home to the enigmatic Prescott Branch, the area exhibits affinities to the east and south, to the Sinagua and Hohokam. The Prescott people occupied small pithouse villages and pueblos, farmed, and participated in central Arizona trade networks between A.D. 800 and 1300. However, the regional prehistory has been interpreted from both eastern and western perspectives.

Archaeologists first ventured into the region in the early 1900s. Jesse Walter Fewkes visited sites in the vicinity of Prescott and concluded that pueblo ruins in the Hassayampa headwaters area were similar to those in the Chino Valley. Fewkes (1912:218) saw the Prescott area as a frontier zone occupied by pioneers from the Salt and Gila rivers.

The Gila Pueblo Foundation and Malcolm Rogers extended their regional surveys into the area during the 1920s and 1930s. The Gila Pueblo archaeologists were particularly interested in defining the geographic ranges of ceramic types in central Arizona. They concluded that the range of "Prescott Gray Ware" extended as far as Hualapai Peak to the northwest, Oak Creek to the northeast, New River to the southeast, and the Plomosa Mountains to the southwest (Gladwin and Gladwin 1930). At a stratified site near Sols Wash west of Wickenburg, Rogers (n.d.) noted the presence of both Prescott Grayware and Hohokam pottery types.

In the 1930s, Spicer and Caywood (1936) excavated portions of King's Ruin and Fitzmaurice Ruin, two pueblos located respectively in Chino Valley and near Lynx Creek southeast of Prescott. The results of these investigations were incorporated into Colton's (1939) synthesis of prehistoric cultural units in northwestern Arizona. The "Prescott Branch" of the Patayan Root was defined by the geographic distribution of Prescott Grayware pottery. Colton defined two phases, the "Prescott Focus" (A.D. 900-1025) and the "Chino Focus" (A.D. 1025-1200). The temporal ranges were based on tree-ring dates associated with nonlocal pottery types found at Prescott area sites.

Colton, operating from a northern perspective and a familiarity with materials from western Arizona, assigned the Prescott Branch to the Patayan Root on the basis of similarities between Prescott Grayware and Patayan wares. However, he stated that "the placing of this branch in the Patayan Root is mainly a convenience and cannot be justified by a study of the determinants" (Colton 1939:30). Gladwin et al. (1938), on the other hand, noted similarities

between Hohokam utility ware and Prescott area pottery. The southern perspective, focused on Prescott Branch-Hohokam relationships, gained ground after Euler (1958) argued that the Prescott Branch should not be incorporated into the Patayan Root.

In 1952, Richard Shutler excavated a pithouse and trash mound in Long Valley, a western branch of Chino Valley. Intrusive Wupatki Black-on-white ceramics indicated a later date than had previously been assigned to Prescott Branch pithouses (Gumerman, Thrift, and Miller 1973; Shutler 1952).

Albert Schroeder (1954) conducted a brief survey near Mayer, a small town east of Prescott. He suggested that local archaeological materials indicated a blending of Hohokam and Patayan traits.

Euler and Dobyns (1962) explored the western periphery of the Prescott Branch in excavations at the Yolo site on Bozarth Mesa. They concluded that sites west of Bozarth Mesa could be attributed to the Cerbat Branch of the Patayan Root. The Yolo excavations revealed a westward decline in the proportion of mica temper in Prescott Grayware. The investigations also indicated that the Chino Focus incorporated not only masonry pueblos but also shallow rock-outlined pithouses. These differed from earlier Prescott Focus pithouses which had no rock outlines.

In the early 1970s, Franklin Barnett, an avocational archaeologist, conducted excavations north of Prescott in the Williamson Valley, at several small pueblos collectively known as the "Matli Ranch Ruins". He also conducted additional investigations at Fitzmaurice Ruin (Barnett 1970, 1973, 1974, 1975).

Ken Austin, also an avocational archaeologist, surveyed portions of the Prescott National Forest during the 1970s. He located over 800 sites and filed his records at the Museum of Northern Arizona. Although this work diminished a vast informational gap, it remained largely unpublished, and the nature of Austin's survey strategy was not clearly documented. Many of the recorded sites were small pueblos, particularly hilltop "forts". Austin suggested that the hilltop sites were linked into extensive line-of-sight communication networks. He defined six major and four minor "line-of-sight chains" in the Prescott region (Austin 1977, 1979).

In the 1960s and 1970s, researchers paid increasing attention to Hohokam manifestations in the Prescott region. Euler recorded Hohokam ball courts in the grassland valleys southwest of Prescott. Ward (1975) noted similarities to Hohokam architecture in excavated Chino Focus structures at the PC Ruin near Prescott. Breternitz (1960:27) suggested that the Agua Fria River was a major route for Hohokam migration and trade. Weed and Ward (1970) described Colonial Hohokam traits at the Henderson site on the upper Agua Fria east of Prescott. Investigations conducted by Southern Illinois University as part of the Central Arizona Ecotone Project supported the Hohokam affiliation of sites along the middle and upper Agua Fria river (Gumerman and Spoerl 1980; Gumerman, Weed, and Hanson 1976). The nature of the Hohokam presence was unclear. Euler (1978:22) proposed that the Prescott Branch was a mountain extension of the Hohokam but later suggested that it was "basically a Hakataya tradition, influenced during the Colonial Period by the Hohokam" (Euler 1982:61). Breternitz (1960) suggested that after A.D. 1125, Hohokam-related groups in the middle Verde Valley were displaced or absorbed by a Sinagua intrusion from the Flagstaff region. It seems likely that events and processes in the Prescott region paralleled changes in other areas of the central Arizona uplands during late prehistoric times.

Only one major research project has been conducted recently near Prescott. In conjunction with a proposed land exchange between the U.S. Forest Service and the Phelps Dodge Corporation, Prescott College archaeologists surveyed approximately 9000 acres (3650 ha) in Copper Basin just southwest of Prescott (Gumerman, Thrift, and Miller 1973). They recorded 53 sites consisting primarily of artifact scatters and rock-outlined oval structures.

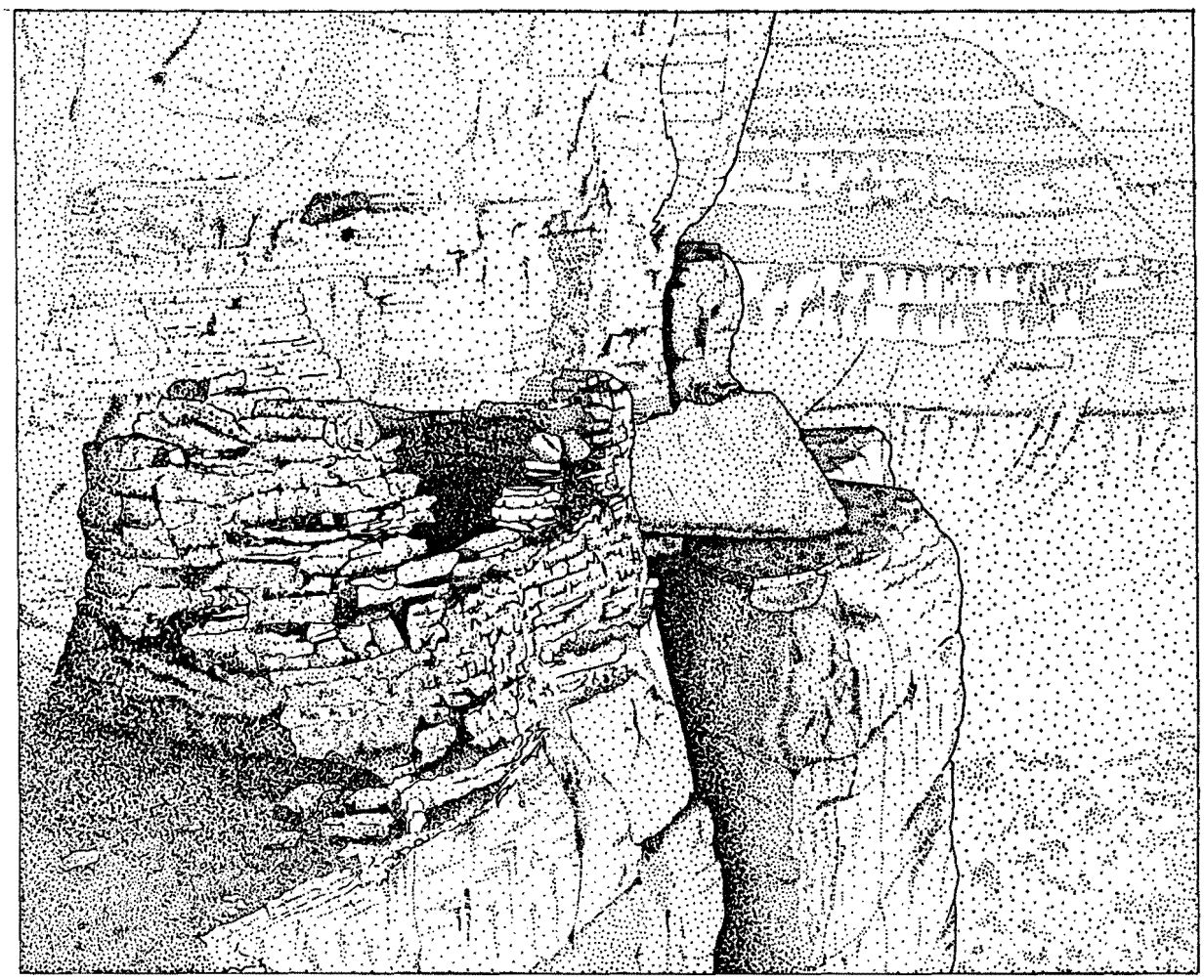
Phelps Dodge later funded investigations at the 40 sites located on Forest Service lands. Marvin Jeter, then a student at Arizona State University, used the work as the basis for a doctoral dissertation (Jeter 1977). Unfortunately, the original survey maps and field notes became unavailable when Prescott College went bankrupt in 1975. Jeter (1977:76) surveyed a series of dispersed transects from which he "obtained some assurance that the original survey had indeed effectively characterized the distribution of sites in the project area". His crews then conducted surface collections and test excavations at most of the sites originally located by Prescott College.

Data collection and analyses were based on a series of hypotheses regarding local settlement and subsistence patterns, regional exchange systems, and the agriculturally "marginal" nature of the area. Since the Copper Basin area was marginal in terms of its ruggedness, limited arable land, and short growing season, its occupation was suggested to indicate stress in surrounding areas of better agricultural potential (Jeter 1977:54). The Copper Basin study contributed to knowledge of Prescott Branch settlement and subsistence systems, chronological development, material culture, architecture, and external relations.

The Bradshaw Mountains to the south of Prescott are a virtually untouched area. Euler (1958) excavated Turkey Creek Cave, a Yavapai site on the eastern face of the massive range. J. Scott Wood, a Forest Service archaeologist, surveyed portions of Battle Flat, a "multiple use demonstration area" 5000 feet (1500 m) in elevation at the center of the range. Battle Flat is the divide between the Agua Fria and Hassayampa watersheds. Wood (1978) found 18 sites and 4 "low density scatter zones" in a 40% areal sample incorporating 920 acres (375 ha). He also identified some areas as probable agricultural fields. Most sites were small habitation areas having 10 or fewer structures resembling the rock-outlined pithouses of the Prescott Branch (Wood 1978:25). A single masonry pueblo was similar to sites located on the Black and Perry mesas along the Agua Fria River to the east. Wood suggested that the dominance of Wingfield pottery types indicated an incursion into the Bradshaw Mountains by Hohokam-related groups from the middle Agua Fria area.

In summary, a quotation from Jeter (1977:274) is applicable not only to the eastern highlands but also to the rest of the overview region:

> The region has the potential to produce some truly excellent archaeological research. The sites and structures of the region are apparently fairly numerous, but generally only small to medium sized, so that judicious sampling programs should begin to produce insights without expenditure of great amounts of time.



CHAPTER 5
PREHISTORY OF THE REGION

The Kingman region is an environmental and cultural transition zone between the Southwest and the Great Basin. These arid regions of the American West share certain broad research issues: (1) the nature of long-term stability in socioeconomic systems in certain areas, notably the central Great Basin and western Arizona (Euler 1975, 1982; Thomas 1982); (2) the nature of *in situ* processes of change in economic, settlement, and social systems; and (3) the role of migrations, areal abandonments, and intercultural relations as factors of change. The complexity inherent in these issues has generated alternative interpretations and controversies, many of which center on the timing and role of migrations as opposed to *in situ* developments. Such controversies can only be resolved through a more detailed definition of archaeological patterns and the testing of intelligently framed alternative hypotheses that can be evaluated with archaeological data. In west central Arizona, the existing archaeological record indicates an ebb and flow of populations that responded to local environmental constraints and the presence of surrounding groups.

Dates assigned to different developmental traditions and cultures should be regarded as tentative markers with large error factors, reflecting both the paucity of data and the possibility that changes were gradual rather than abrupt. Radiocarbon dates always incorporate a statistical confidence interval, a defined range of error. However, in order to create a more comprehensible narrative, dates will be approximated in terms of the standard calendar (B.C. and A.D.) rather than in years before present (B.P.), the form for reporting radiocarbon dates.

THE PALEO-INDIAN PERIOD

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 packrat nests, and global temperature fluctuations have indicated the nature of environmental changes since that time (Antevs 1948; Bayham 1986; Bryan 1941; Davis 1982; Martin 1963 a,b; Phillips and Van Devender 1974; Van Devender and Mead 1976; 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. Lakes existed over much of the Great Basin but were relatively rare in Arizona (Meinzer 1922). 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.

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. Many archaeologists have advanced arguments favoring much earlier occupations (Adovasio et al. 1978, 1980; Bischoff et al. 1976; Davis et al. 1980; Hayden 1976; Krieger 1964). To date, there is insufficient evidence to support these arguments, and the pre-Paleo-Indian presence persists as an important but vexing research issue (Aikens 1983; Haynes 1967, 1969, 1980; Jennings 1968:65-68; Payen et al. 1978).

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 (Agenbroad 1967). Buried sites have been exposed in arroyo walls in southeastern Arizona (Haury, Antevs, and Lance 1953; Haury, Sayles, and Wasley 1959). At Ventana Cave in south central Arizona, the earliest cultural remains were radiocarbon dated to 9300 B.C. This assemblage, labeled as the "Ventana Complex", incorporated extinct megafauna and a rather controversial unfluted point which resembled Clovis points in other respects (Cordell 1984; Haury 1950; Haury and Hayden 1975:v; Irwin-Williams 1979:34). 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 big game 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 "scraper-maker people" in reference to their most common artifact

type (Rogers 1929). 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 (Rogers 1939, 1958, 1966; Warren 1967). 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 included 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, have 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. It is now known that desert pavements can form rapidly and that local climatic and geologic conditions affect degrees of surface alteration of artifacts (Bales and Pewe 1979; Howard, Cowan, and Inouye 1977; Moore and Elvidge 1982).

In Arizona, Rogers assigned most San Dieguito sites to the first phase, while later phase materials were rare and restricted to sites along the Colorado River. Researchers have 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 (1960:267) 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 Cordell (1984), the Paleo-Indian period extended to 5500 B.C. in the Southwest. 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 (Elston 1982). During this period at Ventana Cave, the Ventana Complex materials were separated from later occupational levels by an "erosional disconformity" (Haury 1950).

There is little evidence that the Kingman region was occupied during the Paleo-Indian period. Presumably ancient materials generally have been assigned to the dubious San Dieguito I phase. Relatively low population levels at the end of the Pleistocene period may have allowed groups to concentrate in the most favorable western environments: the lakes of the Great Basin and the southeastern Arizona grasslands that supported herds of game. These resources generally did not exist in western Arizona (Meinzer 1922). Prior to archaeological studies of the Red Lake area, researchers anticipated the presence of Paleo-Indian materials, but none were found (Fuller 1975; Schilz 1982). On the basis of geomorphic evidence, Schilz (1982:97) argued that Red Lake, an ephemeral Holocene playa, never existed as a terminal Pleistocene pluvial lake (Gillespie and Bentley 1971).

Despite the lack of occupational evidence, it is possible that highly mobile groups periodically traveled through western Arizona. Artifacts of the Lake Mohave complex have been found near the Colorado River and along major washes in the desert south of the study area (Carrico and Quillen 1982; Rogers 1966). 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.

ARCHAIC OCCUPATIONS

By the middle Holocene period, which began at about 5000 B.C., post-Pleistocene environmental changes are generally acknowledged 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 1957), 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.

The Desert Culture concept has been criticized for its neglect of spatial and temporal variation in subsistence and settlement strategies (Bettinger 1978; Madsen and Berry 1975). In actuality, the original definition did allow for regional variants. Jennings (1968) later linked the Desert Culture to the concept of a continent-wide Archaic developmental stage characterized by technological versatility and the efficient exploitation of a wide variety of wild, seasonally available resources (Willey and Phillips 1955). In the North American deserts, the Archaic stage incorporated numerous regional variants linked by the challenge of survival in an arid environment.

For the Archaic period in the Southwest, Irwin-Williams (1967) defined an "elementary culture" designated as the Picosa, an acronym for the Pinto Basin, Cochise, and San Jose regional variants. These western, southern, and northern variants shared a number of general traits including grinding implements, simple circular brush shelters, and the exploitation of a wide range of available resources.

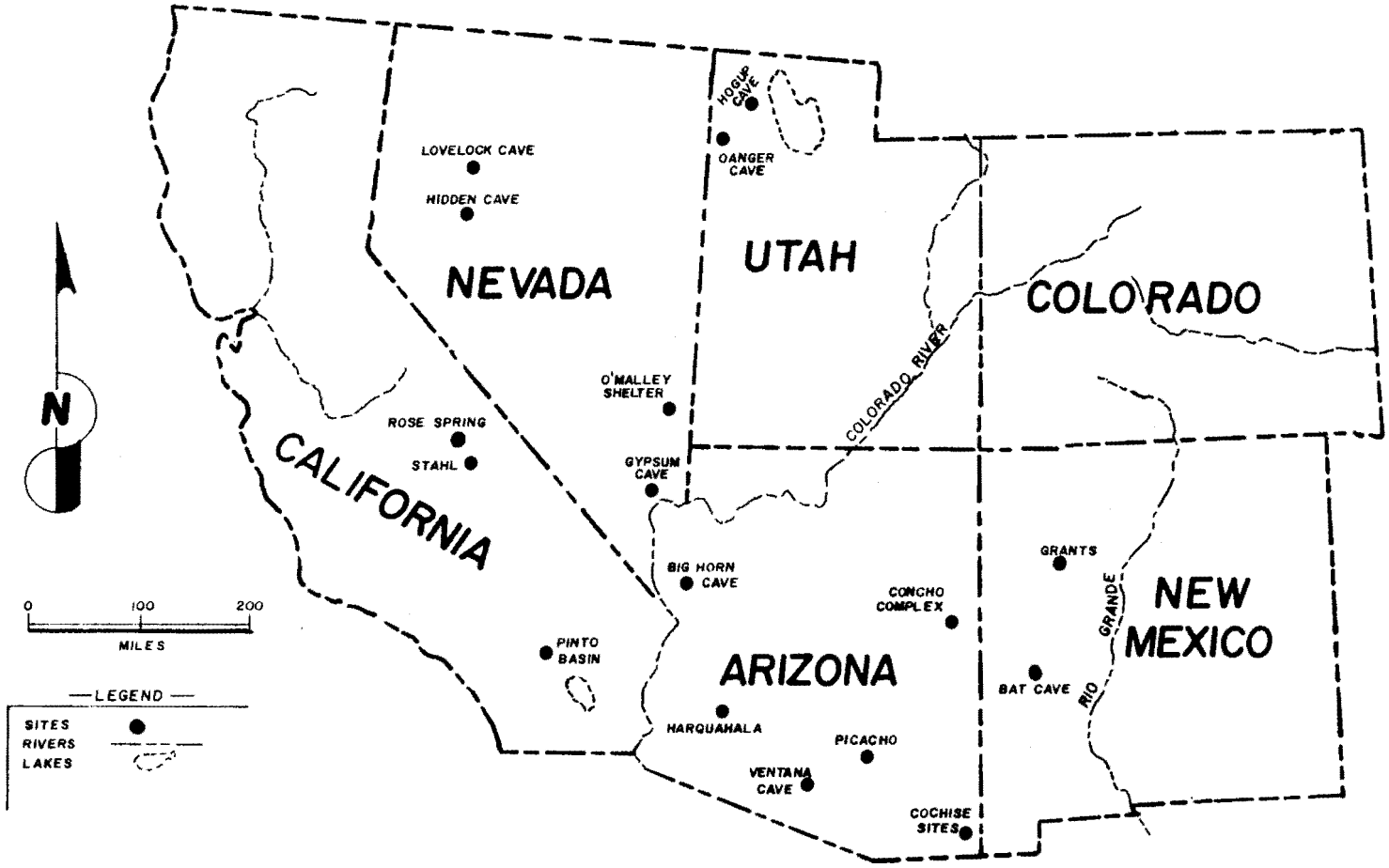
Rogers (1939) defined the Amargosa tradition as the Archaic successor to the San Dieguito complex in southern California and western Arizona. The Amargosa tradition incorporated the addition of grinding implements and distinctive projectile point types to the San Dieguito lithic assemblage. Rogers (1939) 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 Basketmaker III materials in northern Arizona (Haury 1950:534). As for the Archaic assemblages at Ventana Cave, Haury noted an apparent mixture of Amargosa materials and artifacts characteristic of the Cochise culture, an Archaic tradition centered in southeastern Arizona (Sayles and Antevs 1941). There seemed to be an early predominance of Amargosa materials which gradually gave way to a preponderance of late Cochise traits, although the two traditions also exhibited many similarities. Haury (1950:533) suggested a late Archaic expansion of Cochise peoples.

Events at Ventana Cave might appear to be peripheral to Archaic prehistory in the Kingman region. However, Archaic cultural sequences in the Southwest and the Great Basin exhibit striking parallels in diagnostic projectile point styles; generalized settlement, subsistence, and technological patterns; and the timing of changes in these patterns. These parallels could relate to several factors: similar responses to major environmental trends; similar social, demographic, or technological constraints on the adaptive strategies of hunter-gatherers; a process of long-term population growth, migrations, and colonization of new areas; or widespread social or trade networks. The latter are characteristic of highly mobile hunter-gatherers in arid regions. Survival strategies generally incorporate the sharing of both resources and information (Gould 1980; Wiessner 1982). In addition, low-density populations tend to incorporate numerous local groups into large overlapping kinship networks covering vast geographic areas (Wobst 1976). Widespread artifact styles may have been symbolic of such social networks, or they may represent items that circulated frequently through trade networks (Wiessner 1982:175). Archaeologists need to define and examine the generalized Archaic patterns in order to understand long-term developmental processes and large-scale migrations. This knowledge can serve as a basis for further studies of local and regional variants based on the exploitation of different microenvironments.

The following discussion is a composite of archaeological and paleoenvironmental information from several references on the Southwest and the southern and western Great Basin (Bayham 1986; Davis 1982; Elston 1982; Haury 1950; Huckell 1984; Lyneis 1982; McGuire and Schiffer 1982; Rogers 1939; Thomas 1982; Van Devender and Spaulding 1979; Weide 1982; Wilke 1976). Particularly for the Great Basin, temporally diagnostic projectile point styles are relatively firmly anchored by radiocarbon dates (Thomas 1982:161). The dates for phases should be regarded as tentative. Transitions may have occurred at different times in different places, and point styles and other traits often exhibit a considerable degree of overlap through time. Map 5-1 depicts the locations of major Archaic sites in the Southwest and Great Basin.

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. Agave increased its range (Burgess 1985), and there was an expansion of Sonoran and Mohave desertscrub species such as palo verde, ironwood, saguaro, and various cacti. By the end of this middle Holocene period, essentially modern environmental conditions were established.

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, and the "Ventana-Amargosa I" phase at Ventana Cave. Artifacts included percussion-flaked



MAP 5-1: SELECTED ARCHAIC SITE LOCATION IN THE SOUTHWEST & GREAT BASIN

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. According to Haury (1950:533), "western" traits were strongly represented at Ventana Cave. Population movements also may have tracked the expansion of the Sonoran Desert and its resources. 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 and the "Chiricahua-Amargosa II" phase at Ventana Cave. 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.

Researchers have inferred a continued diversification of wild food resources during the Amargosa II or Middle Archaic phase. High mobility and overall low population densities may have allowed a continued emphasis on hunting. Small mobile groups apparently occupied seasonal base camps concentrated near watercourses on valley floors, although a variety of microenvironments were utilized. Few sites of this period have been discovered in the Kingman region. McNutt and Euler (1966) recovered Pinto points at sites south of the Grand Canyon. 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 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. 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.

Gypsum points carried over into the early part of this Amargosa III phase. Elko Corner-notched points with large triangular blades and straight bases were a characteristic projectile point style. The period witnessed an 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.

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. Amargosa III sites with Elko and Gypsum projectile points have been found in the Aquarius Mountains (Linford 1979), at Red Lake (Schilz 1982), and at Bighorn Cave, where the Late Archaic assignment is supported by radiocarbon dates ranging from 1500 to 400 B.C. (Don Simonis, BLM Archaeologist, personal communication 1987). Rogers (1939:68-69) described a projectile point type common in western Arizona but"atypical" in the Great Basin. These broad-stemmed dart points appeared to be most similar to those found in Basketmaker II pithouses in the Virgin River area of southern Nevada. According to Rogers, this was the dominant point type associated with late preceramic base camps in the desert mountain ranges between the Colorado and Gila rivers. 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 a Cochise 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 was said to be a western variant of Basketmaker II, a phase of the Archaic sequence defined for the Plateau.

The presence of split-twig figurines lends an aura of mystery to many of the Late Archaic sites. These small models of deer or sheep, crafted from split, bent, and folded pieces of willow or sumac, have been most frequently found at caves in the Grand Canyon and the Canyonlands area of southern Utah (Euler 1966; Schroedl 1977; Schwartz et al. 1958). The total collection of over 375 specimens from approximately 20 sites also includes figurines from the Flagstaff area, the Mohave Desert, southern Nevada, and Bighorn Cave in the Black Mountains (Jett 1987; Schroedl 1977). Radiocarbon dates cluster between 2000 and 1000 B.C., and associated Gypsum points were found at Cowboy Cave in Utah (Schroedl 1977:262). Schroedl (1977) noted that in the Grand Canyon, where most of the creatures have been found, split-twig figurines tend to occur in caches and that they sometimes are pierced by twigs. These situations indicate that they were ritual objects possibly associated with hunting magic. Outside the Grand Canyon, figurines tend to be fragmented and scattered through habitation debris. Schroedl (1977:262) suggested a change in function from ritual objects to "general social items" or toys as the trait moved outward from the Grand Canyon along the Colorado River and its tributaries. As widespread distinctive and datable objects, split-twig figurines may eventually reveal much about the Late Archaic occupation of western and northern Arizona.

Increasing population densities may have eventually reduced the efficiency of mobile hunting and gathering (Lightfoot 1983; Moore 1981). Local groups may have occupied settlements for longer periods of time, relying more on storage and formal commodity exchange rather than travel and resource sharing as means of reducing resource shortages (Cordell 1984; Wiessner 1982). 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 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). Increasing sedentism was associated with

an increasing reliance on cultivated crops (Huckell 1984; Lightfoot 1983; Wilcox 1979).

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. Rogers (1939, n.d.) assigned many mountain sites to the Basketmaker III phase. By A.D. 700, pottery was common and the large stemmed projectile points, also known as dart points, had been succeeded by small corner-notched points, indicating the replacement of the atlatl or spear thrower by the bow and arrow.

Basketmaker III traits, pithouses and pottery, appeared along the Colorado River at Willow Beach (Schroeder 1961). Floodwater farming along the river also may have been initiated during this period, but evidence is lacking. Artifact assemblages of the Eldorado and Roaring Rapids phases between A.D. 250 and 700 were similar to those of Basketmaker III and later pueblo sites along the Virgin and Muddy rivers in 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).

THE CERAMIC PERIOD

Two major technological shifts were associated with the adoption and spread of farming in the Southwest: the replacement of the spearthrower by the bow and arrow and the manufacture of ceramic containers. The widespread adoption of these items, even by groups that relied minimally on cultivated crops, indicates that they possessed qualities useful in contexts other than farming. Shifts in hunting strategies, such as an increased emphasis on small game or a change in hunting techniques, may have increased the relative efficiency of the bow and arrow (Glassow 1972). As groups became more settled and less mobile, relatively heavy and fragile ceramic containers gained advantages over light, easily transported baskets. Pots were superior containers for the storage of food and water, and they allowed cooks to simmer foods while they were engaged in other activities (Cordell 1984:217). For relatively mobile groups who still relied to a great degree on hunting and gathering, storage of wild harvests was an important consideration. Archaeologists often point to the importance of food storage in the development of sedentary farming villages. Storage at dispersed caches and winter base camps also may have been an important subsistence strategy for groups similar to the historic Hualapai, a factor that probably enhanced the spread of pottery.

For early Southwestern archaeologists, ceramics were also a tool. Pottery types having distinctive technological or decorative characteristics could be tracked through space and time. The material traits and geographic boundaries of particular cultures were defined on the basis of ceramic distributions (Colton 1939). The ceramic period cultures of western Arizona, defined primarily by differences in ceramics, architecture, and inferred subsistence strategies, included the Virgin Branch of the Anasazi, the river Patayan or Amacava Branch, and the Cerbat, Cohonina, and Prescott branches of the upland Patayan. Table 5-1 summarizes the regional culture history from Paleo-Indian through historic times.

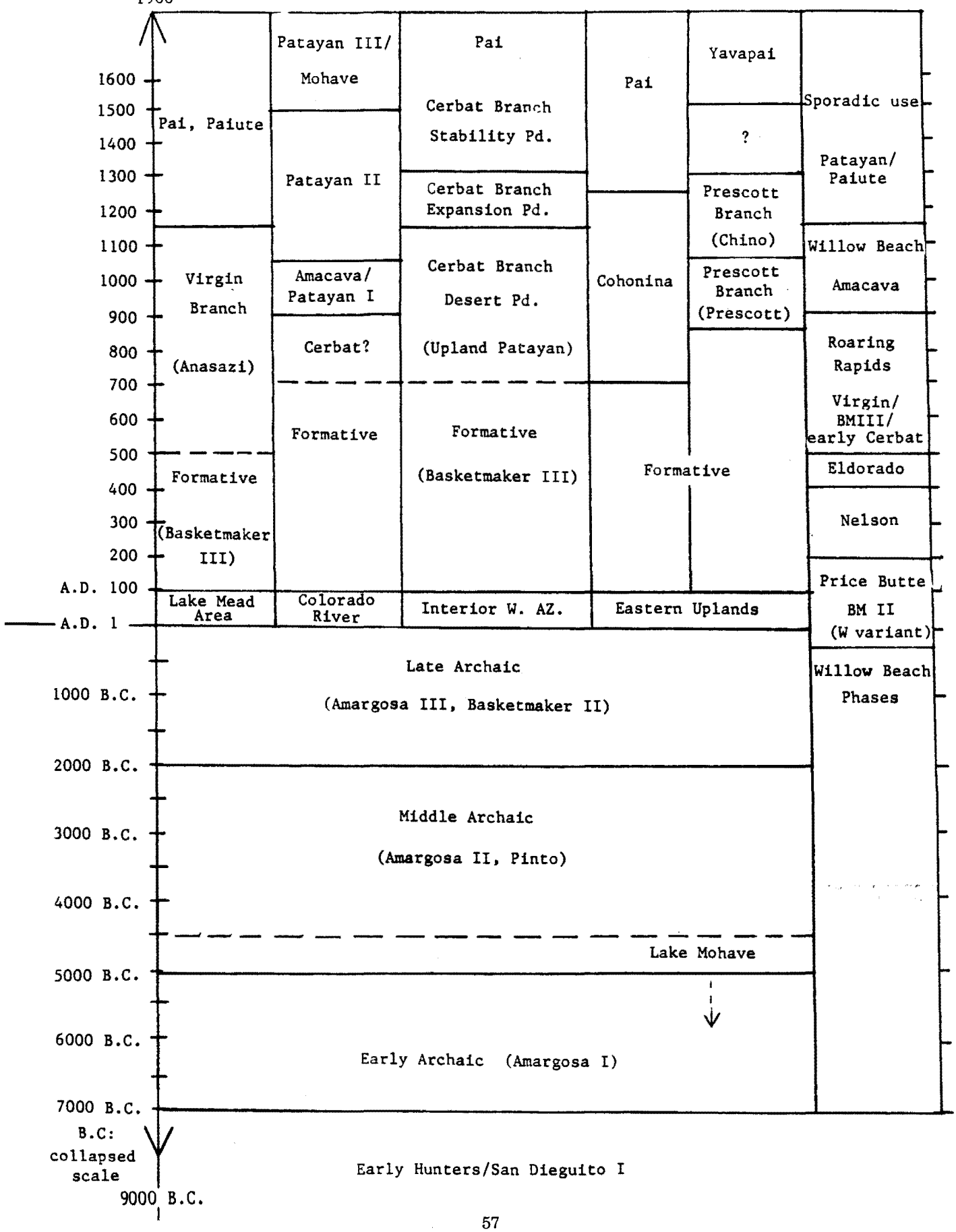
The Virgin Branch

The Virgin Branch, a western Anasazi variant with similarities and trading ties to the Kayenta Branch of the Colorado Plateau in northeastern Arizona, was centered on the lower Muddy and lower Virgin rivers in southern Nevada (Aikens 1966). Its range incorporated the Arizona Strip north of the Colorado River. Although its territory was largely peripheral to the overview area, the Virgin Branch was the first major farming culture in the region as well as a presence that influenced succeeding groups. Schroeder (1961) favored *in situ* development from earlier Basketmaker groups, but others have raised the possibility of a later territorial expansion from the Kayenta region (McClellan, Phillips, and Belshaw 1978:54). From about A.D. 500 to 1150, the Virgin folk occupied sedentary villages and grew crops along the river floodplains. Wild foods included agave, mesquite, pinyon, cattails, rabbits, and mountain sheep (Harrington 1927). Sites were occupied for considerable lengths of time as indicated by structural renovations and deep trash deposits (Aikens 1966; McClellan, Phillips, and Belshaw 1978; Shutler 1961). By A.D. 700, villages consisted of mixed pithouses, pueblos, and storage rooms constructed of adobe or a combination of rocks and adobe. The pueblos, ranging from eight to thirty rooms but occasionally larger, were curved around plazas.

The Virgin Branch people were long-distance traders who transported such items as Pacific marine shells along

TABLE 5-1

REGIONAL CULTURE HISTORY: WEST CENTRAL ARIZONA



east-west trade routes (Lyneis 1982). They procured or produced many trade commodities including turquoise in the Mohave Desert and salt deposits along the Virgin River. The long growing season may have been conducive to the cultivation of cotton. Other trade items included ochre and pottery.

The Virgin Branch apparently abandoned this Anasazi hinterland by A.D 1150. Groups may have moved eastward to join the Kayenta. Droughts and the hypothesized expansion of Shoshonean (Paiute) groups have been suggested as factors in the abandonment, but the events and causes are poorly understood (Cordell 1984:311).

The River Patayan

Malcolm Rogers (1945) defined the ceramic period occupation of western Arizona in terms of the expansion of Yuman groups. 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).

Rogers (1945) defined a series of phases based on unpublished excavations and the study of Lower Colorado Buffware ceramics produced along the Colorado River. His data was reviewed later by Michael Waters, who basically supported Rogers' conclusions but labeled the phases as "Patayan" rather than "Yuman" (Waters 1982).

In their ceramic analyses, Rogers and Waters focused on differences in surface treatments and vessel and rim forms (Waters 1982:277). Schroeder (1951) later revised type definitions to incorporate a greater emphasis on tempering materials. Waters (1982) argued that temper should be a secondary 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 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).

During the Patayan I phase from A.D. 700 to 1000, Lower Colorado Buffware ceramics were confined to the Colorado River and adjacent areas south of the Bill Williams confluence (Waters 1982:286). However, Schroeder (1961) argued that the "Amacava Branch" of the river Hakataya, composed of Yuman immigrants from the Mohave Desert, settled the northern portion of the lower Colorado River valley at about A.D. 900. 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, who still occasionally used the Willow Beach camp as indicated by items and burial practices characteristic of the Virgin Branch.

The Patayan II phase from A.D. 1000 to 1500 was a period of expansion northward along the Colorado River and westward to the shores of Lake Cahuilla (Waters 1982:288). According to Rogers, ceramic brownwares appeared during this period in western Arizona. However, he was later proven wrong when Tizon Brownware was found to dominate the ceramic assemblage at Willow Beach during the Roaring Rapids phase prior to A.D. 750 (Schroeder 1961:98). Willow Beach was rarely used by Amacava groups after A.D. 1100. Schroeder suggested that later settlements, as well as trading activities along the Mohave-Pacific trail, were concentrated in the Mohave Valley.

During the Patayan III phase after A.D. 1500, the dessication of Lake Cahuilla may have prompted groups to migrate to the Colorado River (Rogers 1945; Weide 1976). Rogers also postulated an incursion of river groups into the western Arizona uplands at this time. Euler (1958) later argued for a much earlier expansion of the Cerbat Branch, believed to be ancestral to the upland Yumans, on the basis of evidence from excavated rockshelters and Willow Beach.

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 1981). However, the early CCC site records indicate that a nearly continuous scatter of artifacts and features existed along the river prior to the existence of lakes Mead and Mohave. 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 (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.

The Cerbat Branch

The Cerbat Branch is defined by the distribution of Tizon Brownware pottery, which incorporates types labeled as Cerbat Brown, Sandy Brown, and Aquarius Brown. Cerbat materials are generally interpreted by ethnographic analogy to the historic Hualapai. The bulk of archaeological work and related publications have been contributed by Henry Dobyns and Robert Euler (see References).

Euler (1958, 1982) proposed a sequence of development that began with the Desert Period lasting from about A.D.

700 to 1150. There is little data from sites of this period. Colton (1939:29) originally suggested that the Cerbat Branch occupied much of the historic Hualapai region by A.D. 750, but Euler limited its distribution to the area west of the Grand Wash Cliffs. At Willow Beach, Cerbat Brown was the dominant pottery type by A.D. 750, associated with intrusive types of the Virgin and Kayenta branches (Colton 1945:115; Schroeder 1961).

The origin of the Cerbat Branch and its relationship to previous occupations have received little attention. One question is the degree of continuity between Late Archaic and Basketmaker III populations and their relationships to Yuman migrants who may have entered the region after A.D. 1 (Hale and Harris 1979). At Willow Beach, material traits suggested an eastward migration of Mohave Desert groups by A.D. 450 (Schroeder 1961:95). It is possible that these groups displaced or joined indigenous Archaic peoples. On the other hand, Yuman migrants may have moved into areas vacated by Basketmaker groups who had migrated to the Virgin or Grand Canyon regions to take up farming in settled villages. Yet another alternative scenario is the *in situ* development of the Cerbat Branch from an Archaic-Basketmaker base. Current evidence seems to favor the second alternative, but only the analysis of stratified archaeological deposits will reveal the events and processes that occurred between A.D. 1 and 700.

There is virtually no evidence concerning subsistence and settlement patterns during the Desert Period. The groups nearest the Colorado River may have practiced a transhumant pattern of summer farming and mesquite gathering near the river and mountain resource exploitation during other seasons. The ethnographic pattern of river-upland trade relations may have been established by A.D. 1100 after the river Patayan settled the Colorado floodplain and terraces.

Euler's Period of Territorial Expansion lasted from about A.D. 1150 to 1300. The Cerbat Branch people extended their range onto the Colorado Plateau where they replaced the Cohonina Branch, according to Euler and Dobyns. Colton (1939) originally assigned the Cohonina Branch to the Patayan Root based on the distribution of San Francisco Mountain Grayware pottery which exhibited technological similarities to other Patayan wares. To Colton, color was the primary difference between Deadmans Gray and the types of Tizon Brownware. Euler (1958) and others later disputed this assignment and argued that the Cohonina Branch had closer ties to the Kayenta Branch of the Anasazi (Cartledge 1979; Euler and Green 1978; Sullivan 1986).

The "enigmatic Cohonina culture" of the Flagstaff region has been dated from A.D. 700 to 1200 (Euler 1982:59; Jennings 1971; Sullivan 1986). Euler (1982:60) suggested that Tizon and San Francisco Mountain wares, both constructed using a paddle-and-anvil technique, "perhaps represent an indigenous and independent development from an earlier Hakataya base, with the ceramics of the Cohonina heavily influenced by Anasazi design styles and forms". Although Euler stressed similarities in the lithic technology, mortuary practices, and settlement patterns of the Cohonina and Anasazi, Swarthout (1981:55) noted differences in ceramic technology, architecture, and village layout. The small Cohonina villages incorporated a variety of architectural forms including shallow pithouses, rubble masonry pueblos, and large rectangular jacal structures. There were no kivas, the underground ceremonial chambers found at Anasazi sites (McGregor 1951). These "semi-sedentary" people apparently occupied a series of base camps and relied to a greater degree on hunting and gathering than did the Kayenta Anasazi (Sullivan 1986:331).

Schwartz (1956, 1959, 1966) proposed that the Cohonina were directly ancestral to the Havasupai of the Grand Canyon. Euler and others disagreed and argued that the Cohonina abandoned the area into which the Cerbat groups later migrated (Dobyns 1956; Euler 1958, 1975; Euler and Green 1978). The latter argument was based on dissimilarities in material culture, an archaeological hiatus indicating a period of abandonment, and the kinship between historic Hualapai and Havasupai groups.

The final Cerbat Branch phase was the Period of Maximum Geographic Expansion and Stability from A.D. 1300 to 1850 (Euler 1958). Settlement, subsistence, and architectural patterns approximated those of the historic Hualapai. Material culture incorporated brush wickiups, Tizon Brownware pottery types, coiled and twined basketry, shallow basin grinding slabs, and small triangular and Desert Side-notched projectile points. Euler emphasized the "cultural conservatism" of the Cerbat people and their proposed descendants, the Hualapai. He attributed this stability, indicated by a lack of changes in ceramic and lithic technology, to "internal conservatism", "a value system that eschewed material goods", isolation, and tribal "nationalism" (Euler 1975; 1982:64-65). If such a degree of stability was indeed characteristic of the Cerbat culture, more basic economic and social factors may underlie these ideational ones. The Cerbat people evidently maintained economic and social strategies which worked well in a challenging and unpredictable environment.

The Prescott Branch

The makers of Prescott Grayware pottery occupied the Prescott region from approximately A.D. 900 to 1300. The dates are based primarily on intrusive pottery types and a small number of dendrochronological and radiocarbon determinations (Euler 1982:60; Jeter 1977:239). The Prescott Branch heartland was a cluster of valley grasslands surrounded by wooded mountains. These areas incorporated the Chino Valley and the Kirkland and Peeples valleys to its southwest, as well as the Juniper, Sierra Prieta, and northern Bradshaw mountain ranges. Euler and Dobyns (1962) suggested that Bozarth Mesa marked the western periphery of the heartland.

The wide distribution of intrusive Prescott Grayware sherds at western Arizona sites, as well as perceived similarities to Cohonina Branch grayware, prompted Colton (1939) to assign a Patayan affiliation to the Prescott Branch. Euler's research led him to question Colton's assignment in favor of indigenous development with major influences from the Hohokam area to the southeast (Euler 1958, 1982; Euler and Dobyns 1962). Hohokam relationships also have been emphasized by other recent researchers (Gumerman and Spoerl 1980; Gumerman, Thrift, and Miller 1973; Gumerman, Weed, and Hanson 1976; Jeter 1977; Weed and Ward 1970; Wood 1980).

Lower Colorado Buffware and Tizon Brownware are rarely found at Prescott Branch sites, where intrusive ceramics are dominated by Hohokam pottery and decorated types from the Flagstaff and Kayenta regions (Jeter 1977). The prevailing view links the development of the Prescott Branch to the post-A.D. 500 Colonial period expansion of Hohokam traits along the major tributaries of the Salt and Gila rivers. This phenomenon may or may not have involved the migration of Hohokam pioneers (Weaver 1980). In Jeter's (1977:253) opinion:

> Hohokam-like structures, a small canal, and Santa Cruz, Gila Butte and Snaketown Red-on-buff ceramics at the Henderson site (Weed and Ward 1970) makes it highly plausible that expansion of agriculturalists from the south was a major factor in the rise of the "Prescott Branch".

Schroeder (1980:177) argued that indigenous populations adopted certain Hohokam subsistence practices and elements of material culture: "the Hohokam . . . did not enter an uninhabited land nor did they replace the indigenous occupants". Euler (1982:61) favored Schroeder's interpretation: "I have proposed that the Prescott Branch was a mountain extension of the Hohokam; perhaps it would be better to state this was basically a Hakataya tradition, influenced during the Colonial period by the Hohokam". He linked the development of Prescott Grayware to early Hohokam ceramics such as Gila Plain: "this impetus probably came up the Agua Fria with Wingfield Plain being an intermediate type".

It is difficult to evaluate the origins of the Prescott Branch, since there is little existing information on the transition between the Archaic and ceramic periods in the Prescott region. Wood (1980:38) suggested that the indigenous occupants of the region adopted pottery and farming, and that they inhabited small pithouse villages, between A.D. 1 and 900. Shallow pithouses at the Rattlesnake Ruin near Prescott provided some evidence for an early manifestation dated to A.D. 620 to 950 on the basis of intrusive sherds (Barnett 1970:85).

Colton (1939) outlined the basic chronology and characteristics of the Prescott Branch. His definition of Prescott Grayware ceramics incorporated six types including gray, brown, and orange variants sometimes decorated with painted black designs. One was labeled as Aquarius Orange, not to be confused with Aquarius Brown, a Tizon type. Euler and Dobyns (1962:77) later attributed color variations to poorly controlled firing, and they advocated a simple distinction between plain and painted types. They also noted that sherds in the eastern portion of the geographic range tended to be gray and to contain greater amounts of mica.

Two phases were defined on the basis of tree-ring dates assigned to intrusive pottery types (Colton 1939). The "Prescott Focus" dated from A.D. 900 to 1025. Structures consisted of shallow rectangular pithouses with rounded corners, and artifacts included trough and basin metates, choppers, pottery anvils, and full-grooved axes. Methods of disposal of the dead were unknown.

The "Chino Focus" dated from A.D. 1025 to 1200. Architectural remains included pueblos and hilltop "forts" of rock masonry construction. The pueblo structures lacked kivas. Artifacts included triangular concave-based projectile points, open trough metates, and such exotic materials as Hohokam turquoise mosaics and carved shell. Extended inhumation was the preferred method of corpse disposal.

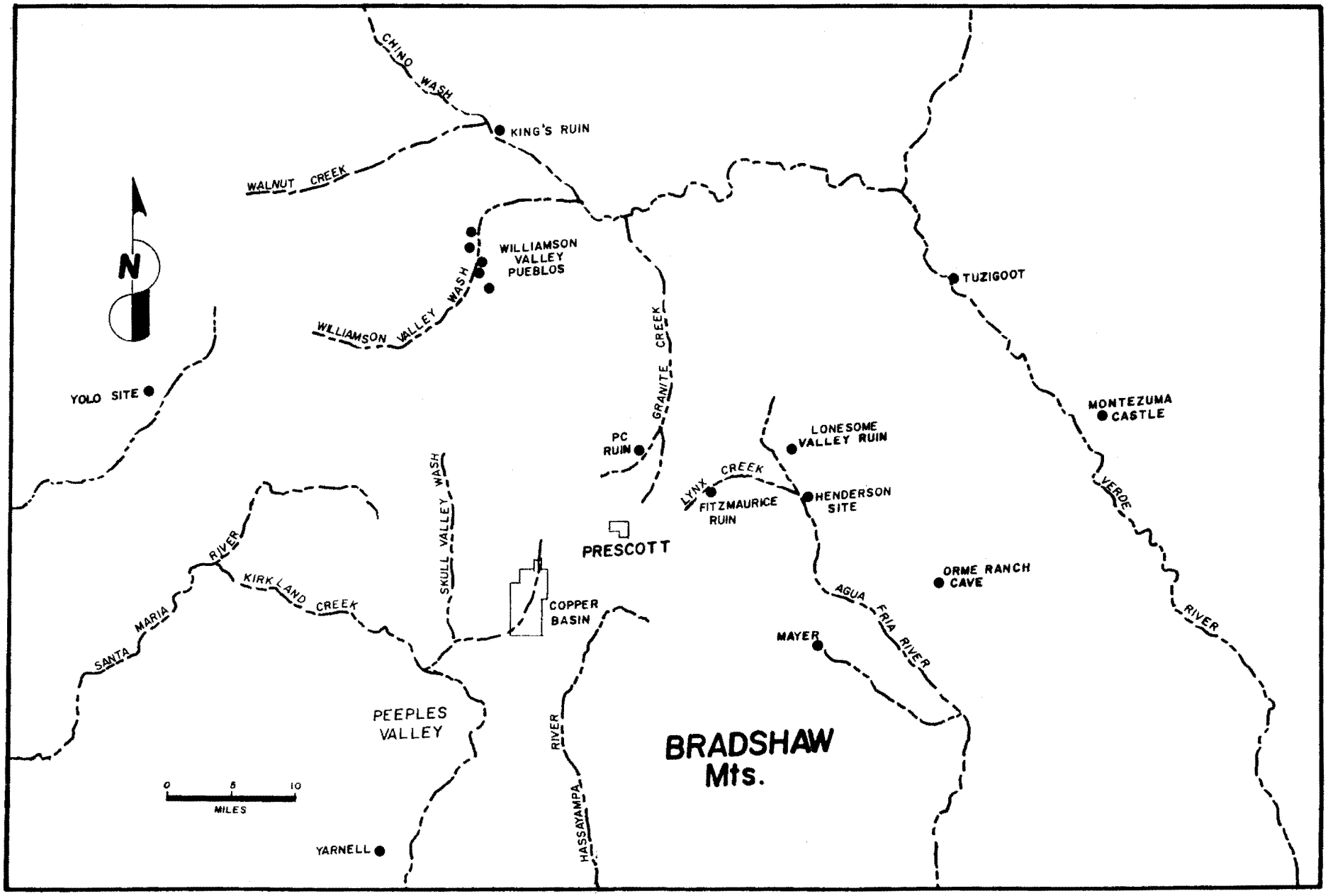
Later investigations led to chronological revisions and a better understanding of Prescott Branch architecture, material culture, and subsistence. Gumerman, Thrift, and Miller (1973) incorporated revised tree-ring dates (Bannister et al. 1966) into an expanded chronological range: A.D. 850 to 1025 for the Prescott phase, and A.D. 1025 to 1310 for the Chino phase.

Jeter (1977:250) found that shallow pithouses were most common prior to A.D. 1000, while a variety of structural types, including rock-walled pithouses, were used later. Ovoid to rectangular rock alignments apparently supported jacal structures with different types of roof support arrangements. Pueblos with multiple rooms appeared around A.D. 1100, although single-room structures persisted. Jeter (1977:252) suggested that changes in architecture and settlement patterns indicated significant shifts in social organization or subsistence practices between A.D. 1100 and 1200. There may have been two types of communities: small scattered hamlets such as the Copper Basin sites and larger communities residing in pueblos such as Fitzmaurice Ruin (Barnett 1974, 1975; Spicer and Caywood 1936).

During both phases of the Prescott sequence, villages may have participated in widespread trade networks. Hohokam "ball court" sites have been recorded in the Skull and Peeples valleys, indicating that the Prescott Branch was "somehow incorporated into the Hohokam regional system" prior to A.D. 1100 (Wilcox and Sternberg 1983:220). Jeter (1977:194) listed azurite, malachite, hematite, and quartz crystals as possible trade items from the Prescott region. Argillite, a known trade commodity, was found in the upper Chino Valley (Fish, Pilles, and Fish 1980). By A.D. 1125, Hohokam-related groups in the middle Verde Valley were displaced or absorbed by a Sinagua intrusion from the Flagstaff region, indicating changes in the structure or areal extent of the Hohokam regional interaction system (Breternitz 1960). From that time on, "the carriers of the Prescott culture were influenced by the Anasazi through Sinagua middlemen" (Euler 1982:61).

Late prehistoric shifts in settlement patterns and trade relationships may have been generated by multiple factors: by wide-ranging changes in sociopolitical systems or trade relations in central Arizona; or at a more localized level, by population growth, more frequent periods of drought, or environmental constraints on agriculture in an arid upland environment (Cordell 1984; Jeter 1977; Wood 1980).

Jeter (1977:231) found that the major Prescott Branch habitation sites were located in proximity to cultivable Lynx soils, which were concentrated in the Chino Valley. Secondary concentrations existed at the headwaters of the Agua Fria River and in the Peeples Valley-Kirkland Creek area (Jeter 1977:228). Map 5-2 depicts major archaeological sites in the Prescott region. In the Copper Basin, small habitation sites were associated with patches of arable land near Copper Basin Wash, while upper basin hunting and gathering camps were apparently used in the exploitation of wild resources. The Copper Basin sites contained



MAP 5-2: ARCHAEOLOGICAL SITES IN THE PRESCOTT REGION
(Based on Jeter 1977:15)

faunal and macrobotanical evidence for the exploitation of corn, beans, amaranth, pinyon nuts, walnuts, deer, and rabbits (Jeter 1977).

The late Chino phase was apparently a time of population aggregation. Copper Basin and the Kirkland Creek watershed were largely abandoned. Jeter (1977:269) hypothesized that stress related to environmental deterioration or population growth resulted in the eventual concentration of the population within those zones most suitable for farming, the Chino and adjacent Williamson valleys.

Similar shifts in settlement patterns occurred in upland zones east of the Prescott area after A.D. 1100. The small hilltop "forts" that proliferated after that date have been interpreted as defensive features, although they may have had other functions as well (Austin 1979; Bruder 1982; Spoerl 1979; Spoerl and Ravesloot 1981). Spoerl (1979) hypothesized that environmental instability or population growth led to competition and conflict over scarce resources during the late prehistoric period. Bruder (1982) likewise argued that poor harvests and conflicts caused the abandonment of less agriculturally productive zones and the subsequent aggregation of groups into larger settlements within more restricted areas. Eventually or even concurrently, there may have been shifts toward less intensive subsistence strategies based on a greater degree of hunting and gathering. Events in the Prescott region may have paralleled those in the uplands of the Agua Fria and Verde watersheds.

By A.D. 1300, most Chino phase sites had been abandoned, and "the Prescott Branch seems to have almost ceased to exist as a recognizable entity" (Jeter 1977:42). To the north, the Cohonina Branch apparently suffered a similar fate. The period between A.D. 1200 and 1300 was a time of widespread local and regional "abandonments" in the Southwest, although stability and expansion characterized the concurrent period in much of the Patayan region. Cordell (1984:304-312) reviewed the nature of events and their proposed causes. Not surprisingly, she concluded that abandonment was a complex process involving different local responses to a multitude of factors, not simply a massive retreat related to a single "great drought" for which little evidence exists. "Abandonments" probably did incorporate migrations as indicated by the aggregation of populations into large, late prehistoric settlements in the Hopi, Little Colorado River, eastern Arizona upland, and middle Gila areas. However, in some areas, population declines or shifts to more mobile or dispersed settlement and subsistence strategies may have been inappropriately labeled as abandonments.

These changes have been viewed as responses to internal strife, intervillage conflicts, and raids by Yuman or Athabaskan immigrants; an increase in mortality from infectious diseases in aggregated populations; the disruption of Mesoamerican trade relations; and environmental factors which adversely affected agricultural harvests and arable soils. The latter may have incorporated increased arroyo cutting and a lowering of water tables related to continued land clearing and a shift toward more intense and frequent summer storms; an increased frequency of droughts after A.D. 1150 (Cordell 1984:311); or in the Hohokam area, salinization and waterlogging of irrigated fields.

There are two basic hypotheses, not necessarily mutually exclusive, concerning the demise of the Prescott Branch and its replacement by the Yavapai. Yavapai immigrants may have moved into the region from the north or west after its abandonment by Prescott Branch groups (Pilles 1981:175-176). A Yavapai migration would represent a final expansion of the Cerbat Branch into the central Arizona uplands, symbolized in Hualapai myths by the expulsion of the Yavapai from Meriwhitica Canyon (Ewing 1961). According to Euler (1982:61):

> Given the fact that the Pai (Walapai and Havasupai) had a material cultural tradition identical to that of the Yavapai, the ceramics of the latter group should also fit within Tizon Brown Ware. Numerous examples of this ware have been found in historic contexts within Yavapai territory.

In favor of this view, Jeter (1977:255) stressed differences between Prescott Branch and Yavapai subsistence strategies, particularly the greater reliance on farming by the former. However, Mariella (1983) argued that the differences had been overemphasized due to the disruption of Yavapai farming during the historic period. Jeter (1977:254) conceded that the Yavapai may have been at least partially derived "from a remnant portion of the Prescott Branch population".

Pilles (1981:172) described a variation of Schroeder's (1960, 1981) alternative hypothesis that indigenous Hakataya peoples, influenced by the Hohokam and other surrounding groups, underwent a successive series of social and economic changes:

> A variation . . . suggests the Yavapai are descendants of other prehistoric groups such as the Prescott and Southern Sinagua. According to this concept, hunting and gathering was a basic way of life to the people of central Arizona. As these groups developed and came into contact with people from other areas, exchange relationships and a more complex organization were formed around a sedentary, agricultural life style. This experiment failed, however, perhaps due to a variety of reasons such as climatic change, shifts in regional centers of importance, disruption of elements in the exchange system, etc. The people then returned to a hunting and gathering life style and the cultural makeup typified by this adaptation; i.e., they became Yavapai.

In some portions of the Hakataya range, indigenous groups may have periodically modified subsistence and settlement strategies and eventually reverted to an emphasis on wild resources. Archaeological investigations at late Chino phase sites could contribute to the evaluation of late prehistoric events and cultural interrelationships in the Prescott region. The resolution of Yavapai origins is complicated by the problem of identifying relatively insubstantial Yavapai sites, a difficult but not insurmountable task (Euler 1958; Jeter 1977:77; Pilles 1981).

changes might be difficult to detect in the archaeological record. This type of adaptive system could be maintained over a long period if population densities remained low as a result of low birth rates or emigration. These observations apply even to the Colorado River farmers:

> 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 . . . or in the development of religious and social patterns usually associated with agricultural peoples [Kelly 1977:1].

It would be interesting to compare the Patayan river and Cerbat groups to the Prescott or Cohonina cultures, which were backwoods participants in the Southwestern ceramic period trends of agricultural intensification, sedentism, changing community and regional organizational patterns, late prehistoric population aggregation, and "abandonment" (Cordell 1984; Cordell and Plog 1979). This research orientation would parallel the comparative approach advocated by Thomas for the Great Basin.

At the lowest geographic scales of analysis, one can focus on particular sites, local areas, or comparisions of areas within the overview region. Studies could target the refinement of the regional chronology; the definition of specific land use patterns or subregional variants in settlement and subsistence systems; the nature of river-upland relationships; or specific cultural frontiers. 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.

Most research problems can be subsumed into general research domains, topical constructs which can be applied at different levels of abstraction or geographic scale. For west central Arizona, particularly relevant research domains include the following: (1) culture history; (2) cultural ecology and socioeconomic systems; (3) technology; (4) demography; (5) social interaction and exchange; (6) ideological systems; and (7) paleoenvironmental reconstruction. There can be a considerable degree of overlap among these domains. The following summary will include a general definition of each domain; a brief review of relevant categories of data and interpretive problems; and comments on related regional research issues. Chapters 4 and 5, which summarize archaeological research and the regional prehistory, describe specific research problems, alternative hypotheses, and relevant variables for particular periods and cultural divisions.

CULTURE HISTORY

The domain of culture history entails the basic distributional description of archaeological patterns through space and time. This task 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, tree-ring specimens for dendrochronology, and patinated lithic artifacts for experimental cation-ratio dating (Dorn et al. 1986). Relatively undisturbed stratified deposits can reveal temporal sequences and changes in archaeological patterns. Many sites in the Kingman region have been cross-dated by the presence of "diagnostic" artifacts anchored to chronological sequences from other regions. Temporally diagnostic artifacts generally consist of stylistically distinctive projectile points or decorated pottery types. A range of traits, including architecture and relatively nondescript pottery plainwares, has been used to define cultural affiliations (Colton 1939; Dobyns 1956; Euler 1982).

Interpretive problems include temporal or spatial overlapping of traits or attributes; temporal lags in the appearance and spread of archaeological traits; the problem of controlling for variations in function or raw material distribution as opposed to temporal or cultural differences; and certain technical limitations of chronometric dating. In many areas of the Southwest, temporal sequences of diagnostic artifacts are insufficiently anchored by chronometric evidence. In the Kingman region, complications include a particularly strong predominance of utilitarian over diagnostic artifacts and an apparent lack of temporal variation in many artifact and feature types. Decades of illegal collecting have further reduced the incidence of distinctive diagnostic artifacts. Particularly in the desert portions of the region, there is a predominance of surface and open sites in which organic remains tend to be poorly preserved. Dendrochronological studies are limited by the lack of substantial architectural remains or suitable tree species at sites in the Basin and Range Province. However, they should be undertaken in the woodland zones or other areas where pueblo structures with preserved beams exist (Jeter 1977).

Chronological sequences need to be refined and strengthened through studies of stratified sites and analyses of datable materials and associated distinctive artifacts. The Great Basin provides ample models for archaeological research at stratified caves and rockshelters (Madsen and O'Connell 1982). Improved characterization and spatial tracking of diagnostic artifacts is an additional priority. Again, studies of Great Basin projectile points can contribute analytical models (Thomas 1982). During both the Archaic and ceramic periods in the overview region, certain distinctive projectile point styles were geographically widespread. It may be possible to track their geographic spread or the interaction systems associated with the use of these temporal markers. Existing museum collections, such as Rogers' collections from western Arizona, offer possibilities for attribute and comparative analyses of diagnostic artifacts (Swarthout 1981:36).

Additional studies of ceramic decorative styles, distinctive manufacturing techniques, and such variables as rim forms of Lower Colorado Buffware may strengthen the role of ceramic types as temporally and spatially diagnostic artifacts (Waters 1982). However, geographic and compositional intergradations among undecorated ceramic types complicate the tasks of classification, boundary definition,

CHAPTER 6
RESEARCH DOMAINS

Cultural resources are repositories of information that can further our understanding of the relationships between human societies and the natural environment. This information can also reveal processes of stability, change, and technological advancement. In order to extract such information from prehistoric cultural resources, which offer a unique long-term perspective, scientists define and evaluate specific research problems that can vary in terms of topics, levels of generality, and geographic scale.

Productive research ultimately is rooted in the description of basic patterns of spatial and temporal variation. These patterns are addressed in studies which seek to explain similarities, differences, changes, and their underlying causes. Ideally, research issues are incorporated into explanatory models or alternative hypotheses that specify the relevant data required for productive investigations. Research is a continuous process that involves comparative studies and the reevaluation and revision of models. Archaeological patterns should not be forced to fit existing models but instead should illuminate them, require revisions, or suggest new models in a continuing process of inquiry.

A Class I regional overview should "enable" rather than "dictate" future research, as Richard Matson commented in a 1979 letter to BLM Phoenix District archaeologists. As Matson noted, research potential can exist regardless of whether particular research problems are being actively pursued at a given time. The overview should offer both direction and flexibility to future researchers.

In comparison to other areas of the Southwest, little recent work has been accomplished in the Kingman region. Environmental heterogeneity complicates the development of research models. Existing models and classification systems need to be substantiated or tested with additional data. Thus the initial step of archaeological research, the definition of basic patterns of variation in settlement patterns and material remains, continues to hold a high research priority.

The region offers a great potential, not just for more traditional types of scientific research, but also for innovative approaches involving experimental technological studies and ethnographic work. Existing examples of such work include the experimental reproduction of grinding implements at Colorado River quarries (Huckell 1986); ethnobotanical studies of "lost" food plants formerly used by the Hualapai (Smith 1973); "ethno-archaeological" studies of Hualapai food grinding implements (Euler and Dobyns 1983); and geochemical and distributional studies of archaeological obsidian from lower Burro Creek (Brown 1982; Shackley 1986).

Increasingly specific research problems can be defined at progressively smaller geographic scales. The largest scale of all, a global perspective, was employed by McClellan, Phillips, and Belshaw (1978) in their overview of research in the Lake Mead National Recreation Area. In their view, local knowledge ultimately could be applied to understanding common features of human adaptations to arid lands. Global issues related to arid lands included alternative strategies for coping with drought; the relative stability of different economic strategies and organizational systems under similar environmental conditions; the nature of interrelationships of oasis and hinterland populations; and the importance of extra-regional sociopolitical or economic ties in achieving stability. As regional examples related to these issues, McClellan, Phillips, and Belshaw cited the replacement of the Cohonina by the Pai in the Grand Canyon and the relatively long-term cultural stability in the Hualapai country as opposed to the development of more intensive economic systems and greater sociopolitical complexity in other areas of the prehistoric Southwest.

Cross-cultural correlations can be addressed at the global scale, but the basic causes and processes of cultural stability and change require regional and local levels of analysis. The Kingman region is a cultural and environmental bridge between the Great Basin and the Southwest. As a transitional zone, it links two areas that shared the constraints of aridity and environmental unpredictability yet varied in such key characteristics as accessibility to the highly developed societies of Mesoamerica. The Kingman region was a zone of migrations, interaction, and characteristics derived from both areas. As such, it can reveal much about their differences and interrelationships. The people of the Patayan region pushed agriculture to its environmental limits in the American deserts; in that sense, they were versatile experimenters. They were entrepreneurs as well, traders who apparently shored up their peripheral position and precarious economic situation through commerce. Yet among the major cultural traditions of the Southwest, they adhered the most closely to their Archaic heritage. Euler (1958, 1975, 1982) has emphasized the centuries of cultural and economic stability in the Hualapai country. This view has gained support from archaeological studies which indicate similarities in Archaic, Cerbat, and Hualapai adaptive strategies (Linford 1979; Matson 1971; Schilz 1982). This apparent continuity of patterns parallels the situation in the central Great Basin, characterized by Thomas (1982:166) as "a place of rather striking long-term stability". Thomas noted that "while this may be boring to some, I see it as the beginning of a very stimulating episode of research . . . what factors account for the variability and change evident in some parts of the Great Basin and the apparent stability in the central Great Basin?"

The issue of stability is an important research consideration for the Kingman region. Changes may well have occurred more frequently or had more drastic effects than archaeologists yet have realized. It is difficult to define the meaning of stability in the sense of long-term survival strategies. Change within limits, rather than a lack of changes, is probably the most reasonable definition. Flexibility, the capacity to respond quickly and effectively to periodic but unpredictable environmental fluctuations, may have involved frequent short-term shifts in subsistence strategies, social organization, the spatial distribution of populations, or the degree of reliance on trade. Such

and the assignment of cultural affiliations (Stone 1982). In reference to western and central Arizona plainwares, Malcolm Rogers (1945:191) noted that "because the pastes employed present a confusing similarity, very little headway has been made toward solving their origins, sequence, and peculiar overlapping distributions". Breternitz (1960:27) argued that many separate "wares" really constituted a single basic paddle-and-anvil manufactured brownware. In 1980, a group of archaeologists met informally at the Museum of Northern Arizona to discuss issues of ceramic classification in central and western Arizona. To a great extent, they echoed the difficulties voiced by earlier researchers. Yet some plainware types, such as Cerbat Brown of Tizon Brownware and heavily micaceous types of Prescott Grayware, appear to be distinctive. Differences between the buff-firing sedimentary clay used by the Colorado River valley groups and the reddish-brown residual clay used by the upland groups help to define river and upland plainwares (Rogers 1936). 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 (Stone 1982).

The diagnostic and distributional characteristics of other traits or classes of cultural material warrant additional research. These include rock art designs, unfired clay objects, split-twig figurines, and other perishable artifacts such as cordage, basketry, and sandals. Textiles (cordage, baskets, and woven cloth) represent a versatile medium offering excellent possibilities for productive diagnostic studies (Adovasio 1972, 1974). The Kingman region appears to incorporate a zone of overlap between Southwestern and Great Basin areas exhibiting distinctive basketry manufacturing techniques (Advasio 1974:143). Caves in the overview area have yielded impressive specimens, few of which have been recovered scientifically or examined closely.

Culture historical data bear on research issues related to cultural origins, continuity, stability, and specific changes. They provide an interpretive framework for studies of *in situ* development vs. abandonment and replacement vs. competition and displacement of populations. In the overview area, one such issue is the generally assumed continuity between the prehistoric Cerbat Branch and the historic Hualapai. Euler and Dobyns have argued emphatically in favor of this link (Dobyns 1956; Dobyns and Euler 1956; Euler 1958, 1982). Others have called for stronger evidence (Swarthout 1981:59-60). Linford (1979:41) questioned the physical association of Tizon ceramics with historic artifacts at the sites examined by Dobyns and Euler. Another criticism has focused on the classification of the "Wilder pot" as an example of Hualapai pottery and Tizon Brownware (Dobyns 1956:147-150). This jar owned by an old Hualapai woman was said to have been manufactured by the Hualapai, who stopped producing pottery by the late 1800s (Kroeber 1935). The Wilder pot was shown to the participants at the 1980 informal ceramics conference at the Museum of Northern Arizona, some of whom observed that it most resembled Papago ware, which itself incorporates a great degree of technological diversity (Fontana et al. 1962). Suffice it to say that more work, based on adequate sample sizes, needs to be accomplished in the area of ceramic classification. Euler's "direct historical" approach, which focuses on sites having historic and prehistoric components, is one appropriate research strategy for the resolution of cultural continuity (Euler 1981:211). To date, no positive evidence has been presented to support an alternative to Cerbat-Hualapai continuity.

The most serious temporal gaps for the region include the earliest occupational periods (the initial occupation, the validity of the San Dieguito I concept, and the nature of early and middle Archaic occupations); the period from A.D. 1 to 900; and the protohistoric period from A.D. 1300 to 1700. However, all periods require further research.

CULTURAL ECOLOGY AND SOCIOECONOMIC SYSTEMS

This research domain focuses on the interrelationships of human activities and organization within the natural environment. This is the realm of Julian Steward's "culture core", the links among environmental, economic, and technological factors which influence all other aspects of society (Steward 1938, 1955). In archaeology, it incorporates the study of subsistence and settlement strategies, the organization of labor and resource consumption, and impinging environmental and technological factors.

Together, studies of specific sites and areal or 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 sites.

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.

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. Given certain technological capabilities and conditions of accessibility, food resources and raw materials varied in nutritional value, workability, reliability, periods of availability, and efficiency of exploitation. The distribution and relative densities of particular resources determined the suitability of particular areas for subsistence, tool manufacture, communication, travel, and other activities.

Interpretive problems include difficulties encountered in the determination of site functions. Natural deterioration, cultural factors, and data recovery techniques contribute to the differential preservation of plant and faunal remains (Gasser 1982a:217). 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

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. The interpretation of these variables can be complex and difficult, particularly for surface scatters. Button (1980:4) expressed this difficulty in simple terms:

> Does a given cluster represent a single two-day shindig by 500 folks celebrating a successful rabbit or antelope drive, or a season's camp of a much smaller group, or a prehistoric KOA Kampground where single family bands periodically spent the night over the course of a hundred years?

Despite interpretive difficulties, archaeologists have advanced in the development of sophisticated methods for quantitative spatial analysis and the determination of "site formation processes" (Ackerly 1982; Button 1980; Chapman 1980; Doelle 1980; Schiffer 1983). For example, Ackerly (1982) employed statistical techniques to examine differences in intrasite spatial structure, artifact density, and artifact diversity among sites recorded during a sample survey. On the basis of this analysis, he was able to define three basic site types: base camps, relatively short-term camps, and limited activity areas of repeated use.

Site reoccupations also complicate the definition of settlement systems. It is possible that single sites had periodically different roles in the same settlement system, or that the particular function of a site such as a hunting camp or quarry was maintained through a succession of different systems (Binford 1980, 1982). Difficulties in establishing the contemporaneity of sites or occupations could contribute to a false impression of stability over time.

In the Kingman region of west central Arizona, there is a need for more sophisticated quantitative studies of site functions. Studies of survey data have focused largely on the presence or absence of artifact and feature types using a limited repertoire of cluster analysis techniques (Crocker 1979; Kincaid and Giorgi 1979; Matson 1971; Swarthout and Powers 1978). More attention should be directed to the degree of diversity within assemblages (Kintigh 1984), intrasite spatial patterning, and the effect of lithic raw material availability and associated manufacturing activities on the interpretation of site functions (Linford 1979).

Particularly in the Basin and Range Province, there is a pattern of numerous small sites with diverse assemblages including finished tools. They seem to represent base camps, or multiple activity sites, occupied for varying lengths of time. A lack of clear functional differences, along with a high incidence of low density artifact scatters, indicates a pattern that Binford (1980) has termed "foraging". Foraging involves frequent moves to different resource zones. Along Binford's proposed continuum from foraging to "collecting", the latter pattern involves relatively lower mobility, greater reliance on storage, and longer-term base camps with functonally specific satellite camps. Since these concepts embody a continuum as well as possible seasonal differences within single systems, rigid distinctions should not be drawn between foragers and collectors. However, the concept of a mobility continuum can guide subregional comparisons of settlement and subsistence systems. More substantial winter base camps and storage structures would be expected in the cooler upland and plateau zones with more reliable but spatially concentrated springs. Enhanced possibilities for farming in areas of greater precipitation or in canyons with reliable springs also should have reduced overall mobility.

Important research priorities include the mapping of land use patterns and associated environmental variables as well as the development and testing of subsistence and settlement models. There is a need to move beyond models based primarily on ethnographic analogy, such as Matson's Hualapai model (Matson 1971). Although ethnographies remain a valuable resource for hypothesis development and interpretation, alternative models of economic and settlement systems also should incorporate theoretical principles, cross-cultural correlations, and analytical approaches based on the characteristics and distribution of target resources. Martin's (1973) paper on Pai subsistence practices, task groups, and local group sizes is an example of an approach incorporating ethnographic data, theoretical principles, and a cross-cultural perspective.

There is also a need to move beyond a "generalized" Hualapai model toward the characterization of subregional variants that eventually can be compared with each other and with systems incorporating a greater reliance on agriculture (Fowler 1982). Settlement studies must confront the environmental heterogeneity of the region. As Matson commented to BLM archaeologists, his settlement model applied only to the Basin and Range country of west central Arizona. Several approaches could be taken toward the development of subregional settlement and socioeconomic models. One approach could focus on the documented geographic ranges of specific subtribes or regional bands (Map 3-1). An alternative approach could target smaller areas incorporating multiple zones likely to yield diverse natural resources. Such areas might include different elevations at the desert-plateau interface along the Grand Wash Cliffs; floodplains, terraces, and adjacent bajada and mountainous zones along the Colorado, Bill Williams, or Big Sandy rivers; or particular watersheds incorporating major canyons or streams that crosscut several environmental zones, such as Burro Creek (Keller 1986:61). Finally, in order to understand the full range of land use activities, specific studies could focus on mountain passes, potential travel routes, the vicinities of major springs, or potentially rare but valuable resource concentrations such as pinyon groves or turquoise deposits.

Throughout the region, prehistoric villages and major base camps tend to be located near the most reliable water sources (Dobyns 1956; Jeter 1977; Kincaid and Giorgi 1979; Kroeber 1935; Matson 1971; Swarthout 1981; Swarthout and Powers 1978). However, there seems to be no clear association between lesser camps or resource areas and known water sources. Matson noted that although the Basin and Range region is extremely arid, the mountains contain numerous small, impermanent, and dispersed water sources which could provide adequate domestic supplies for highly mobile, dispersed groups. In the Plateau country, groups may have been more closely tethered to the relatively few but reliable and productive springs concentrated in the deep tributary canyons of the Colorado River. Such differences could underlie distinctions along the relative mobility continuum defined by Binford (1980). Hydrological studies could make an important contribution to cultural ecological analyses.

Data from the region can be applied to numerous research issues in the domain of cultural ecology and socioeconomic systems. These include but are not limited to the following general issues:

(1) The nature of changes in early, middle, and late Archaic socioeconomic and settlement systems and parallels to concurrent changes in the Great Basin and in other regions of the Southwest.

(2) The changing use of the Colorado River valley.

(3) The nature of flexibility in relatively stable subsistence and settlement systems.

(4) The nature of storage strategies and the relative importance of caching and storage in different socioeconomic systems.

(5) The adoption, spread, and relative importance of farming and the nature of farming strategies in different microenvironments.

(6) The exploitation of nonriverine resources by river-based groups.

(7) The characteristics and function of the huge roasting pits along the canyon segment of the Colorado River.

(8) The nature and role of trade, in both subsistence and non-subsistence or "exotic" commodities, in socioeconomic systems. Did trade constitute a source of needed security for the inhabitants of a marginal and unpredictable environment? Did it increase the overall efficiency or security of socioeconomic systems for the participating groups?

(9) The factors and processes accounting for the pithouse-to-pueblo transition and related sociocultural changes in the eastern part of the region.

(10) The dynamics of areal "abandonments" and their underlying economic and social factors.

TECHNOLOGY

Technology incorporates the manufacture and use of tools and facilities for extracting and processing resources and for producing other tools, material objects, and structures. Technological constraints and capabilities affect economic strategies, the organization of labor, and the efficiency of resource use. Changes can be sensitive indicators of shifts in subsistence and settlement strategies, task organization, or trade relations.

Relevant data include the distribution and qualities of raw materials; attributes of tools and debitage that reveal manufacturing techiques and stages, functional efficiency, durability, repair and maintenance, and types of use wear; and experimental studies of manufacturing and use.

Interpretive problems include the complexities of multivariate analysis and the choice of appropriate attributes for analysis. It can be difficult to distinguish among potential sources of variation: raw material qualities, manufacturing techniques, intended function, cultural custom, style or decoration, multiple functions, or changes in the characteristics and uses of single tools through time.

In the overview region, there is a need for basic multivariate descriptive studies of technology based on adequate sample sizes and geographic coverage. Analyses should incorporate the reevaluation and, if indicated by the data, the revision of existing classification schemes. Analyses should be directed toward classes of perishable artifacts as well as lithics and ceramics.

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 different 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.

In his study of grinding implement manufacturing along the Colorado River, Huckell (1986) addressed the issue of production for local use vs. trade. He considered numerous factors including specialized production techniques, estimates of tool use-life and local requirements, and the estimated production rates for local quarries. He concluded that the implements were destined for local use. More exotic raw materials, such as turquoise or argillite, may have been mined for export or fashioned into ornaments for trade. Prehistoric turquoise mines have been found in the Cerbat Mountains near Kingman, but the extent to which they were exploited by local groups is uncertain (Johnston 1964; True and Reinman 1973). A lack of turquoise ornaments or debitage at local sites indicates little specialized production of ornaments (Don Simonis, personal communication 1987). However, mining techniques and the possibilities of raw material export or long-distance mining expeditions deserve further study (Lyneis 1982).

DEMOGRAPHY

Demography encompasses the characteristics of human populations: size, distribution, age and sex structure, fertility and mortality rates, and genetic relationships. Population growth and migrations often assume causal priority in models of prehistoric cultural changes (Cohen 1977; Madsen and O'Connell 1982).

Archaeological settlement patterns can yield information on the size and distribution of populations. Population estimates generally rely on architectural variables interpreted with reference to assumptions derived from historic or ethnographic observations on household composition. For more substantial structures such as pueblos, relevant variables include estimated household size, number of occupied rooms or structures per household and settlement, estimated lengths of occupation, and the history of construction at a particular settlement. At sites with less substantial structures, estimates might rely on site size or the number of hearths (Hassan 1981; Huckell 1986:48-49; Lightfoot 1981; Plog 1974).

Human skeletal remains reveal the age and sex structure of populations, genetic interrelationships, and aspects of prehistoric health and nutrition. Biological studies of living populations have been used to generate model life tables for prehistoric populations (Weiss 1973). Computer simulations and mathematical modeling also have been used to study Pai group sizes (Martin 1973) and to predict

the effects of demographic changes on human behavior and archaeological patterns (Moore 1981; Wobst 1974, 1976; Zimmerman 1977).

Interpretive problems reflect the structure of assumptions and relatively detailed data requirements for prehistoric demography. Since population estimates often employ assumptions based on indirect or inconclusive evidence, they incorporate large margins of error. It can be difficult to establish the contemporaneity of occupations at different settlements and thus to track population changes or to define occupational gaps in regional sequences. Finally, there is the problem of distinguishing between migrations and *in situ* demographic or cultural changes. Rouse (1958) suggested archaeological criteria for evaluating "site unit intrusions" as an aspect of migrations, but these criteria have been difficult to apply (McGuire and Schiffer 1982:158). Schwartz (1970) attempted to track phases of migration in the Anasazi settlement of the Grand Canyon. The challenge is to construct testable alternative hypotheses that deal with the push and pull of donor and recipient areas (Bruder 1982). Difficulties in constructing and evaluating migration models are illustrated by the continuing controversy over the Shoshonean expansion into the Great Basin (Bettinger and Baumhoff 1982; Lyneis 1982:180; Thomas 1982:167).

In much of the Kingman region, demographic patterns are obscured by such factors as high mobility, ephemeral structures, the practices of cremation and isolated burials, the cultural practice of destroying the structures of the deceased, and the frequent reoccupation of settlements. The best prospects for demographic studies exist in the mountain and plateau areas with relatively sedentary settlements and more substantial architecture, such as the highland zone occupied by the Prescott Branch.

In general, the understanding of demographic variables can be furthered through the strengthening of chronological sequences and the development of a broader data base for analyses of settlement patterns and material culture. These in turn can then support the development of testable alternative models incorporating demographic processes.

SOCIAL INTERACTION AND EXCHANGE

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. Difficulties in ceramic plainware classification have been discussed previously. 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. Once again, the establishment of occupational contemporaneity is a goal. The issue of shared land use vs. 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. His conclusions, based on an analysis of ceramic assemblages from sites throughout the region, are summarized below. The proposed patterns represent hypotheses that require further testing, particularly since Dobyns was dealing with small ceramic samples from many sites.

Dobyns found that Tizon Brownware dominated ceramic assemblages in much of the Hualapai ethnographic range, accounting for over 70% of the sherds at most sites. To the west and south, Lower Colorado Buffware was dominant along the Colorado and Bill Williams rivers, and it accounted for approximately 30% 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).

To the east of Hualapai country, Prescott Grayware dominated assemblages in the Prescott Branch heartland: the Chino Valley and the mountains surrounding Prescott. Beyond this heartland were the Sinagua of the Verde Valley and the Cohonina of the Kaibab forest. There was an overlap of Prescott and Tizon pottery wares in the Mohon and Aquarius mountain ranges and the upper reaches of Burro Creek and the Santa Maria River. The distribution of pueblos also indicates that this was a cultural frontier. It roughly correlates with the boundary of the Basin and Range Province as well as the historic buffer zone between

the Hualapai and Yavapai (Gifford 1936). However, Euler (1982) argued that Prescott Branch "enclaves" existed in the Basin and Range country.

Cohonina pottery types accounted for about a third of the sherds recovered from the eastern part of the Hualapai Indian Reservation. The lower Grand Canyon apparently was a zone of Anasazi colonization and interaction with the Cohonina. Pueblos and cliff dwellings exist in Meriwhitica Canyon and other deep side canyons on the reservation. In general, intrusive Cohonina, Kayenta Anasazi, and Hopi ceramics from the Colorado Plateau were concentrated near sites in the vicinities of present-day Prescott and Kingman, areas apparently incorporated into Pueblo trade networks. Finally, small amounts of Paiute pottery indicated late prehistoric or historic interaction with groups in the Arizona Strip country, but the Grand Canyon was a barrier and boundary.

Pre-ceramic cultural frontiers, indicated by the overlapping of traits associated with the Amargosa and Basketmaker traditions, also deserve further study. Analyses of Archaic material culture should incorporate comparisons with assemblages from Nevada, the Arizona Strip, and southern Utah. Technological analyses of baskets and other perishable artifacts may illuminate the nature of the broader frontier between the Great Basin and the Southwest.

Moving beyond the study of cultural frontiers, analyses could focus on more localized systems of interaction or communication. Settlement analyses thus would focus on sites as components of communities and regional social networks. For example, Jeter (1977) suggested that Chino phase settlements in the Prescott region were organized into larger dominant communities surrounded by smaller farming villages. Wood (1980:89) proposed that those settlements were "arranged and combined to form organizational patterns and hierarchies in multi-site communities". If the larger pueblo sites were to yield relatively higher proportions of trade items, this would indicate that they linked the Prescott Branch to wide-ranging trade networks. The nature and distribution of hilltop "fort" pueblos is relevant to hypotheses regarding defense, warfare, and communication systems (Austin 1977, 1979; Spoerl 1979; Spoerl and Ravesloot 1981). It would be interesting to examine the relationships of habitation sites to Austin's proposed "fort" communication networks and to conduct experimental signaling studies to test their effectiveness.

Long-distance trade networks incorporating the Hohokam, Sinagua, Anasazi, and California groups should be an important aspect of regional archaeological research. Patterns of trade indicate economic strategies as well as the nature of social and political ties among groups. The Virgin Branch Anasazi, river Patayan, and Cerbat groups had access to such valued goods as salt and turquoise, and they moved Pacific Coast shell, other California goods, and Anasazi woven cloth along a major east-west trade route which apparently paralleled present Interstate Highway 40 (Davis 1961; Schroeder 1961, 1981). The distribution of intrusive ceramics supports the existence of this trade route. The Prescott Branch groups may have been peripheral participants in a trade network linking the Hohokam, Verde Valley, and Flagstaff areas (Fish, Pilles, and Fish 1980; Wilcox and Sternberg 1983).

Sourcing and distributional analyses of decorated pottery types, diagnostic artifacts, and distinctive raw materials are an important aspect of trade studies, since they allow researchers to track exchange ties through space and time. The geochemical characterization of obsidian sources, a relatively young yet promising research specialization, has already incorporated analyses of "Apache tears" from lower Burro Creek (Brown 1982; Shackley 1986). Future analyses should track the distribution of artifacts produced from these obsidian nodules as well as the obsidian from well-known sources in the Flagstaff and Williams areas. Other obsidian sources, including reported occurrences in the Bradshaw Mountains (Gifford 1936), should be located and characterized.

IDEOLOGICAL SYSTEMS

This is the domain of cultural symbolism, religion, ceremonial organization, magical practices, and art. Data which might reveal symbolic or ceremonial behavior include rock art, intaglios, burials, ceremonial structures, and such unusual or exotic items as split-twig figurines or turquoise fetishes. The most obvious interpretive difficulty is a strongly subjective element which renders it difficult to test alternative hypotheses. However, detailed contextual analyses and distributional patterning can offer insights into symbolic and ceremonial behavior.

In the overview region, there is an apparent lack of such ceremonial structures as kivas. The historic Yuman tribes, even the farmers along the Colorado River, had few public ceremonies and even fewer rites associated with agricultural fertility. In these respects, they differed from the Anasazi and later Pueblo groups. Kelly (1977) argued that the individualized focus of Yuman religions, which emphasized shamanism, dreaming, and death rites, reflected the self-sufficiency and organizational flexibility required for survival in an arid environment offering unpredictable farming success. Yet the Hopi maintained a relatively complex social and ceremonial organization in a similarly risky environment. Future research should address the complex interrelationships among environmental contexts, economic strategies, and social and ceremonial organization. For example, the lack of kivas at Cohonina and Prescott Branch sites may indicate that the backwoods farmers were linked more closely to the Anasazi and Sinagua through trade or borrowed farming strategies than through participation in shared ceremonial systems.

In the overview region, other research issues relevant to ideological systems include the origin, function, and distribution of the split-twig figurine complex; and the probable functions and cultural affiliation of intaglio sites.

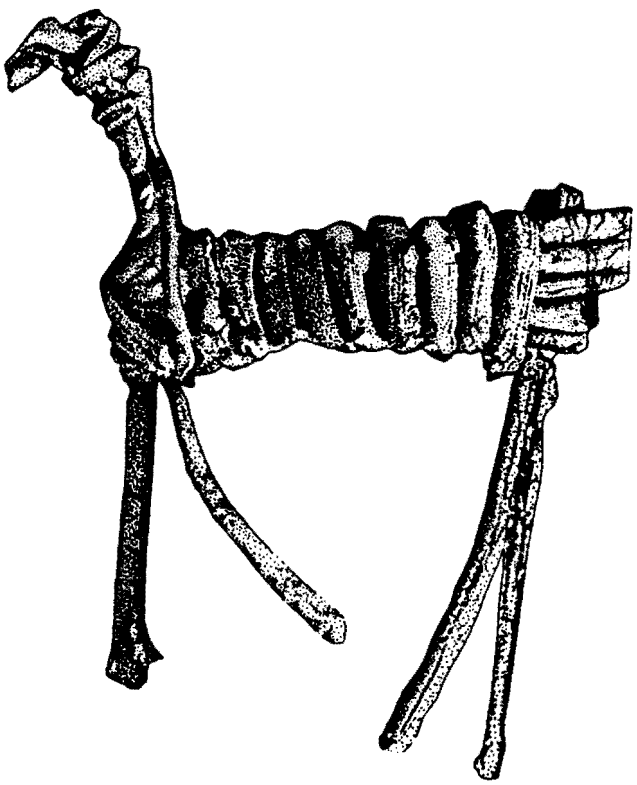
PALEOENVIRONMENTAL RECONSTRUCTION

The accurate description of past environments and environmental changes is critical to understanding prehistoric land use and changes in the cultural systems incorporated into other research domains. Relevant data can be gained through studies of geomorphic processes, tree-ring

widths, fossilized packrat nests, and organic remains such as fossilized pollen, coprolites, animal bones, and plant remains. Interpretive problems are related to poor preservation and the recovery of adequate sample sizes, and to biases introduced by collection or analytical procedures. It is best to employ a multidisciplinary approach incorporating multiple classes of data (Cordell 1984; Madsen and O'Connell 1982). There should be an expansion of packrat nest studies in the Basin and Range country and the Grand Canyon, and dendroclimatic studies should be extended into the forests and woodlands of the upland Patayan country and the western Plateau.

CONCLUSION

This region of west central Arizona offers many opportunities for productive and innovative research on numerous topics and issues. The currently limited data base and paucity of detailed studies renders it difficult to define specific research priorities in greater detail. Interpretive difficulties and challenges reflect the region's transitional position, its cultural and environmental diversity, and the practical difficulties of archaeological data recovery and interpretation. It is difficult to sort the multiple variables that pose constraints and offer alternative paths to cultural development. Archaeologists need to formulate testable alternative hypotheses that explicitly link human behavior or cultural processes to the archaeological record as revealed in cultural resources. Many interpretive difficulties may yet be ameliorated, just as problems have been overcome in the past. Ultimately, the Kingman region will be recognized as more than a peripheral zone to be quickly summarized in Southwestern syntheses. Its relatively egalitarian social systems and stable economic strategies, coupled with its remoteness from Mesoamerican influences, offer a comparative baseline for studies of more complex Southwestern societies that underwent more pronounced series of changes through time.



CHAPTER 7

THE EXISTING DATA BASE: THE TYPES AND DISTRIBUTION OF CULTURAL RESOURCES

Information in institutional site files reveals that slightly more than a thousand prehistoric sites have been documented in the overview region. Many of the sites located along the Colorado River have since been destroyed or inundated by dam contruction and reservoirs. Definitely less than 5% and probably less than 1% of the total acreage has been subjected to cultural resource surveys. The area is likely to contain several thousand additional prehistoric sites.

Much of the existing data base was generated from reconnaissance surveys which reflected the biases and concerns of early researchers. Except for the few recent intensive, sample, and linear transect surveys conducted since 1970, there has been little effort to record the entire range of cultural resources within particular areas. Dobyns (1956), Euler (1958), and Colton (1939) focused on the recording of traditional base camps, caves, historic Hualapai sites, and artifact scatters with ceramics. In the wooded uplands, Austin (1977, 1979) concentrated on the discovery of pueblos and hilltop stone "forts". In general, the records indicate a bias toward the larger or more impressive sites accessible to historic or modern settlements. These included major base camps, caves, rock art sites, and pueblos as well as sites to which Dobyns was guided by Hualapai informants.

SITE TYPES

Open artifact scatters account for about 80% of the prehistoric sites in the regional files, although this estimate ranges down to about 60% of the sites recorded in the areas where pueblos exist. At least 135 caves and rockshelters comprise about 15% of the recorded sites. At least 25 sites, or 3% of the total, consist of rock art localities. Since site boundaries have been defined in different ways, these are only general estimates.

The following discussion lists site types in order of their relative frequencies as indicated in the regional site files. Those listed first are the most common types. These are basically descriptive categories that can incorporate a great range of variability in the characteristics and functions of particular sites. Specific interpretations require detailed analyses of specific sites. The types need not be mutually exclusive; many consist of features or phenomena which can occur in combination at a single location. Stone (1986:99-116) discusses research values and data recovery procedures for different site types in greater detail.

Artifact Scatters Without Obvious Structures

Open artifact scatters incorporate a great range of variability in size, depth, and the numbers, density, types, relative diversity, and spatial distribution of artifacts and features. They are not limited to particular environmental zones. Among other functional types, these sites include pithouse villages, Colorado terrace "rancherias", base camps, temporary camps, repeatedly used gathering or hunting areas, low density scatters indicative of travel or short-term uses, non-localized lithic manufacturing areas, and specialized sites like Willow Beach, a camp on a trade route.

Caves and Rockshelters

Like artifact scatters, these sites exhibit a great range of variability in physical and assemblage characteristics. They were favored as shelters by the upland Yuman people and presumably by earlier groups. They also figure prominently in mythology and religious beliefs (Dobyns 1956). Natural shelters could have been used as repeatedly occupied base camps, temporary shelters, storage areas, or ceremonial sites. Wright (1954) suggested that Catclaw Cave may have served as a women's retreat. The functions of particular sites may have changed through time. Caves and rockshelter sites have been recorded along the lower Grand Canyon and its tributaries, in other canyons along the Colorado River, and in many mountain ranges including the Black, Cerbat, and Aquarius ranges. They likely exist in other mountainous zones or in canyons adjacent to major streams.

Pueblos and Sites With Obvious Structures

Variability exists in structural size, contiguity, intrasite patterning, associated features, and construction techniques at these sites. Architectural variability is common within single settlements in the Prescott Branch and Cohonina regions. Structures include rock masonry or rock-footed jacal pueblos of generally less than 30 rooms; single-room structures such as hilltop "forts"; and "rock ring pithouses", oval to rectangular rock outlines which served as structural foundations for shallow pithouses in the Prescott area (Jeter 1977; Wood 1980). These were primarily habitation sites with trash deposited in scatters or mounds. However, structural sites also could have served as seasonal camps, agricultural field houses, storage areas, refuges, or communication nodes. Relatively substantial structures are concentrated in the upland valleys, mesas, and woodlands to the east of the Aquarius Mountains. They also exist in the Bradshaw Mountains and the mountains of the Transition Zone. Cliff dwellings are present in the lower Grand Canyon and the canyons of the Hualapai Reservation. Inhabitants of the relatively warm and dry Basin and Range country apparently made more use of rockshelters and less substantial brush wickiups.

Rock Features

Rock features include rock rings, concentrations, and non-structural alignments. Rock rings are circular surface alignments of generally minimal depth (Stone and Dobbins 1982). Those with a diameter of less than a meter may have served as container supports, and larger features may represent the foundations of temporary brush shelters. Unlike "rock ring pithouses", they exhibit few or no internal features such as hearths or prepared floors. Rock rings are concentrated in the most arid zones of the overview

area, on the desert pavements of the terraces and bajadas adjacent to the lower Colorado, Bill Williams, and Santa Maria rivers.

Rock concentrations, sometimes isolated and sometimes incorporated into other sites as features, vary in size, configuration, subsurface contents, and associated artifacts. They may represent the remains of hearths, roasting pits, trail "shrines", boundary markers, hunting blinds, or platforms. As agricultural features, they may have been associated with field clearing, enhanced runoff, or mulching. Very large features along the Grand Canyon to Lake Mead portion of the Colorado River have been interpreted as agave roasting ovens, but they may have been used for meat roasting or other purposes as well (Castetter, Bell, and Grove 1938).

Non-structural rock alignments may have served symbolic or other functions similar to those of intaglios, as part of the complex of "ground figures" found on the desert pavements of the most arid zones (Hayden 1982; Solari and Johnson 1982). Alternatively, they may have been components of water and soil diversion systems for farming or the enhancement of wild resource yields. Such systems exist at late prehistoric sites in the mountains of central and eastern Arizona, but they have been recorded only rarely in the west central area. Fewkes (1912:206) and Barnett (1974) described prehistoric irrigation systems and terraced plots at Prescott Branch sites. Water diversion systems apparently tapped reliable springs in the Grand Canyon region (Kroeber 1935). Linford (1979) recorded possible check dams and farm plots along lower Burro Creek. However, Russell (1977:338) suggested that such systems would have had limited effectiveness in this arid region. He argued that even in the Prescott area, the most successful strategy would have been floodwater farming of low terraces during periods of relatively higher precipitation. Nevertheless, water and soil control systems may yet be found in the eastern portion of the overview region.

Rock Art

Rock art incorporates pecked petroglyphs, painted pictographs, and scratched or incised rock surfaces. Variability exists in the number, nature, and diversity of designs, the extent of reuse over time, and associated archaeological materials and environmental contexts. Rock art may have served the following general functions: (1) ceremonial or ritual use related to shamanistic practices, hunting magic, or mythical representations; (2) clan or group insignia; (3) records of events; (4) calendrical devices; (5) maps or boundary markers; or (6) aesthetic expression. These alternatives need not have been mutually exclusive at a single site.

In the overview region, rock art has been recorded along the Colorado River and in most of the mountain ranges. Rogers (n.d.) recorded many pictographs in the passes of the Black Mountains. Great Basin design styles appear to be dominant (Pilles 1981:178). Incised or "scratched" boulders in the Colorado River valley may represent examples of the "Great Basin Scratched" style of parallel lines and cross hatching (Grant 1967; Schroeder 1961:94). The BLM archaeologist for the Kingman Resource Area recently discovered pebbles with similar scratched designs. Additional rock art sites can be expected to occur in canyons and passes, near springs and trails, at natural tanks or landmarks, and in caves or rockshelters. Heavily patinated areas of basalt or rhyolite boulders on slopes or knolls should be examined for their presence.

Quarries

Quarries are localized sources of raw materials where at least the initial stages of artifact manufacturing took place as indicated by the presence of debitage or discarded tool blanks. As used here, the term refers to repeatedly used areas which yielded high quality or extremely dense and abundant lithic raw materials. Aboriginal groups also made use of non-localized, scattered raw materials along upper bajadas and stream terraces. Non-localized raw material sources, represented by isolated chipping stations and low density scatters of debitage, may have been used in a more expedient manner in the context of subsistence activities or travel (Gould 1980, 1985).

Major chert, chalcedony, and obsidian quarries are known to exist in the Alamo Lake and Burro Creek areas (Dosh 1984; Keller 1986; Stone 1977). They likely exist in many other areas. Quarries for the manufacture of grinding implements, also known as "macroflaking" sites, cover vast areas between the Black Mountains and the Colorado River (Huckell 1986). The artifactual remains include huge flakes, crude debitage, hammerstones, and tool blanks abandoned at various stages of production. Prehistoric turquoise mines incorporating picks, mauls, trenches, and tunnels have been found in the Cerbat Mountains near Kingman (Johnston 1964). Other mined or quarried materials could have included clay, ochre, salt, mica for ceramic tempering, or minerals for trade.

Trails

Most visible aboriginal trails are relatively straight cleared paths indented on desert pavement surfaces. In rocky areas and on slopes, trails may take the form of cleared paths with rock berms. They are rarely more than a meter wide (Stone 1986:108). Historic and modern roads often follow the routes of prehistoric trails (Davis 1961).

Although established trails probably traversed much of the region during prehistoric times, they are rarely preserved beyond the desert pavement surfaces at its western and southern margins. Trail segments are not unusual finds adjacent to the Colorado and Bill Williams rivers. The historic Yumans frequently traveled north and south along the Colorado River by foot; small rafts were used occasionally for downstream travel (Kroeber 1951).

Stationary Grinding Features

Bedrock mortars, basins, and "slicks" tend to occur in canyons and mountain passes in association with natural water catchments, artifact scatters or petroglyph sites. Schroeder (personal communication, 1984) commented on the absence of pestles and manos at bedrock grinding areas. Such implements may have been removed by native users or modern artifact collectors. They might also have been curated and transferred from camp to camp (Doelle 1980). According to Euler and Dobyns (1983), manos were highly valued tools that were carefully maintained by the Hualapai; their use-lives sometimes exceeded 50 years.

Intaglios

These are large naturalistic, anthropomorphic, and geometric designs produced by scraping aside desert pavement to expose lighter colored underlying sediments. These mysterious sites, best viewed from aircraft, have long fascinated the public, but there has been a lack of scientific research. Solari and Johnson (1982:417), authors of a comprehensive summary and management recommendations for intaglios, noted that "basic questions . . . concerning their time of construction, purpose, and creators remain largely unanswered". They may have served as trail or boundary markers, ceremonial sites, or "pure" art.

At least 17 intaglios have been recorded along the Arizona bank of the lower Colorado River north of its junction with the Bill Williams River. More intaglios, including the well known "Mystic Maze" with its windrows of raked gravel, exist across the river in California. Many of these sites are located in areas managed by the Bureau of Land Management.

SUMMARY OF KNOWN GEOGRAPHIC DISTRIBUTIONS

Relative densities of prehistoric cultural resources and the patterning of site types across the regional landscape are indicated by the data in the regional site files. This summary presents very broad generalizations, given the very low survey coverage and the biases inherent in past research.

Prior to the construction of dams and reservoirs, a nearly continuous series of artifact scatters apparently existed along the lower Colorado River. These sites may have incorporated villages, temporary camps, and farming areas. To the north of the river, there were Virgin Branch pueblos and farms. A variety of temporary and specialized sites exist on the desert pavement terraces and bajada zones bordering the lower Colorado River. These include surface artifact scatters, low density lithic scatters and chipping stations, rock rings, trails, rock art sites, grinding implement quarries, and intaglios. Lithic tool manufacturing, travel, and temporary resource exploitation or camping activities apparently took place in this area. A similar patterning of site types exists along the Bill Williams River and its bordering desert.

The Black Mountains contain numerous caves, rockshelters, rock art localities, and artifact scatters. Some may represent camps on travel routes through passes, while sites near springs in the eastern canyons may have been base camps. Lithic scatters exist on the upper bajadas.

The arid desert basins, the Detrital, Sacramento, and Hualapai valleys and Dutch Flat, have generally low densities of cultural resources. Exceptions include the area surrounding Red Lake, ringed by a relatively continuous scatter of probable seed processing camps (Schilz 1982). The southern portion of Dutch Flat was evidently a good source area for lithic raw materials, as were the bordering pediments of the Rawhide Mountains (Henss 1983). Artifact scatters exist near major washes on the upper bajada of the Sacramento Valley.

The Cerbat Mountains contain a rich and diverse array of cultural resources. Functionally diverse artifact scatters, including substantial base camps, exist in a variety of environmental zones at all elevations. Cultural resources also include caves, rock art sites, turquoise mines, and historic Hualapai camps associated with Anglo-American mining activities. The pattern of large base camps and functionally diverse sites continues southward into the northern portion of the Hualapai Mountains. Little is known of archaeological sites in the southern portion of the Hualapai range.

To the east, the valley of the Big Sandy River contains probable base camps, possible farming areas, and lithic scatters. The bordering Aquarius Mountains contain numerous small but diverse sites consisting of surface artifact scatters, low density lithic scatters, quarries, and rockshelters. Many of the artifact scatters seem to have been base camps of short occupational duration, since they tend to exhibit diverse artifact assemblages despite their small size. More substantial base camps appear to have been located along the Santa Maria River and Burro Creek.

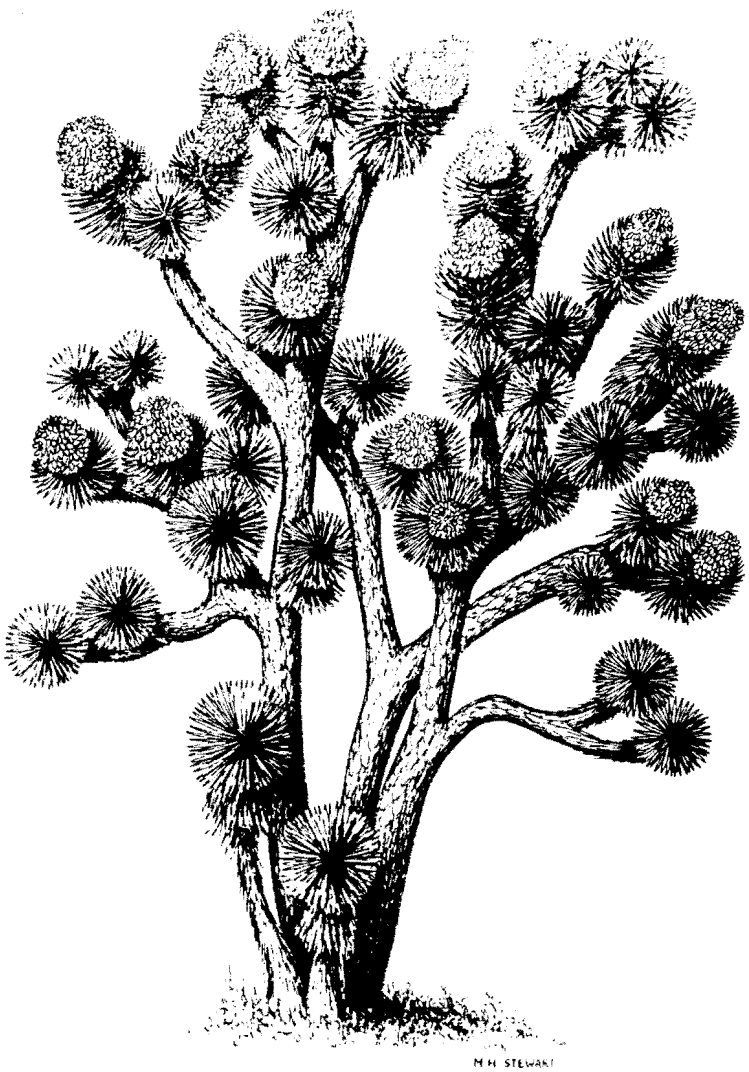
Moving northward, the Music, Cottonwood, and Peacock mountain ranges, linked by the Truxton Wash-Hackberry area, appear to contain an exceptionally high density and diversity of cultural resources. These were apparently important zones of habitation and natural resource exploitation. Sites in this area appear to contain a relatively high proportion of formal artifact types and finished tools, possibly a reflection of a major Archaic occupation. Site types include substantial base camps, temporary camps, rock art, caves, numerous roasting pits, quarries, and possible pinyon gathering areas.

Canyons slicing into the Grand Wash Cliffs may have served as trails linking the Basin and Range country to the Plateau. The cliff margins appear to contain a relatively high density of cultural resources (BLM 1978). The spring-fed canyons of the Hualapai Reservation are the mythical heartland of the tribe. They contain base camps, possible farming areas, and pueblos including cliff dwellings. The lower Grand Canyon and its tributaries also contain caves which have yielded split-twig figurines and fossilized packrat nests among other perishable remains.

The high Plateau grasslands appear to be areas of relatively low cultural resource density. This situation may reflect the limited occurrence of water sources, but these areas have received little survey coverage. Small lithic scatters, some of which contain obsidian, exist in the Seligman area.

Chino Valley and the surrounding Juniper, Mohon, and Sierra Prieta mountain ranges contain pueblos, hilltop "forts", artifact scatters, and a variety of other site types. Prescott Branch sites and pueblos have been documented on Bozarth Mesa and along upper Burro Creek. They likely extend southward into the Bradshaw Mountains. The Bradshaws, one of the least surveyed areas of comparable size in the entire Southwest, are likely also to yield cultural resources related to the Hohokam tradition (Wood 1978).

In summary, prehistoric cultural resources tend to be more dense and diverse in the mountain ranges and along the major rivers and streams. This is not an unexpected generalization given the distribution of water sources, game, and wild plant foods in the region. Rather striking subregional differences in the densities and types of sites deserve greater scrutiny, since the differences could be linked to the economic strategies practiced by different groups in this region of environmental diversity. In general, archaeological patterns seem to parallel recorded ethnographic patterns of social organization and land use (see Chapter 3). These parallels support the usefulness of ethnographic analogy as a starting point in the generation of cultural models.



CHAPTER 8

MANAGEMENT CONSIDERATIONS: EVALUATION, INVENTORY, AND PROTECTION

"Management" refers to a process of decision making that establishes objectives, specific plans to meet those objectives, and means to resolve conflicts among various goals. 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. Management objectives 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".

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 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).

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 included in or 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.

EVALUATION

Cultural resource management by the BLM involves several major tasks: (1) inventory to assemble the data required for decision making; (2) the assessment of values followed by the allocation of cultural resources to "use categories"; and (3) planning for the protection of resources or the realization of potential uses. The latter process involves the setting of program priorities and the development of specific management plans. Appropriate use is the objective of management.

Evaluations of cultural resources focus on the determination of use potentials as defined in the cultural resource use categories. An additional consideration is the application of *National Register* eligibility criteria, in consultation with the State Historic Preservation Officer. The *National Register* criteria are interpreted with reference to the BLM use categories. In essence, the groundwork which provides for the assessment of potential uses also provides the information for evaluations 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". Criterion D is addresed in terms of "historic contexts" defined by theme, place, and time. In the BLM evaluation process, judgments regarding "scientific use" potential are relevant to Criterion D. The information contained in regional Class I inventories can be used to define meaningful periods, areas, and themes (based on research domains and issues) for the development of historic contexts.

BLM Manual 8111 defines six cultural resource use categories: scientific use, conservation for future use, management use, socio-cultural use, public use, and discharged use. Special management attention should be directed toward sites having extremely high values or those exhibiting combinations of compatible uses, such as sites of high informational potential that also possess socio-cultural values or possibilities for public interpretation or nonprofessional participation in supervised scientific studies. As a preliminary step in evaluation, it is possible to relate certain classes of cultural resources to the use categories. However, site-specific assignments require judgments based on more specific data.

Scientific Use

This category signifies that a cultural property is suitable for consideration as the object of scientific study utilizing current research techniques. In management terms, it means that a site is allowed to be physically altered as a result of an appropriate data recovery procedure if preservation is not a viable option. Specific assessments are based on physical integrity and the potential to yield information relevant to research issues.

The primary value of most cultural resources rests in their potential contributions to scientific research. The category of scientific use is likely to incorporate more sites than any other use category. The vast majority of sites in the region can be expected to yield information relevant to cultural ecological, organizational, and land use studies. Even the most impressive sites, such as large pueblos or stratified caves, cannot be adequately understood apart from the regional subsistence, settlement, and organizational systems which encompassed them. Thus even common or visually unimpressive sites, such as low density lithic scatters, rock rings, single trail segments, and artifact scatters with no diagnostic materials, can contribute to the resolution of research issues addressing the nature of prehistoric technology and settlement systems.

Although most sites will possess informational value, certain sites will possess exceptional value by virtue of their unusual character, potential contribution to a broad range of research issues, or the potential to resolve particularly difficult research problems such as chronological data gaps. The presence of relatively rare types of data, such as datable, diagnostic, or perishable remains, would increase a site's informational value. Sites containing a discernable record of occupations through time could offer important contributions to culture historical studies. Depending on their contents and locations, particular sites could narrow spatial and temporal informational gaps or fill in the blanks in the spatial patterning of particular variables. Uniqueness itself should not be a sole criterion of value; a relatively common type of site might well contain a broader range of data than an unusual site. However, some rare site types such as intaglios are valuable in view of their potential contribution to research domains, such as ideological systems, that cannot be examined at many other sites. Other important site types, such as major base camps, not only tend to contain a broader range of data but are also vastly outnumbered by less substantial temporary camps.

The above considerations are incorporated into the following list of site types likely to exhibit particularly high scientific value given the current state of knowledge:

1. Sites with buried features or stratified deposits indicative of multiple occupations through time.

2. Sites with the potential to yield perishable artifacts for technological and chronometric studies, or organic remains for chronometric, subsistence, or paleoenvironmental studies. Such sites could include caves and rockshelters, roasting pit or storage features, pueblos with intact beams, or fossilized packrat middens.

3. Sites with inorganic datable remains or temporally diagnostic artifacts. Examples would include diagnostic projectile points, decorated ceramics, fired clay floors or hearths for archaeomagnetic dating, and patinated lithic artifacts for cation-ratio dating.

4. Probable major habitation sites or base camps used repeatedly or by relatively large groups over extended periods of time. These could include pueblos of over 20 rooms, possible villages along the Colorado River, sites exhibiting architectural variability, or particularly dense and diverse artifact scatters with multiple features or discrete activity areas.

5. Sites with a variety of culturally diagnostic ceramic types.

6. Sites with probable trade items such as turquoise, shell, or materials of Anasazi, Hohokam, or Pacific coast origin.

7. Turquoise mines or other types of mines.

8. Major quarries, particularly those yielding sourceable materials.

9. Large rock art sites with evidence of long-term, repeated, or Archaic use; and pictograph sites.

10. Water control features or irrigation systems.

11. Intaglios or stone "ground figures".

12. Trail networks.

13. Sites yielding split-twig figurines.

14. Pre-ceramic and early ceramic period sites.

15. Protohistoric and historic aboriginal sites including those associated with Anglo-American settlements and mines.

16. Sites out of context: those that are exceptions to known existing distributional patterns. Hypothetical examples include Prescott Branch "enclaves", pueblos in the Hualapai Mountains, kivas, and Hohokam ball courts. Unusual sites might well occur in unusual environmental situations.

17. Sites in environmental remnants, areas where the integrity of many similar sites is likely to have been destroyed by human disturbance or natural erosional processes. These might include villages or base camps along the Colorado, Bill Williams, and Big Sandy rivers.

In summary, site-specific assessments require specific data. Sites, rather than classes of site types, are ultimately allocated to use categories. The site files appear to contain numerous sites that fit the above characteristics. Examples include base camps in the Hualapai, Cerbat, and Music mountain ranges; pueblos in the upper Burro Creek area and Juniper Mountains; rock art sites in the Black Mountains; and the Burro Creek obsidian quarry. Yet although the above list contains many types, they are likely to constitute a minority of the total cultural resources within the region, as indicated by existing survey data.

The BLM has authorized recent work at two important sites. Huckell (1986) reported on data recovery and experimental replication studies at grinding implement quarrying and manufacturing areas near Bullhead City. The Museum of Northern Arizona and Northern Arizona University combined their expertise, with BLM support, to

conduct test excavations and radiocarbon dating in order to assess the integrity and research potential of Bighorn Cave. This large natural shelter, located in the Black Mountains, yielded perishable artifacts, split-twig figurines, and organic remains from stratified cultural deposists dating back to 1500 B.C. Despite its remote location, it has suffered from unauthorized digging yet retains considerable integrity. It appears to equal the caliber of major cave sites that have been excavated in the Great Basin. Bighorn Cave appears to be a significant site that merits nomination to the *National Register of Historic Places*. As yet, no prehistoric properties on public land within the Kingman Resource Area are listed on the *National Register*.

Conservation for Future Use

This category is reserved for extremely rare site types or those with research potential "that surpasses the current state of the art". Such sites would not be eligible for data recovery unless specific conditions were met in the future. Management would focus on protection measures which might even include segregation from other land or resource uses.

Sites assigned to this category would probably come from the above list of particularly important types. It is somewhat dificult to predict the nature of sites at which future analytical or data recovery techniques will yield significant advances in knowledge. New techniques for chronometric dating or the compositional charaterization and sourcing of artifacts, as well as more sensitive recovery techniques for organic remains and sedimentary data, are likely to be developed in the future. Thus sites deemed worthy of special conservation measures could include caves, stratified open sites, intaglios, lithic scatters with artifacts exhibiting different degrees of patination, and important rock art sites. Cation-ratio dating is a relatively new technique that could be applied eventually to the latter three site types (Bruder 1983; Dorn et al. 1986; Solari and Johnson 1982). It is difficult at present to recommend specific sites for assignment to this category.

Management Use

Sites assigned to this category could be used as subjects of controlled experimental studies conducted in order to determine the best means for protecting similar sites. Such studies could indicate the effects of deterioration caused by natural processes or human activities as well as the relative effectiveness of protection measures. Management use might well result in the physical alteration of a site.

Sites assigned to this category should not include rare types or those possessing particularly important research values. Appropriate sites could include relatively abundant types such as common or less substantial types of artifact scatters, low density lithic scatters, rock rings, or single-room pueblo structures. Pre-impact studies should incorporate mapping and detailed data recording. Unsampled portions of sites previously subjected to data recovery could be assigned to management use. Managers might even consider the use of experimental rather than real sites in management studies. Roney (1977) "constructed" a lithic scatter for an investigation of the effects of livestock trampling. His study thus was well controlled. In addition, he was able to locate his "site" in order to evaluate the worst case effects of heavy livestock use.

Management studies should focus on the evaluation of specific impacts, attempting to control for the effects of other variables. Specific impacts could include livestock trampling, off-road vehicle traffic, the use of mechanized equipment for land modification or vegetation removal, or natural erosion. Plans should specify the particular areas and types of impacts; the types of information to be recorded; a schedule for short-term or long-range monitoring, depending on the nature of the study; and procedures for post-impact analysis.

Socio-cultural Use

This category applies to cultural resources perceived by a particular social or cultural group as having attributes that contribute to maintaining that group's heritage or existence. It could incorporate sacred areas or zones that yield wild resources currently used by native peoples. Socio-cultural values must be taken into account in planning and management. Managers must also comply with notification and consultation procedures outlined in legislative regulations.

The Mohave, Hualapai, and Yavapai tribes (and perhaps the Paiute, Chemehuevi, Havasupai, and Hopi) are expected to have concerns regarding cultural resources in the overview region. Existing ethnographic sources and additional interviews with native informants could reveal particular areas of socio-cultural importance. However, Native Americans may well be reluctant to reveal the locations of particular sites for religious reasons or the fear that this information would be difficult to safeguard. In the latter case, they should be assured of agency procedures for protecting such information from unauthorized scrutiny.

Ethnographic work has revealed aspects of native ties to the land and its cultural resources. Bean et al. (1978) conducted interviews regarding Native American values associated with the Sonoran Desert in western Arizona. These studies reveal that site types of special cultural value are likely to incorporate rock art, caves, intaglios, trails, cairns known as "trail shrines", burials, and mineral sources. Yet native concerns about cultural and natural resources also tend to be expressed in terms of particular environmental zones or topographic features rather than in terms of specific sites. As Bean et al. (1978:6-92) expressed these sentiments, "land is the physical and symbolic context of the very existence of the Yavapai . . . profound religious meaning is indelibly attached to Yavapai land and its mountains, plants, and animals". Yuman myths are grounded in networks of topographic features (Kroeber 1951; Spier 1933). Mountains figure prominently in religious beliefs. Springs and hot springs might also possess socio-cultural values. The spires known as the "Needles" near the Colorado River are a sacred zone, as is Meriwhitica Canyon on the Hualapai Indian Reservation, the original home of the Hualapai and other tribes according to legends (Ewing 1961).

Many cultural resources undoubtedly are located on reservation lands, and the tribes have initiated active efforts to understand and maintain their cultural heritage. Mohave leaders and elders participated in consultations during the testing of Bighorn Cave. In 1984, the Bureau of

Land Management signed a Memorandum of Understanding with the Truxton Canon Agency (Hualapai) of the Bureau of Indian Affairs, in cooperation with the State Historic Preservation Officer, providing for certain professional services by the Kingman Resource Area archaeologist. These services include para-professional training and program compliance review. The Hualapai have made exemplary efforts to maintain their heritage through a bilingual education program which has focused on the traditional use of natural resources. The BLM could contribute its expertise to the development of tribal interpretive programs, and it should encourage Native American participation in programs that interpret their cultural heritage.

Public Use

Some cultural properties may be appropriate for consideration as interpretive exhibits or subjects of supervised participation in scientific or historical study. Public educational and recreational use can enhance the understanding and appreciation of cultural resource values.

Sites assigned to this category could include those at which scientific data recovery is in progress or has been completed. Public use creates a need for active protection strategies that could range from fencing or periodic monitoring to reconstruction or stabilization to park development. Signs advising visitors of antiquities laws should be placed at all sites assigned to public use. Interpretive exhibits-in-place and recreational areas will generally be managed through the cooperative efforts of recreation managers and cultural resources staff.

Sites considered suitable for public use should be those that are most interesting and accessible to the public. Protection measures should be adequate yet economically feasible. Care should be taken to ensure that other cultural resources in the vicinity will not be threatened by deterioration as a result of public visitation. Many of the cultural resources in west central Arizona are either visually unimpressive or located in remote areas. None have acquired fame as a result of past scientific work. Thus few sites will be appropriate for interpretive exhibits-in-place. Larger pueblos, rock art sites, and intaglios should be considered as possible interpretive exhibits. Solari and Johnson (1982) discuss strategies for the interpretation, public use, and protection of intaglios.

Although relatively few cultural resources will be appropriate for public display, the prehistory of the region is interesting particularly when considered in conjunction with its history and natural environment. Interpretive programs and displays presented to the public at campgrounds and recreational areas, museums, schools, and public or professional gatherings can enhance public education and enjoyment of cultural resources. Efforts toward public education can also foster responsible attitudes toward historic preservation. An example is an interpretive display about the archaeology of Bighorn Cave, prepared for an Arizona Archaeology Week exhibit at the State Capitol and later displayed at the 1987 BLM Training Course 8000-1 in cultural resource management conducted in Phoenix. Such portable displays can illustrate effectively the values of cultural resources as opposed to the destructive effects of vandalism.

In addition to interpretive programs, another aspect of public use is the supervised participation of non-professionals in scientific studies of cultural resources. Participants might include organized societies of avocational archaeologists; field school students; community groups interested in historic preservation; interested scientists from disciplines other than archaeology; or concerned and responsible individuals who are not members of a particular group. Supervision will usually be provided by the professionals who have been authorized to conduct scientific data recovery projects. However, in some cases BLM archaeologists might assume some responsibility for monitoring scientific studies. This situation could occur when data recovery consists of field recording with minimal alteration or disturbance of cultural resources. For example, the BLM could enlist the aid of avocational archaeologists in the recording of rock art sites, particularly sites threatened by vandalism. In such cases, data recording can be a labor-intensive but non-destructive process that constitutes the major form of scientific data recovery. Since such sites are interesting to interpret and also vulnerable to vandalism, rock art areas are ideal for supervised data recovery by public volunteers. They also offer the potential for public participation in developing interpretive programs.

The regional data base contains many cultural resources recorded by avocational archaeologists. Such individuals should be monitored and encouraged to employ scientific recording standards. Their survey efforts should be strictly limited to data recording with records made available to the BLM or other appropriate public agencies or institutions. Under no circumstances should they excavate or disturb sites or make any collections; nor should they publicize site locations. Such individuals should be encouraged to join or form chapters of the Arizona Archaeological Society or to consider participation in the voluntary Site Steward program recently initiated by the Arizona Archaeology Advisory Commission.

Discharged Use

Sites assigned to this use category will have lost their status in other categories as a result of destruction, realization of their scientific potential through data recovery, or other factors. Assignment to discharged use indicates a lack of remaining value as well as ineligibility for nomination to the *National Register*. Allocation to discharged use thus means that a site's location "no longer represents a management constraint for competing land uses". This category should be applied in cases where sites have been damaged or scientifically investigated to the point that they have little remaining value for either scientific study or interpretive display. For some sites, such as rock rings or small lithic or sherd scatters, adequate data recovery could consist of field recording. This is a judgment that should be made in the field rather than in advance of discovery.

INVENTORY

Inventory is a continuing process that provides relevant data for evaluation, planning, and management. *BLM Manual 8111* establishes three classes of inventory for different purposes. A "Class I inventory" is a regional compilation and interpretive synthesis of existing data on cultural resources. It serves as a major background reference and a primary source for guiding management decisions and planning.

A "Class II inventory" is a statistically based sample survey designed to aid in characterizing the probable density, diversity, and distribution of cultural properties within a large area. Class II inventories can generate data for developing and testing predictive models. They can be conducted in several phases, using different sampling designs in order to improve statistical reliability. Since Class II inventories are associated with general land use planning or other planning objectives, specific inventory decisions are based on planning area boundaries and Class I inventory data. The latter can indicate informational deficiencies that should be addressed in survey designs. Within individual sample units selected as part of the total sample, survey methods and intensity parallel those of Class III inventories.

A "Class III inventory" is a continuous intensive survey of an entire target area, conducted in accordance with current regional professional standards. Class III inventories, which provide a total inventory of cultural resources within an area, are normally conducted to assess the impacts of proposed land uses. In more general planning contexts, intensive inventories could be conducted in relatively small areas expected to contain particularly dense, rare, or important cultural resources. Randomly selected Class II samples might not incorporate such zones, and intensive surveys might well be more cost-effective than the design and execution of separate Class II surveys for small areas. As an example of such a phased approach, regional Class II sample surveys could be augmented by intensive surveys of small areas surrounding springs.

Survey and sampling methods have generated a vast quantity of literature in archaeology. Stone (1986) summarizes aspects of the literature relevant to the design and implementation of cultural resource surveys in west central Arizona. This summary addresses site definition, field procedures, sampling strategies, phased inventories, and relevant considerations in planning future inventories. Specific survey designs should reflect both inventory goals and logistic concerns, and they should be tailored to best accomplish defined goals in particular situations.

Certain considerations should be taken into account in planning for future inventories in the overview region. The region has received a very low level of archaeological survey coverage. Only a few localized areas have been well characterized in recent intensive or sample surveys, areas such as the southern Cerbat Mountains, Red Lake, and the southern Aquarius Mountains. Although survey coverage has been limited in terms of total area intensively surveyed, it has been dispersed across the region, touching on many environmental zones. This dispersion reflects the wide-ranging efforts of Colton (1939), Dobyns (1956), Euler (1958), and Austin (1977, 1979) as well as the later Class II stratified sample surveys conducted by the BLM. In general, this dispersion in conjunction with the low percentage of coverage makes it difficult to define particular areal gaps toward which future surveys should be targeted. The entire region needs more study, with particular attention to areas expected to yield relatively dense or important cultural resources (see Chapter 7).

Class II sample inventories, undertaken by the BLM in the late 1970s for the preparation of grazing environmental impact statements, covered approximately 1% of BLM-administered lands in the Black Mountains, Cerbat, Hualapai, and Aquarius planning units (Fryman, Powers, and Aitchison 1977; Kincaid 1978; Kincaid and Giorgi 1979; Swarthout and Powers 1978). These surveys were an important contribution to basic knowledge regarding the nature and distribution of archaeological sites within the region. However, certain problems with sampling designs reduced their effectiveness. Site discovery rates appeared to be artificially low, and very wide statistical confidence intervals for population estimates made it difficult to evaluate the relative densities of sites in different environmental zones (Swarthout and Powers 1978). These problems stemmed from a general sampling design that yielded low numbers of sites from different zones or strata. Separate sampling strata were defined on the basis of vegetation and hydrologic zones. Relatively high numbers of strata, ranging from four to nine, incorporated too few sample units to yield adequate samples of sites given the low sampling percentage, relatively large sample units (quarter-section quadrats), and overall low site density within the region. For example, one planning unit sample incorporated only 57 sample units within 9 sampling strata. The problems were intensified by environmental heterogeneity and apparently great variations in site densities across the landscape. Dispersed large sample units yielded minimal results in areas such as the Hualapai Mountains, where sites appear to have been clustered in major canyons. Finally, stratification schemes based on vegetation zones are a problem in this region due to historic changes in the nature and distribution of plant communities (Matson 1971).

Even had the low sampling fraction been maintained, better results probably would have been achieved with a general sampling design incorporating simple random sampling, smaller and thus more numerous sample units, or fewer strata based on more stable environmental criteria such as topographic zones (Swarthout and Powers 1978). Kincaid (1978) recommended a combination of approaches with sample surveys augmented by intensive surveys of smaller, purposely chosen areas expected to contain relatively dense or important sites. In the future, Class II sample surveys could focus on particular planning zones, such as proposed wilderness areas or land exchanges, or on the large blocks of federal holdings situated in certain mountain ranges or drainage basins. Purposive surveys could target zones likely to be highly sensitive for the existence of cultural resources, such as the margins of springs and streams or mountain passes with reported sites.

Fortunately, BLM-administered lands are distributed across many environmental zones. Few obvious environmental biases exist except for a scarcity of major springs, which tend to be located on private lands (Kincaid 1978). With that exception, land tenure patterns appear to pose

few barriers to cultural inventories on public lands, although the checkerboard pattern of alternating public and private sections in the desert basins hinders efficient multiple use management.

PROTECTION

Inventories can be undertaken to assess the nature and expected severity of threats to the integrity of cultural resources. Unfortunately such threats are not limited to proposed land uses that incorporate advance planning and the explicit consideration of potential adverse impacts. Sources of deterioration also include natural processes and human activities that are more difficult to manage and control.

Construction, real estate development, and related land use modifications pose localized threats to cultural resources. However, since many projects will involve "undertakings" subject to *Section 106* compliance procedures of the *National Historic Preservation Act*, adverse effects can be minimized through preliminary planning, avoidance of sites, intensive survey, and scientific data recovery. Construction projects likely will be concentrated along the Colorado River, where the creation of the existing dams and reservoirs destroyed many archaeological sites before they could be adequately investigated. Real estate development is now capitalizing on the area's recreational opportunities and the construction of a new gambling center in Laughlin, Nevada. Further south along the river, a diminished but important set of cultural resources is threatened by severe deterioration related to real estate development and recreational traffic. Cultural resource inventories are needed, and any proposed developments or land exchanges should be carefully scrutinized in terms of their possible impacts on cultural resources. In conjunction with real estate transfers near Bullhead City, the BLM recently sponsored an important data recovery effort at a grinding implement quarry (Huckell 1986). Swarthout (1981:74-79) discussed in greater detail the problems of site detection, deterioration, and protection related to human activities along the lower Colorado River.

In the desert and mountainous areas of the region, construction projects likely will incorporate linear rights-of-way in the form of transmission routes. The establishment of appropriate corridors in the context of regional planning should allow for minimal impacts to known cultural resources.

Agriculture is limited primarily to the Colorado River floodplain. It is difficult to monitor the effects of agricultural activities since they take place primarily on private and tribal lands. Cultivation is expected to severely disturb surface artifact scatters. Livestock grazing is a form of land use that has touched nearly all areas of the overview region. Trampling, as well as soil erosion aggravated by heavy grazing, can cause the breakage and displacement of artifacts and the deterioration of features. Adverse impacts to cultural resources are likely to be particularly severe in riparian zones and near corrals and watering facilities (Roney 1977; Stone 1986:127).

The initial lure to Anglo-American settlement, mining, is likely to continue in the future although mining is currently a depressed industry in Arizona. In some areas such as the Aquarius Mountains, geothermal energy development is a future possibility. Mining can adversely affect archaeological sites in a variety of ways. Disturbance by heavy machinery or explosives can destroy cultural resources. Through clearing, road construction, and the destruction of alluvium, mining-related activities can intensify erosional processes. Historic woodcutting in mining areas depleted vegetation and contributed to erosion (Dobyns 1981; Hastings and Turner 1965). Finally, the construction of roads to remote mines can increase public access to formerly inaccessible cultural resources, a contributing factor to vandalism. Rock art and quarries, as well as roasting pits and base camps located in canyons, are particularly vulnerable to disturbance by mining activities and associated soil erosion. Along rivers, rock quarrying threatens rock art areas, prehistoric quarries, and other sites.

In many rural areas of Arizona, tourism and recreational developments seem likely to replace mining as a major industry. Recreation is already an important aspect of land use in the Prescott area and along the Colorado River. Recreational activities that can contribute to the intentional or inadvertent disturbance of prehistoric sites include off-road driving, rockhounding, and the traffic associated with hunting, hiking, and camping. Off-road vehicles represent the most serious threat, particularly to surface artifact scatters, rock features, trails, and intaglios located on the desert pavement zones bordering the Colorado River. Their destructive power is illustrated in comparative photographs of intaglios taken in 1932 and 1974 (Solari and Johnson 1982:430-431). According to Swarthout (1981:75), approximately 20%-30% of the sites along the lower Colorado River have been damaged by erosion related to off-road vehicle activity. In addition to their physical disturbance of sites, off-road vehicles give access to formerly remote or inaccessible areas where sites may exist. Authorized uses of off-road vehicles, such as organized races, can be monitored and limited to existing roads and washes. However, it is difficult to control unauthorized use.

Vandalism at archaeological sites on public lands, ranging from the casual collection of artifacts to the removal of deposits with heavy machinery, is a serious problem in the Southwest (Green and LeBlanc 1979; Nickens, Larralde, and Tucker 1981). Motivations include illegal trafficking in black market antiquities, collection as a recreational activity, and destruction as a form of thoughtless or antisocial behavior. The degree of vandalism correlates positively with the size, artifact density, and visibility of sites; the overall density of sites within an area; the ease of public access; and public knowledge of site locations. Sites least prone to vandalism include unobtrusive sites in areas of low population density with restricted or difficult access and low overall densities of cultural resources (Williams 1979).

The latter description fits much of west central Arizona, where the overall rate of vandalism appears to be lower than that in many other regions of the Southwest (McAllister 1979). The vast mountainous areas contain many sites in remarkably good condition. The site files describe many virtually intact pueblo structures with walls exceeding two meters in height. The canyons of the Hualapai Reservation

also contain many well-preserved sites, although recreational use of the Colorado River allows public access to its tributary canyons.

Unfortunately, illegal digging and artifact collecting have disturbed many sites. In the overview region, much of this activity appears to have been recreational in nature, but the extent of antiquities market participation is difficult to gauge. The problem has been particularly serious in the vicinity of Kingman, where early researchers reported that sites had been "vacuumed" by pothunters. Digging has occurred at many caves in the Kingman area, even at relatively inaccessible Bighorn Cave. Ironically, artifact collecting was a weekend recreational activity for crews of the Civilian Conservation Corps, according to early surveyors. Perishable artifacts and diagnostic projectile points have been removed from many sites, a situation which severely reduces their scientific potential. Artifact collecting undoubtedly has disturbed contextual information in addition to removing rare and important data objects from archaeological sites. Such objects include a recently recovered fiber sandal that had been taken from Bighorn Cave.

In the Prescott area, prehistoric structures have received the brunt of the damage. In state archaeological quadrant N:6, incorporated largely within the Prescott National Forest, a quarter of the 79 recorded prehistoric sites have been vandalized. Pueblos and hilltop "forts" constitute 35% of the total number of sites, yet they account for 67% of the damaged sites.

In summary, site types most prone to vandalism include accessible pueblos, caves, rock art, and villages or base camps. Not only vandalism but also other sources of deterioration reflect the distribution of historic and modern land use activities. Natural erosion and weathering can contribute to deterioration, but where humans go, cultural resources tend to suffer.

Strategies for the protection of cultural resources include scientific data recovery, avoidance, physical and administrative measures, and public education. According to *BLM Manual 8142*, data recovery is an "extreme" and "irreversible" form of protection used as a last resort. Data recovery generally takes place at sites threatened by loss of integrity, where avoidance or other protection measures are not feasible or effective for particular reasons. Decisions regarding data recovery involve consultation with the State Historic Preservation Officer in compliance with *Section 106* procedures.

Avoidance of destructive effects involves the systematic consideration of cultural resources in planning and management decisions. Plans and specific projects can be designed to incorporate avoidance.

Physical protection measures can include fences or other barriers, the placement of warning signs, or repair and restoration. Such measures are designed to arrest, divert, or retard sources of deterioration. Neither fences nor signs should be placed so that they draw attention to relatively unobtrusive cultural resources. Fences can be used to restrict access and to protect such sites as intaglios. Solari and Johnson (1982:429) offer practical suggestions for fencing intaglios. Fences also can protect sites from trampling in areas of heavy livestock use.

Barriers across roads or trails can be effective in limiting access to sites in canyons or heavily dissected areas where ridges are separated by deep arroyos. They can be used in combination with fences to restrict access to areas of high cultural resource density in such environmental situations.

Signs should not draw undue attention to a site, but they should be clearly visible once the presence of a site becomes obvious. Signs should be placed at obvious, accessible rock art and intaglio sites in areas of relatively frequent public use, as well as at publicized and previously vandalized sites that may be located in more remote areas.

Extremely important or conspicuous sites, such as rock art areas, intaglios, major base camps, and stratified caves, should be periodically monitored to check for vandalism or increased traffic. Cases of obvious or reported vandalism indicate a need for surveillance. In such a large and rugged area with few major roads, patrol and surveillance pose practical problems. Two recent developments promise to enhance the effectiveness of surveillance: a cooperative agreement between the BLM and the Arizona National Guard to peruse archaeologically sensitive zones during the course of Guard aerial maneuvers; and the creation of a voluntary site steward network by the Arizona Archaeology Commission. The Kingman Resource Area archaeologist has organized a group of volunteers to monitor Bighorn Cave. Law enforcement officers, including BLM rangers, should be educated as to the content of the *Archaeological Resources Protection Act*.

Administrative protection measures include areal closures, withdrawals, or other non-physical means of protection. Since such measures would generally restrict other land uses, they should be reserved for very important properties which might include sites listed on the *National Register of Historic Places*, extremely fragile areas, or resources assigned to the categories of public use, sociocultural use, or conservation for future use. Specific management plans, which might incorporate physical protection measures, would be prepared for special management areas.

Wilderness designation represents a form of protection for cultural resources since it restricts access by vehicles and reduces other sources of deterioration. However, it also limits opportunities for inventory, surveillance, and restoration.

Specific priorities for the Kingman Resource Area should incorporate the continued evaluation and protection of Bighorn Cave, pictographs and petroglyphs in the passes of the Black Mountains, and other important, fragile, and threatened sites. There should also be continued cooperation with researchers interested in geochemical studies of obsidian from Burro Creek and other sources.

Public education efforts, undertaken in cooperation with other agencies and organizations, are ultimately crucial to the protection and preservation of cultural resources. BLM archaeologists can cooperate with Indian tribes, professional groups, and avocational groups in the development of educational and interpretive programs. Chapters of the Arizona Archaeological Society, an active avocational organization, exist in Prescott and Kingman. The keen public interest in the mysteries and scientific quest of archaeology can be channeled toward the goals of protection and understanding of our cultural heritage.

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