Background to Prehistory of the El Paso/Red Mountain Desert Region

by
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With Contributions by:
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Prepared for:

United States Department of Interior
Bureau of Land Management
California Desert Planning Program
1695 Spruce Street
Riverside, CA 92507

Contract No. USDI 52500-CT5-1009

March 31, 1975

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INTRODUCTION

This report represents the second in a series of regional (i.e., Planning Unit) studies undertaken or scheduled for the California Desert Planning Program, United States Department of Interior, Bureau of Land Management. Both the initial report, "Background to Prehistory of the Yuha Desert Region" (Weide and Barker 1974), and the present one were prepared by the Archaeological Research Unit, Dry Lands Research Institute, University of California, Riverside.

The intent of these studies is to provide the BLM with an overview of information pertaining to the prehistory of a planning unit, which can then serve as background for the cultural resource section of the Unit Resource Analysis. Basic objectives in the studies are to describe and discuss available archaeological and ethnological data. The information is presented in terms of ethnohistory and ethnography, previous archaeological research, culture history (or sequence), potential archaeological significance, and archaeologically sensitive areas within the planning unit. Ultimately, the background information may be incorporated into a program of statistical sampling of archaeological inventory areas in the California Desert under development by the BLM (cf. Weide 1973; Weide and Barker 1974: 90-96). The program is being designed to yield projections of patterns of site locations and densities in the desert which, ideally, will be instrumental in long-term planning of use and development in the California Desert.

As defined by the Bureau of Land Management, the El Paso/Red Mountain Planning Units cover an area of variable terrain comprised of approximately 1.6 million acres in southeastern California (Fig. 1). The El Paso Planning Unit lies in the northeastern corner of Kern County, while the Red Mountain Planning Unit is located in the northwestern corner of San Bernardino County and contains an additional portion, North Searles Valley, in southern Inyo County. Geographic boundaries for the study area as a whole shall be set somewhat arbitrarily as: the northern Tehachapi and southernmost Sierra Nevada Mountains (i.e., Scodie Mountains) on the west; the northern margin of Rogers Dry Lake and the Kramer Hills on the south; eastern Searles Valley, Granite Mountain, Black Mountain, and Water Valley on the east; and the southern Argus Range and China Lake on the north.

The format to be followed features four main sections and two short concluding sections. To provide an idea of the environmental setting, the first section considers the general geologic, hydrologic, vegetational and climatic evolution of the El Paso/Red Mountain Planning Units. A rough synopsis of post-contact events and developments is provided in the second section which, due to the nature of the record, emphasizes ethnohistoric insights into aboriginal lifeways and the impact (i.e., physical remains) of historic mining activities. The third section summarizes ethnographic data on aboriginal utilization of lands encompassed by the planning units, bearing in mind that there have been no comprehensive studies of peoples who specifically occupied the defined territories. The fourth section presents an archaeological sequence of culture history for the study area based on what limited data are available and, primarily, on inferential evidence gleaned from

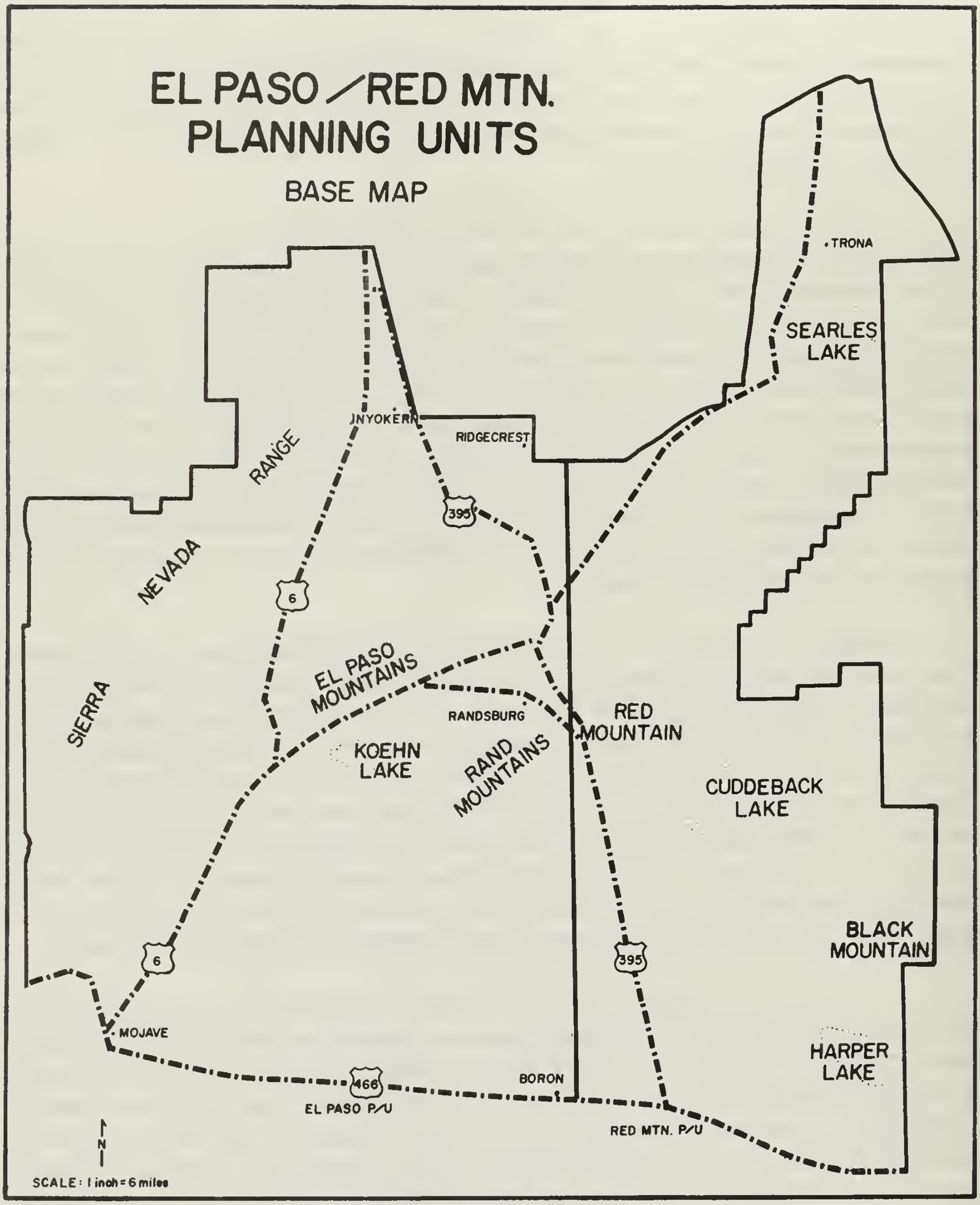
EL PASO / RED MTN.
PLANNING UNITS
BASE MAP
TRONA
SEARLES LAKE
INYOKERN
RIDGECREST
RANGE
395
NEVADA
6
EL PASO MOUNTAINS
RANDSBURG
RED MOUNTAIN
SIERRA
KOEHN LAKE
RAND MOUNTAINS
CUDDEBACK LAKE
BLACK MOUNTAIN
395
6
MOJAVE
HARPER LAKE
466
BORON
EL PASO P/U
RED MTN. P/U
N
SCALE: 1 inch = 6 miles

FIGURE 1

the archaeological record in surrounding territories and the Great Basin. Although there have been locationally selective site surveys (e.g., in the El Paso Mountains and at Black Canyon), no large-scale archaeological investigations have been conducted in either of the planning units. Nonetheless, preliminary indications are that the region has witnessed a long and varied pattern of human occupation. Each of the four main sections includes a short introduction intended to outline particular objectives and delineate certain inherent difficulties of the research.

Following presentation of an inferred culture history, brief consideration is given to the overall and potential archaeological significance of the El Paso/Red Mountain Planning Units. For example, the possibility of studying, through analysis of archaeological remains, the dynamic relationship between man and his habitat, cultural response(s) to an evolving environment, or interaction between human groups. The concluding portion of the report offers a description of the distribution of known archaeological sites, a brief discussion of discernible site location patterns in terms of regional research questions generated from the archaeological and ethnological records, and an indication of possibly sensitive archaeological areas in the El Paso/Red Mountain Planning Units.

The report is accompanied by two base maps; one locates known or recorded prehistoric sites, the other delimits known or potential areas of archaeological significance in the El Paso/Red Mountain Planning Units.

REGIONAL ENVIRONMENTAL HISTORY OF THE EL PASO/RED MOUNTAIN PLANNING UNITS

INTRODUCTION

Owing to an intimate bond between man and nature, artifactual evidence and inferred collective behavior of a cultural system reflect, to different degrees, the concern with environment in basic, day-to-day human existence. Though environment and culture cannot be considered independent variables, the study of a cultural system's ecological situation constitutes but one, albeit major, factor in the explanation of cultural processes. In this context, this section provides a description of the regional environmental history of the El Paso/Red Mountain Planning Units. Consideration is given to the general geologic history of the study area for two reasons: (1) in the long run of time, it is geologic action following cultural deposition that influences the extent and condition of archaeological remains (Malde 1964a; Heizer and Graham 1967:27; Hole and Heizer 1969:82); and, (2) as a result of geologic processes over time, certain substances (e.g., chalcedony, quartz, obsidian) were formed that undoubtedly performed a vital role as sources of raw materials for tool manufacture by human populations. Hydrologic, vegetational, and climatic elements of regional environmental history are also discussed for each affected the interaction between culture and environment.

There is some controversy among geologists as to the exact geomorphic province boundaries contained within the El Paso/Red Mountain Planning Units (Hewitt 1954:5). In part, this may be due to the fact that much of the region has not been studied in detail and its history is imperfectly known (Hind 1952:89). For the purposes of this report, the planning units lie within the Mojave Desert region as defined by Hewitt (1954).

Again, following Hewitt (1954), the Garlock Fault, which bisects the area from approximately the city of Mojave in the southwest to Searles Dry Lake in the northeast, subdivides the planning units into two geomorphic provinces. The name "Mojave Block" will be applied to that portion of the Mojave Desert region within the planning units lying south of the Garlock Fault. The area north of the fault will be referred to as the "Basin Ranges Province" (Fig. 2).

There are four major aspects of the regional geologic and environmental history that are especially relevant to the archaeological evaluation of the planning units. These include the general geologic, hydrologic, vegetational, and climatic evolutions of the area. This portion of the report presents a brief summary of these aspects of the geologic and environmental history of the El Paso/Red Mountain Planning Units. Because the study area has been largely ignored by scholars and is so extensive, data from many parts of it are incomplete or nonexistent. As a result, only a partial picture of how the present landscape was formed can be constructed. However, enough information is available so that all geological periods at least can be described. Nevertheless, a survey of the literature indicated that not all geologists interpret certain features in the same way, particularly in assigning ages for

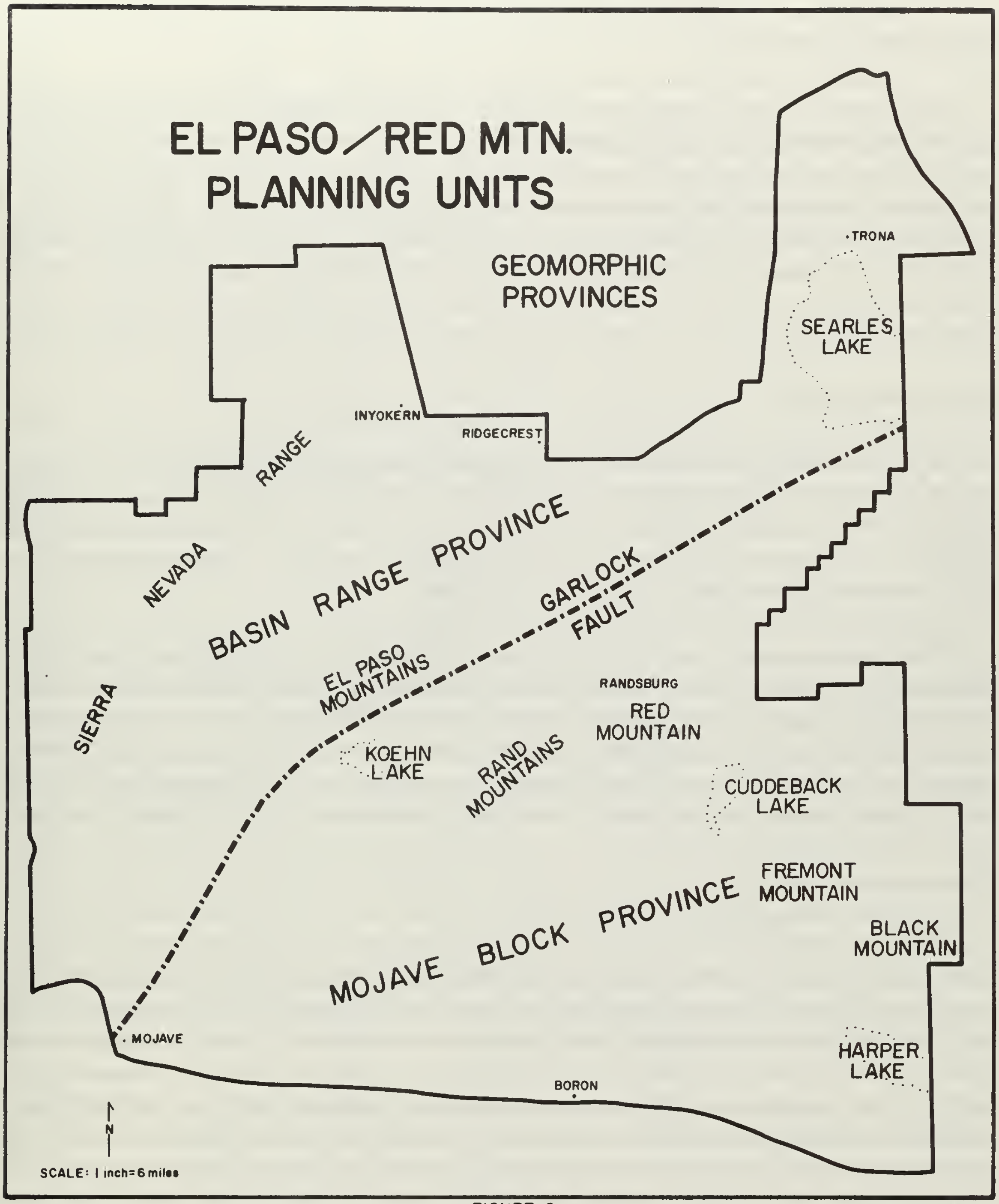
EL PASO/RED MTN.
PLANNING UNITS
GEOMORPHIC
PROVINCES
TRONA
SEARLES
LAKE
INYOKERN
RIDGECREST
RANGE
NEVADA
SIERRA
BASIN RANGE PROVINCE
GARLOCK
FAULT
EL PASO
MOUNTAINS
RANDSBURG
RED
MOUNTAIN
KOEHN
LAKE
RAND
MOUNTAINS
CUDDEBACK
LAKE
FREMONT
MOUNTAIN
MOJAVE BLOCK PROVINCE
BLACK
MOUNTAIN
MOJAVE
HARPER
LAKE
BORON
N
SCALE: 1 inch=6 miles

FIGURE 2

various geologic events. In general, such disagreements lie in the realm of detailed analyses, which have not been carried out and are beyond the scope of this report.

GEOLOGIC EVOLUTION

The particular time span most relevant to this background study falls into the Quaternary, which is subidivided into the Pleistocene and Holocene (Recent) periods of the geologic time scale. The Quaternary encompasses approximately the last two million years of earth's history and the entire period of man's presence on earth. Although present interests lie primarily in the Quaternary, a brief summary of events in the preceding geologic periods will be given to provide a better overall understanding of the evolution of the El Paso/Red Mountain Planning Units. It is noteworthy that the existing literature indicates that the evolution of the area covered by the planning units was essentially uniform.

Pre-Cambrian Era

During the early Pre-Cambrian, a thick series of sediments were deposited throughout the Mojave Desert region, probably as a result of the area's submergence under a large sea (Hewitt 1954:6; Dibblee 1952:40, 1968:54). After deposition, these sediments underwent large-scale deformation and orogeny which uplifted the area into a series of upland plains and mountains (Hewitt 1954:6; Dibblee 1952, 1968).

The metasedimentary rocks from this period, lying in scattered exposures, are known throughout the Mojave Desert region by such general names as the Pelona Schist, the Waterman Gneissic Complex, and the Pahrumph Series. Specific exposures may have their own names, such as the Rand Schist in the Rand Mountains and the Mesquite Schist in the El Paso Mountains. By the close of the Pre-Cambrian, these upland areas had undergone a period of severe erosion, which reduced them to a low relief area (Hewitt 1954:9; Dibblee 1952:54).

Paleozoic Era

During the Paleozoic, the area was again submerged under a widespread shallow sea. This submergence resulted in the deposition of another series of sediments, commonly known as the Garlock Series. The most pertinent aspect of these sediments is the remarkably large percentage of siliceous sediments, now present as the chalcedony family of cryptocrystallines. The exact source of these enormous amounts of silica is unknown. However, it is believed that the siliceous sediments resulted from a combined deposition of microscopic siliceous organisms and extrusive tuffs, both of which were metamorphosed to form the existing chalcedonies. Another important result of this deposition was the formation of existing quartz and quartzite deposits (Dibblee 1952:40-43, 1968; Hewitt 1954).

As a result of later deformation, these deposits exist in scattered exposures throughout the planning units. It was these deposits that probably supplied an excellent source of tool material for later aboriginal populations.

Mesozoic Era

As a result of the Nevadan orogeny during the Jurassic-Cretaceous periods of the Mesozoic era, the Mojave Desert region emerged from the Paleozoic sea. During this orogeny, the pre-existing Pre-Cambrian and Paleozoic formations underwent severe deformation, becoming deeply folded into the earth's crust where further static metamorphism took place. During this period, the metasedimentary country rock was regionally invaded by platonic intrusion of the southern California/Sierran granitic batholith. This intrusion, which occurred in several waves, resulted in the dramatic uplift of the entire region. Following this uplift, the region suffered severe erosion that again reduced the area to low relief (Hewitt 1954:11-14; Dibblee 1952, 1968; Samsel 1962).

Cenozoic Era

The early Tertiary period of the Cenozoic era was characterized by widespread recurrent uplift and severe erosion throughout the Mojave Desert region. However, the distribution of early Tertiary sediment (Golar Formation) and those of later periods indicates that the history of the Mojave Block differs from that of the Basin Ranges to the north (Hewitt 1954:14).

During or following the Eocene-Oligocene deposition of the Golar Formation, there appears to have been an extended period of intense recurrent deformation that continued into the middle Pleistocene epoch. This recurrent deformation, and associated erosion, resulted in the general uplift of the areas both north and south of the present Barstow syncline, which resulted from this peripheral upflit. It is believed that, beginning in the late Mesozoic, most of the major fault systems that exist in the Mojave Block today, including the San Andreas and Garlock faults, were formed. These seem to fall into two main categories. Those in the southern portion of the block, including the Helendale, Harper, and Blackwater faults, tend to strike to the northwest and persist for some distance. Those faults located in the northern portion of the block, on the other hand, tend to have diverse orientations and are generally localized. An analysis of the features of both groups of faults suggest that they formed in response to the great compression which the Mojave Block was undergoing during the Tertiary and Quaternary periods. Most of the major contemporary physiographic features of the Mojave Block are associated with fault zones, thus the Mojave Block began taking its present physiographic form at this time (Hind 1952:89; Hewitt 1954:17-18).

During this era, there appears to have been two major periods of volcanic activity. The first of these occurred as local extrusions in the Rand, Red, Lava, and El Paso mountains. Other local representations of this period of volcanism are found in the Fremont and Opal mountain areas to the south. The second major period of volcanism, the Black Mountain Basalt Flows, could have occurred as late as the middle Pleistocene. These flows occurred throughout the southeastern quarter of the planning units, but are most readily observable in the vicinity of the Black and Opal mountains (Hewitt 1954:16-18; Dibblee 1952, 1968; Samsel 1962).

As a result of these (and other) periods of volcanism, the planning unit area contains numerous exposures of volcanic extrusives, including obsidian. This material, in addition to the previously mentioned chalcedony deposits, supplied excellent sources of tool material for aboriginal populations.

The record of Tertiary and Quaternary sediments in the Mojave Block indicates that until the middle or late Pleistocene erosion almost kept pace with the contemporaneous orogenies (Hewitt 1954:16-18). By this time, the province had generally assumed its present structural form.

Pleistocene/Holocene Mojave Block Hydrology

Although evidence is far from complete on the hydrologic history of the Mojave Block, existing evidence indicates, for the most part, that this region was drained by a single, well integrated drainage system (Blackwelder 1954:37) (Fig. 3).

Late Tertiary orogeny within the Mojave Block resulted in the uplift of the western portions of the block, including the formation of the San Gabriel and San Bernardino mountain ranges. Water flowing off the slopes of these ranges, as well as the Sierra, Tehachapi, El Paso, and lesser ranges collected in a number of shallow basins throughout the Mojave Block. It is also probable that the Mojave River took form during the Late Tertiary orogeny. In the course of its flow, the Mojave River integrated a number of these basin lakes. Others, however, including Koehn, Rosamond, and Rogers lakes, as well as smaller unnamed lakes, never overflowed to join the Mojave River (Blackwelder 1954:37).

There is some evidence indicating that during the early Pleistocene the basin lakes in the Cuddeback and Superior valleys drained into Harper Valley. From there the water flowed into the Mojave River via the Hinkley Valley. However, as deformation of the Mojave Block continued into the middle and late Pleistocene, drainage to the Mojave River was permanently disrupted (Dibblee 1968:53-54). The continued deformation, volcanism, and orogeny that occurred throughout the Pleistocene also appears to have resulted in a major change in the Mojave Drainage System (Hewitt 1954:19; Blackwelder 1954:37-39).

Until the late Pleistocene, the Mojave River was apparently an external drainage system which flowed southeast to join the Colorado River via Ludlow, Bristol, Cadiz, and Danby lakes. However, as the probable combined result of continued uplift and lava flows from the building of Pisgah Volcano, the Mojave River appears to have been diverted east and northward to join Lake Manly.

The periods of greatest pluvial activity seem to roughly correspond to the McGee (2.6 million years B.P.), Sherwin (700,000 years B.P.), and especially the Tahoe (70-60,000 years B.P.), Tioga (46,000 years B.P.), and Laurentide (23-10,000 years B.P.) glacial periods. These periods of greatest flow were interspaced by progressively drier interglacial periods (Wahrhafrig and Birman 1965:306; Meinzer 1922:541-552; Flint and Gale 1958:710). The

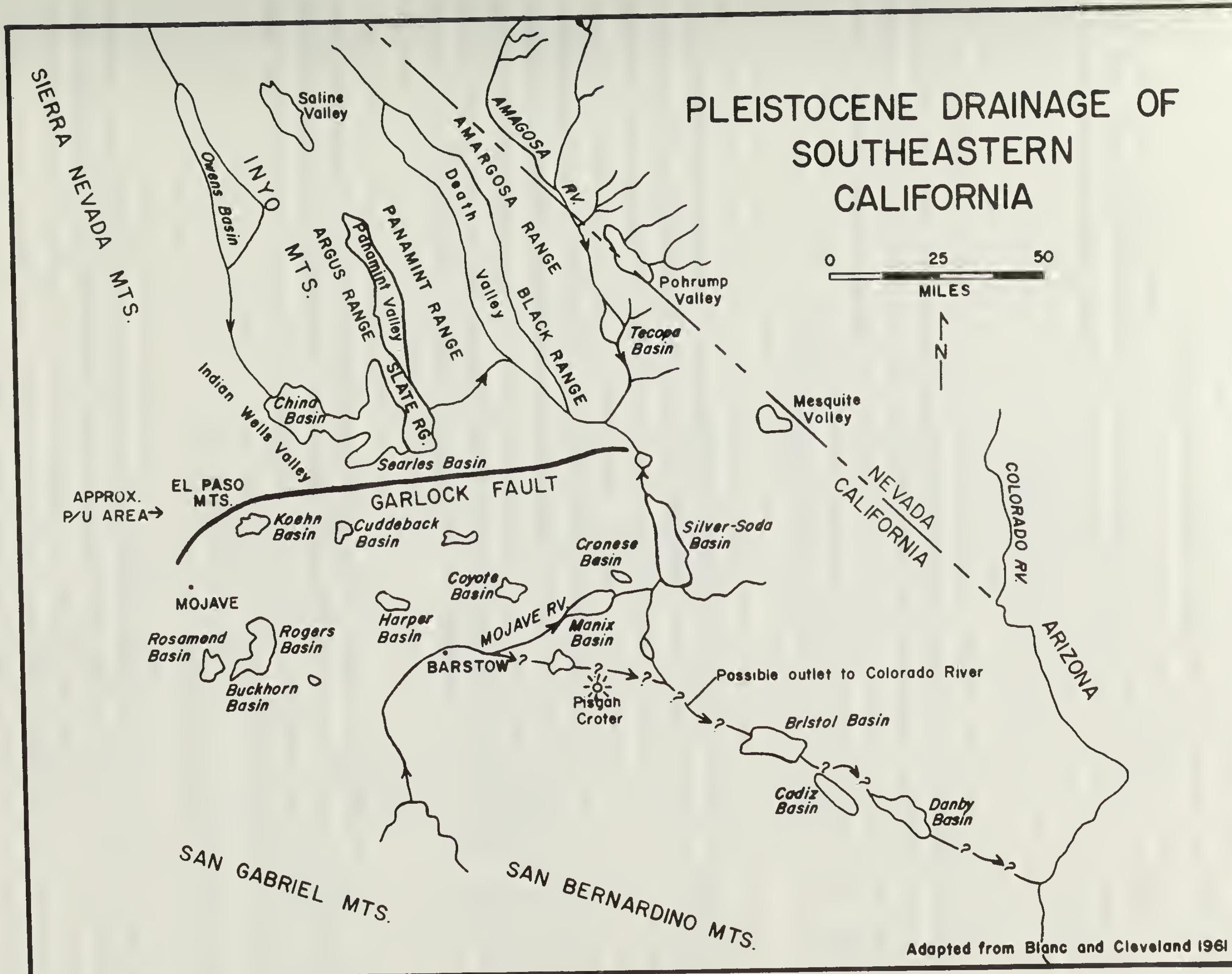
PLEISTOCENE DRAINAGE OF SOUTHEASTERN CALIFORNIA
0
25
50
MILES
N
SIERRA NEVADA MTS.
Owens Basin
INYO MTS.
Saline Valley
ARGUS RANGE
Panamint Valley
PANAMINT RANGE
SLATE RG.
Death Valley
AMARGOSA RANGE
BLACK RANGE
AMAGOSA RV.
Pohrump Valley
Tecopa Basin
Mesquite Valley
NEVADA
CALIFORNIA
COLORADO RV.
ARIZONA
Indian Wells Valley
China Basin
Searles Basin
EL PASO MTS.
APPROX. P/U AREA
GARLOCK FAULT
Koehn Basin
Cuddeback Basin
Silver-Soda Basin
Cronese Basin
Coyote Basin
MOJAVE
Harper Basin
MOJAVE RV.
Manix Basin
Rosamond Basin
Rogers Basin
Buckhorn Basin
BARSTOW
Pisgah Crater
Possible outlet to Colorado River
Bristol Basin
Cadiz Basin
Danby Basin
SAN GABRIEL MTS.
SAN BERNARDINO MTS.
Adapted from Blanc and Cleveland 1961

FIGURE 3

result of this progressively drier climate was the formation of existing playa sediments in the former basin lakes, and the associated desiccation of the Mojave River. Thus, by the early Holocene, the Mojave Block had assumed both its present structural and hydrologic form.

Basin Range Province Physiographic Evolution and Hydrology

Evidence indicates that while the fault systems of the Mojave Block were forming in response to tectonic compression during the early Tertiary (and subsequent periods) a similar fault formation period was occurring in the Basin Ranges Province to the north (Gale 1915:253; Hind 1952:89; Hewitt 1954:17-18).

This fault activity resulted in the formation of the distinctive northward trending mountain ranges of this region, including the Coso, Argus, Slate, Panamint, Black, and Amargosa mountain ranges and the intervening Owens, Indian Wells, Salt Wells, Searles, Panamint, and Death valleys (Gale 1915:253). The subsequent geologic history of these basins may be sumarized as one of extensive alluvial deposition resulting from the outwash of the surrounding mountains (Gale 1915:253; Hewitt 1954:7).

On the basis of strandlines, subsurface stratigraphy, and sedimentary deposition, it has been determined that these intervening valleys formed a continuous drainage system for this region, herein termed the Owens Drainage System. Unlike the Mojave Block system, however, the Owens system never had an external outlet. This fact accounts for the much more extensive saline and borate deposits now present in the former Owens system as compared to those of the Mojave system (Flint and Gale 1958:689-693). From accumulated water in the Owens Valley Basin, there was a series of successive overflows into the Indian Wells and Salt Wells valleys to form China Lake. From here the overflow formed Searles Lake in the Searles Basin and Lake Manly in Death Valley, with Lake Manly forming the final lake in this internal drainage system (Blanc and Cleveland 1961a:2-5) (Fig. 3).

As in the Mojave Block, the periods of greatest pluvial activity roughly correlate with the periods of glaciation. Again, these periods were interspaced by progressively drier interglacial periods. The result of this progressively drier climate was the formation of the various saline playa sediments which are so prominent in the area today (Flint and Gale 1958:689-693; Roosma 1958).

VEGETATION AND CLIMATE

Since climatic factors directly influence the composition and distribution of regional vegetational zones, perhaps the single most accurate procedure for reconstructing the paleovegetation and climate is the study of fossil pollen, i.e., palynology. To date, however, no suitable regional pollen chronology has been developed for the Mojave Desert region or for the area encompassed by the El Paso/Red Mountain Planning Units.

As a result of the lack of extensive knowledge about the paleovegetation, no detailed map can be constructed for this area. Furthermore, most of the information that does exist on the paleovegetation of the Mojave Desert region is drawn from locations outside the planning units. However, the nature and distribution of this evidence indicates that the vegetation and climate was largely similar throughout most of the deserts of the western United States (Axelrod 1950:239-248). From an examination and correlation of existing sources (Axelrod 1950; Roosma 1958; Wells and Jorgensen 1964; Wells and Berger 1967; Munz and Keck 1968; Ornduff 1974), a rough overview of the general climatic and vegetational evolution of the area can be developed.

As stated by Axelrod (1950), the Pleistocene vegetation of western North America has evolved as a result of a progressive trend toward a drier climate, a trend which apparently has been intensified since the Tertiary. An examination of existing literature seems to indicate that during the more temperate periods of the Pleistocene, which roughly coincide with the periods of glaciation, the general area encompassed by the planning units received, on the order of five to eight inches, more annual precipitation than at present. Further, these pluvial periods were accompanied by an approximate 5°F drop in yearly mean temperature. Thus, overall, it can be concluded that the Pleistocene climate of the planning units was far more temperate than that which characterizes the same region today.

To avoid confusion later in this section, the significant plant species that comprise the plant communities discussed will not be included in the body of the text. These communities are listed in Appendix I in the order mentioned in the text.

Although some local variations exist, evidence indicates that during the wetter pluvial periods of the Pleistocene, the area under consideration was covered to a minimum altitude of approximately 600 meters by what appears to have been a plant community similar to what Munz and Keck (1968) term Desert Woodland. Below this elevation, the region was apparently characterized by a Valley Grassland plant community (Roosma 1958; Wells and Jorgensen 1964; Wells and Berger 1967; Munz and Keck 1968:1-21; Ornduff 1974:61-126).

The Desert Woodland vegetational zone can be roughly subdivided into three interrelated plant communities: (1) Northern Juniper Type Woodland; (2) Piñon-Juniper Woodland; and, (3) the Joshua Tree Woodland. Although an exact delineation (demarcation) of the geographical area covered by each of these subdivisions within the zone is difficult, the Desert Woodland zone apparently centered around a core area consisting of Piñon-Juniper Woodland, which descended to a minimum altitude of approximately 1,000 meters. On the basis of existing information, it appears that the upper elevations of this region, above 1,500 meters, were dominated by a Northern Juniper Type Woodland while the plant species typical of the present Joshua Tree Woodland prevailed down to approximately 600 meters on the lower, well-drained slopes of the region.

Below the 600-meter level, the Desert Woodland gradually gave way to a predominance of perennial bunch grasses which characterize the Valley Grassland plant community. On the basis of known faunal remains, it is apparent that these vegetational zones supported an extensive population of grazing animals (Munz and Keck 1968:1-21; Axelrod 1950:268-270; Roosma 1958; Wells and Jorgensen 1964; Wells and Berger 1967; Ornduff 1974:61-121).

With the onset of the progressively drier interglacial periods, these plant communities migrated to higher elevations, became localized in climax zones, or disappeared from the area in response to the changing climatic conditions. A further response to these changing climatic conditions was the increased distribution and dominance of the desert plant communities known today (Munz and Keck 1968:1-21; Axelrod 1950:260-298; Ornduff 1974:61-126).

In summary, it appears that the Pleistocene Mojave Desert region proved a far more hospitable habitat, especially in terms of available plant and animal resources, than is typical of the region at present. By the opening of the Holocene, however, this relatively rich environment had evolved into the modern arid desert, both in structure and environment.

PRESENT CLIMATE AND VEGETATION

The Mojave Desert region, including the area of the El Paso/Red Mountain Planning Units, constitutes an arid desert environment typical of much of the southwestern United States. The region receives less than five inches of mean annual precipitation in the lower valley areas, and a slightly higher average in the upland mountain areas. Nearly all of this mositure comes in the form of winter rainstorms brought up from either the Gulf Coast or over the crest of the Sierra Nevada Mountains from the Pacific Ocean. The area also receives a small amount of moisture in the form of thunderstorms and flash floods, which usually occur between April and October. Spring is climatically characterized by the frequent occurrence of strong westerly gales which sweep the region. The normal temperatures of this area range from a high in excess of 100°F in the summer to below freezing in the winter months (Dibblee 1952:9, 1968:9; Hind 1952:89; Ornduff 1974:34-60).

The vegetational distribution of this area is characterized by four major and four minor plant communities (Appendix I).

Desert scrubs, which characterize the major portion of the study area, fall into four plant communities as defined by Munz and Keck (1968). These include: (1) the Sagebrush; (2) Shadscale; (3) Creosote; and, (4) Alkali plant communities. The Alkali community has the least distribution of these major zonations since it is specifically adapted to the alkaline soils that exist on former lake playas. However, there are playa beds that are too alkaline even for this community. Such areas form notable sterile zones within the study area.

In addition to the four major plant communities, there are relic communities of the formerly extensive Pleistocene Valley Grassland, Piñon-Juniper Woodland, and Joshua Tree Woodland scattered throughout the area covered by the planning units (Dibblee 1952:9, 1968:9; Hind 1952:89; Munz and Keck 1968; Ornduff 1974).

AN ETHNOHISTORY AND HISTORY OF THE EL PASO/RED MOUNTAIN PLANNING UNITS

INTRODUCTION

Beginning in 1772, with the travels of Pedro Fages, and continuing to the present the El Paso/Red Mountain Planning Units have been the scene of many complex interactions between a harsh desert environment and native peoples, European explorers, and American settlers (Fig. 4). Since Fages, there has been increasing historical activity, climaxing in the mining boom of the period between 1890 and 1925. The earliest contact period saw sporadic exploration. This was followed, in the 1800s, by waves of immigrants trying to reach the promised land on the California coast. The climax came in the early 1890s when gold fever touched off a period of intensive mining activity. However, the gold played out, as did the tungsten and silver booms which followed, and after the 1920s the history of the units is one of reduction and economic stagnation (Fig. 5).

This section focuses on the way in which historical activity has impacted the El Paso/Red Mountain environment and highlights the physical remains of that activity. It also outlines the scant ethnohistorical references to aboriginal lifeways. Early expeditions and government-sponsored incursions are discussed only as they relate to either the development of the area or to aboriginal lifeways. Due to the content and nature of the historical record, emphasis is placed on mineral production within the planning units, and it is necessary to call on events which took place outside of the planning units.

The section is divided into two major parts. The first is a general overview of the history of the planning units. It serves to put Part Two into context. Part Two is an inventory of the historic remains located within the planning units. It is structured in terms of the 24 quadrangles which have been numbered by the Bureau of Land Management. Where possible, the present condition of these remains are noted.

HISTORY AND ETHNOHISTORY: AN OVERVIEW

The history and ethnohistory of the El Paso/Red Mountain Planning Units is divided into three general periods. The first is called the exploratory period and covers the events between the first Spanish contact in the area and the beginning of immigrant wagon crossings. The second period is called the immigrant period and it traces events between the crossing of the first American wagon train and the discovery of gold in the area. The third period is called the mining period and covers the events between the discovery of gold and the end of large scale mining activities.

Exploratory Period (1772-1844)

In 1772, Pedro Fages made the first recorded journey through Cajon Pass, along the edge of the Mojave Desert, across Antelope Valley, and into the Southern San Joaquin

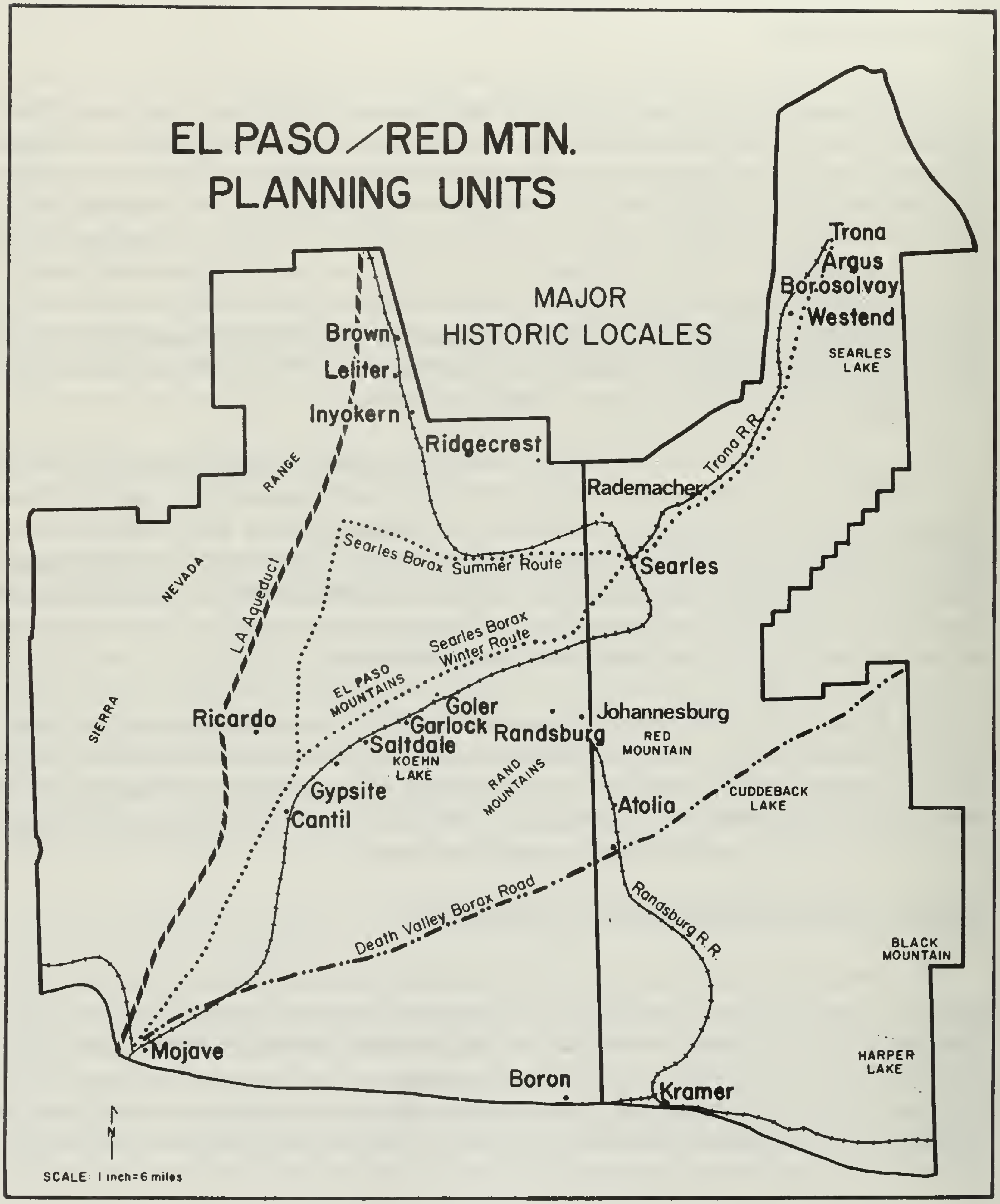
EL PASO / RED MTN.
PLANNING UNITS
MAJOR
HISTORIC LOCALES
Trona
Argus
Borosolvay
Westend
SEARLES
LAKE
Brown
Leliter
Inyokern
Ridgecrest
Trona R.R.
Rademacher
Searles
Searles Borax Summer Route
Searles Borax
Winter Route
NEVADA
RANGE
SIERRA
L.A. Aqueduct
Ricardo
EL PASO
MOUNTAINS
Goler
Garlock
Saltdale
KOEHN
LAKE
Randsburg
Johannesburg
RED
MOUNTAIN
RAND
MOUNTAINS
Gypsite
Cantil
Atolia
CUDDEBACK
LAKE
Death Valley Borax Road
Randsburg R.R.
BLACK
MOUNTAIN
HARPER
LAKE
Mojave
Boron
Kramer
N
SCALE: 1 inch=6 miles

FIGURE 4

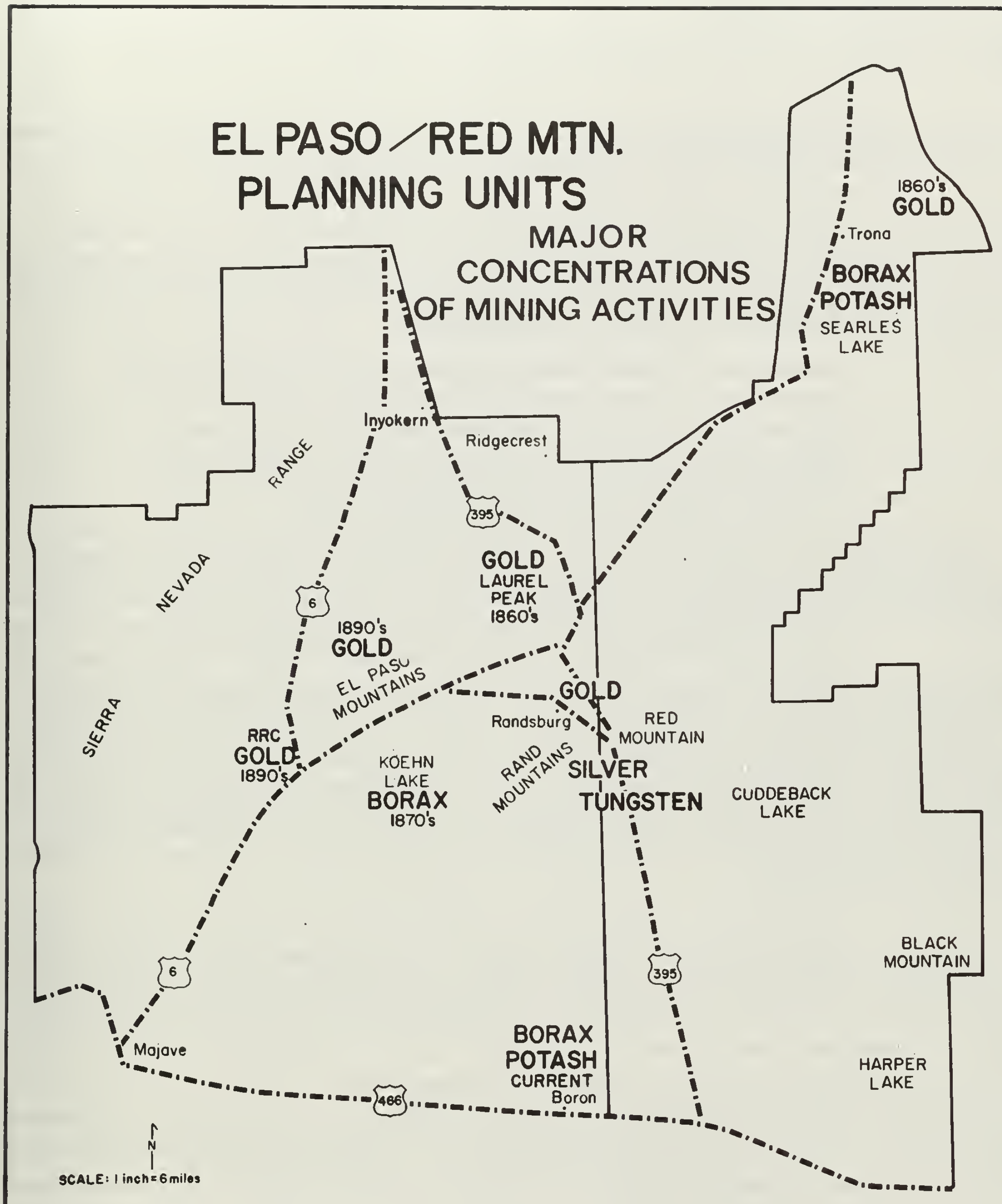
EL PASO/RED MTN.
PLANNING UNITS
MAJOR
CONCENTRATIONS
OF MINING ACTIVITIES
1860's
GOLD
Trona
BORAX
POTASH
SEARLES
LAKE
Inyokern
Ridgecrest
RANGE
NEVADA
SIERRA
395
GOLD
LAUREL
PEAK
1860's
6
1890's
GOLD
EL PASO
MOUNTAINS
GOLD
Randsburg
RED
MOUNTAIN
RRC
GOLD
1890's
KOEHN
LAKE
BORAX
1870's
RAND
MOUNTAINS
SILVER
TUNGSTEN
CUDDEBACK
LAKE
BLACK
MOUNTAIN
6
395
Majave
BORAX
POTASH
CURRENT
Boron
HARPER
LAKE
466
N
SCALE: 1 inch = 6 miles

FIGURE 5

Valley (Bolton 1931:218). While skirting the Mojave Desert, he may have passed through the planning units. The area he crossed was claimed at least in part by such Indian groups as the Kawaiisu, Koso, and Chemehuevi. Fages, and other Spanish explorers (the most notable being Francisco Garcés) did not greatly disrupt aboriginal lifeways or leave any physical remains. The only evidence of their passage is contained in the journals they kept during their travels.

Fages made his historic journey while chasing Spaniards who had deserted the missions to live with the Indians. While on this punitive expedition, Fages apparently left San Diego in 1772, and crossed the peninsular ranges into the Imerpial Valley. He then turned north to travel up the valley and across Cajon Pass to the edge of the Mojave Desert. From Cajon Pass he turned northwest and traveled along the edge of the Mojave, across Antelope Valley and into the Southern San Joaquin Valley (Bolton 1931). As quoted by Bolton (1931:215), this is how Fages described his trip across the planning units:

> We went along the plain toward the north keeping to the Sierra on account of water, traveling about twenty-five leagues until we reached the pass of Buena Vista. Most of these twenty-five leagues we were passing through groves of date palms, the land both east and south having more and more palm groves. But the country appeared to be very short of water. We saw many smokes along the plain.

This description of Fages' crossing is so compressed that it obviously mixes features of the Imperial Valley with those of the Mojave Desert. For example, the plain he is referring to has been interpreted (Bolton 1931:214) as being the Mojave Desert. However, the date groves are stands of native California Fan Palm (*Washingtonia filifera* Lindl.). These only occurred in the Imperial Valley. The "many smokes" have been interpreted as representing Indian camps. Thus, the earliest account of a possible crossing of the planning units tells us that there were Indians on the Mojave Desert, as well as date groves in the Imperial Valley and a lack of water in both places. Today, most of the Indians and date palms are gone and there is still a lack of water. Fages goes on to give relatively extensive descriptions of aboriginal lifeways in the San Joaquin Valley, saying nothing more about aboriginal groups within the planning units.

The next recorded contact between Spanish explorers and the planning units is recorded in the diaries of Francisco Garcés, who in March, April, and May of 1776 partially retraced some of Fages' route (Coues 1900). Garcés left Mexico City in 1775 with the historic Anza party to settle San Francisco. But in the vicinity of present-day Needles, California, Garcés left the expedition to strike out across the Mojave Desert. On March 8, 1776, Garcés discovered the Mojave River. He first encountered the River in the vicinity of Soda Lake and followed it upstream to the San Bernardino Mountains. Garcés (Coues 1900:235) stopped at an Indian camp on March 11th. He described the Indians (which he called Beneme and Coues identifies as Panamint) as being so poor that they were entirely naked with only rush roots for food. This agrees with later ethnographic accounts. Given that it was March, the Indians should have been eating starvation foods such as rush roots. Garcés goes on to note that these Indians had baskets and that mesquite trees and wild grapes were located in the vicinity of the camp.

For some reason, Garcés left the Mojave River on March 18, 1776 and struck out to the west. Coues (1900:237) interprets Garcés' diary to indicate that Garcés went toward Grapevine, California. If this is true, then Garcés could have entered the planning units. Near Grapevine, and by inference in the planning units, Garcés stopped at an Indian camp inhabited by some 40 Beneme (Panamint) Indians, and two days later, on March 20th, he stopped at another Indian camp of some 70 individuals. Unfortunately, Garcés does not give any further information than to note the size of the camps. After leaving these camps, Garcés turned southeast and, on March 22nd, crossed Cajon Pass to arrive at Mission San Gabriel on March 24, 1776.

Garcés left San Gabriel on April 9, 1776 intent on exploring the San Joaquin Valley (Coues 1900:254). After leaving San Gabriel, Garcés proceeded to the San Fernando Valley, crossed the mountains in the Newhall/Castaic area, and went through Tejon Pass to the San Joaquin Valley. On May 10th, he left the Valley by crossing the Sierra at either Tehachapi Pass or through Kelso Valley and on May 14th stopped at the present-day town of Mojave (Coues 1900:264). Kelso Valley is in the El Paso Planning Unit and Mojave is in the southwest corner of the unit. Garcés notes that there was an Indian camp between the San Joaquin Valley and Mojave. He reached this camp on May 12, 1776 and noted that there were only women and children present; the men he presumed were out hunting (Coues 1900:263). The Indians gave Garcés meat, seeds, and shell beads. This is the extent of his description of these Indians. On May 15, 1776, Garcés left Mojave and crossed the Mojave Desert to the Mojave River and on to the Colorado River. By the time he had reached the Mojave River, Garcés had passed out of the planning units for the last time.

There are no further Spanish references to explorations in the planning units. The first recorded American incursion into the planning units was that of Jedediah Smith in 1826-27 (Dale 1941:179; Sullivan 1934:ii). Smith was a fur trapper who left St. Louis with William Ashley in the spring of 1826, intent on traveling overland to the Pacific coast. There has been some controversy over the dates when Smith crossed the planning units (Merriam 1924:25-30). However, Smith actually crossed the Mojave Desert twice. In 1826, he left the Great Salt Lake in Utah and traveled across the Mojave Desert to San Bernardino and San Gabriel. However, he also left San Gabriel in 1827 and again traveled along the edge of the Mojave Desert and into the San Joaquin Valley. On the 1826 trip he did not actually enter the planning units. The closest he came was the Mojave River. On the 1827 trip Jedediah Smith probably did cross the planning units.

According to Smith's narrative (Sullivan 1934; Dale 1941), he reached the Mojave River (which he called Inconstant) in 1826. Smith came across two Indian lodges on the Mojave River. He traded some cloth, knives, and beads for two horses, some cane grass candy, and water. This indicates that by 1826 the Indians on the Mojave Desert were using horses. Near the head of the Mojave River, in Vanyume territory, he again stopped at some Indian lodges and purchased two horses. This leg of Smith's trip ended on November 27, 1826 when he reached Mission San Gabriel (Sullivan 1934:34-35; Dale 1941:187). Smith's narrative does not give any details of his crossing of the planning units. It merely notes that he left San Gabriel early in 1827 and, after traveling 300 miles, reached the upper San Joaquin Valley.

In April of 1884, John C. Fremont led a U.S. Government-sponsored expedition up the San Joaquin Valley, and on April 15, 1844 he crossed the mountains at the southern end of the valley, thus entering the planning units from the west (Fremont 1845:255-256). In his journal, Fremont (1845:256) recorded his first impression of the Mojave Desert, as seen from the Tehachapis. He said:

> A hot mist lay over it [the Mojave] to-day, through which it had a white and glistening appearance; here and there a few dry looking buttes and isolated black ridges rose suddenly upon it. "There, said our guide, there are the great *llanos*, there is neither water nor grass–nothing; every animal that goes out upon them, dies."

This comment by Fremont's guide indicates that he was not from a group which claimed the area. Fremont traveled south and east along the edge of the desert. He noted the presence of Yucca plants and recorded seeing several antelope (Fremont 1845:257). On April 18, 1844, Fremont crossed out of the planning units and came to the Mojave River. While traveling down the Mojave River, Fremont (1845:260) met a group of six Indians which he described as follows:

> Here a party of six Indians came into camp, poor and hungry, and quite in keeping with the character of the country. Their arms were bows of unusual length, each had a large gourd, strengthened with meshes of cord, in which he carried water. They proved to be Mohahve [sic] . . . He [their leader] said they lived upon a large river in the southeast (Colorado River) . . . They sometimes came over to trade with the Indians of the Sierra, bringing with them blankets and goods.

This is an obvious reference to a group of Colorado River Indians who were traveling across the Mojave Desert to trade with groups from the Sierra Nevada Mountains. This supports the trade information contained in the ethnographic sketch section. Also, Fremont (1845:260) says that on his map he called the river the Mohahve. This seems to be the first time that this name is applied to the river presently called the Mojave River. This is the last bit of information offered by Fremont that is relevant to the planning units.

There were other American explorers through the area, the most notable being Joseph Reddeford Walker who pioneered and named Walker Pass in 1834. However, Fremont and Smith were the major explorers and limited though their reports may be, they offer the best ethnohistoric data for this period.

Immigrant Period (1844-1860)

In 1843, Joseph Walker returned to the area to lead the Joseph B. Chiles immigrant party to the California coast. The Chiles party was the first substantial American immigrant wagon train to cross Walker Pass (Fremont 1845:165).

Probably the most famous immigrant party to cross the planning units was the Bennett-Arcane party. In 1849, this party, also known as the Death Valley 49er's, traveled from Cobble Creek, Utah, through Death Valley, and on to Los Angeles (Manly 1894).

Death Valley was named as a result of their trials and hardships while making this crossing. While trying to find a way out of Death Valley, it was decided that the party would camp while the two youngest, strongest men attempted to find a route (Manly 1894:151). The men selected were William Lewis Manly and John Rogers. Unfortunately, Manly's account of his crossing does not give accurate locational information, but it does seem clear from Rogers' brief account (Belden 1954:62-68) that they did leave the southern end of Death Valley and cross the Mojave Desert to the Newhall area. This would mean that they crossed the planning units sometime late in 1849. Manly and Rogers reached the San Fernando Valley near the end of 1849, and they returned to Death Valley, again crossing the planning units, to guide the rest of the party to the San Fernando Valley (Manly 1894:176-215). Sometime in February, 1850, probably about the middle of the month, the whole party left Death Valley and crossed the planning units (Manly 1894:216-222). Manly does not report on the Indians or on the environment of the area except to note that it lacked water and was covered by Yucca trees.

As a result of the military appropriation act passed by Congress on March 3, 1853, the U.S. Army was allocated $150,000 to survey all possible routes for a Pacific railroad (Anderson 1948:177-195). In May of 1853, Secretary of War Jefferson Davis ordered Lt. Robert Stockton Williamson to attempt to find a suitable pass through the Southern Sierra Nevada Mountains (Anderson 1948:181). On July 10, 1853, Williamson left San Francisco with a party of 49 men. He was intent on surveying the southern San Joaquin Valley and hoped to find a suitable pass through the mountains to the Mojave Desert (Anderson 1948:182). In the course of his survey, Williamson evaluated all three major southern passes, namely Walker, Tejon, and the little known Tehachapi.

During his survey, Williamson made several observations about the Indians he encountered. At a spring approximately 13 miles south of Walker Pass (in the El Paso Planning Unit) he recorded the following encounter with some Indians:

> There was an abundance of bulrush growing here, and a large number of Indians, probably 50 or 60, engaged in gathering it. They had evidently heard of us from their neighbors, and did not show the least sign of fear; but men, women, and children came flocking around us, evincing much curiosity [Williamson 1885:18].

This is the extent of the information Williamson provides about aboriginal activities within the planning units. However, he does discuss several encounters with Indians in the areas immediately surrounding the planning units. While in Walker Pass, Williamson observed that:

> There were a number of Indians, both on the creek and at the spring near our camp . . . They seemed at this season (summer 1853) to be principally employed in collecting a kind of bulrush or cane . . . They cut the cane and spread it in the sun to dry, and afterwards by threshing, separated the sugar from the leaf. The cane itself had no sweet taste [Williamson 1885:15].

As a final reference to the Indians in the area, Williamson noted that he came across two Indian camps in the vicinity of Tehachapi Pass. Unfortunately, he does not elaborate.

The lack of references to aboriginal lifeways during both the exploratory periods and the early immigrant periods stresses the low population density that must have been characteristic of precontact times (see ethnographic section). There were many parties crossing the area at all times of the year, so it is unlikely that they would have so little contact with the Indians, unless there were relatively few Indians in the area. From the first contact in 1772 until after the Williamson survey in 1853 the lifeways of the Indians were not significantly impacted by contact with either the Spanish or the Americans. However, the addition of horses, guns, knives, etc. undoubtedly had an effect on Indian lifestyles.

This lack of impact was not to last. In the 1850s gold was discovered in the Kern River area. It has been estimated that during the years from 1854-55 more than 5,000 Americans immigrated to the Kern River area (Wynn 1963:14). Following the usual destructive policy, when there was a large influx of Americans into an area, the Indians living in that area were removed to reservations so that they would not hinder American development. So, coincident with the discovery of gold, the first California Indian reservation was established at Fort Tejon, located at the foot of the Tehachapi Mountains (Caughey 1952:xxxi-xxxiii). In 1852, Edward F. Beale came to California as the superintendent of Indian Affairs. In the fall of 1853, he negotiated with the Indians in the Tejon Pass area and convinced them to occupy a reservation to be maintained at Fort Tejon. By February of 1854, there were more than 2,500 Indians, who had been rounded up from the surrounding area (probably including the planning units), living in a mission-like community on the reservation. They planted 2,000 acres in wheat, 500 in barley, and 150 in corn and maintained this acreage through a ditch irrigation system (Caughey 1952:xxxii). The establishment of the Fort Tejon reservation marks the beginning of relatively intense mining activity in the planning units. This activity began in the 1860s, reached a climax during the period 1890-1925, and has declined (but not ended) since 1925.

Mining Period (1860-1925)

Gold was discovered on the side of Laurel Mountain in the El Paso Mountains in 1863 (Wynn 1963:16). The area was designated the El Paso Mining District, and El Paso City, its major settlement, was founded. On April 1, 1863, the *Los Angeles Tri Weekly News* reported:

> There is much activity in the El Paso Mining District, situated beyond Tahachape (sic) and about 50 miles to this side of the Slate Range. We have seen specimens of several newly discovered lodes; one of gold quartz, which is without doubt the richest yet discovered in this part of the state.

This report touched off the minor gold rush that was to mark the beginning of intensive mining activities. Slightly prior to this the Slate Range Mining District was organized to exploit the gold discoveries there. Its two most famous citizens were the Searles brothers, who in the 1870s would develop the borate deposits at Searles Lake (Chalfant 1922:135). A mill was set up in the district, and it processed 3,000 tons of ore assayed at $35 a ton. The excitement over this strike, as well as the one in the El Paso Mountains brought speculators to the area in droves. Over 300 claims were filed, and stock corporations were formed (Chalfant 1922:136). It was these floating stock companies as well as attempts to oversell the districts that led to the cessation of mining activities in these areas by the 1870s.

In the 1870s, mining activity shifted to the borate deposits that were discovered as early as 1862. In 1873-74, there was intense competition to control marsh lands and playas (Hanks 1883:26). It was the Searles brothers (John and Dennis) who emerged from this competition to dominate borate exploitation. During the period from 1873 to 1881, these brothers and their borax works on Searles Lake would be the primary source of borax for all of California (Chickering 1938:116). The water to run the borax works was carried through iron pipes from the Argus Mountains, some 7.5 miles away. Mesquite wood and sagebrush were used as fuel for the boilers until the late 1880s when wood was replaced by crude oil (DeGroot 1890:539). At maximum production, the Searles plant attained a capacity of 100 tons of processed borax a month. The refined borax was transported, in 20-mule-team trains, to the siding at Mojave (DeGroot 1890:534). In the 1880s, the borax deposits in Death Valley were developed and borate mining emphasis shifted to this area. By 1887, the price of borates had dropped so low that the works closed.

In the 1890s, gold was again discovered in the planning units. There was placer mining in Red Rock Canyon in 1893. The Goler Mining District was organized on March 15, 1893, and a stage route was opened to Goler in the fall of 1893 (Fairbanks 1894:458). At Goler, the miners lived in dugouts, and water for digging was hauled in from Mesquite Springs (Wynn 1963:59). In spite of this, it was the lack of water that led to Goler being abandoned in favor of the mining activities in the Rand Mountains (Wynn 1963:64).

On April 25, 1895, three claims were staked for gold deposits on the side of Rand Mountain (Wynn 1963:80). This marked the beginning of the Rand Mountain Mining District and the Yellow Aster Mine. It was also the beginning of the most intensive mining activities in the planning units. The original settlement of Randsburg took place as an adjunct to the activities at the Yellow Aster. The miners lived as close to the mine as possible and were housed in dugouts and tents (Wynn 1963:93-94). Later, abandoned camps such as Goler would be scavenged for their buildings. By 1896, overpopulation and encroachment on Yellow Aster property led to the resettlement of Randsburg on its present site, downhill from the mine (Wynn 1963:95). By the end of 1896, the population of Randsburg and surrounding camps was over 1,500 housed in over 300 structures. The ore from Randsburg was processed at mills located in Garlock, and the town of Johannesburg developed as a freight center. Randsburg was destroyed twice by fire, once in January of 1898, and again on May 6, 1898.

By the turn of the century, gold deposits were playing out and it seemed as if the mining boom would soon be over. The attempts to mine gold in the Randsburg area had always been plagued by a heavy white mineral that interfered with the concentration of gold ore. In 1903, this mineral was identified as scheelite, from which tungsten is derived (Hulin 1925:108). This discovery set off a rush to stake the area for scheelite. In 1906, the Atolia

Mining Company began operations on the main scheelite deposits in the Randsburg area. Production was limited until the beginning of World War I which created a demand for tungsten. In 1913, scheelite was selling for $7 a ton and by 1916 it was worth $80 a ton (Hulin 1925:108). After the war, the price dropped so low that scheelite mining was halted. The Atolia Mining Company ceased operations on March 1, 1919, and once again the Randsburg area was faced with abandonment.

It was saved for the last time on April 12, 1919 when several silver deposits were discovered, and the California Rand Silver Mine was opened (Hulin 1925:108-109). Silver prospecting reached its peak during 1922-23. During this time, over 50 shafts were sunk within a radius of one mile from the original find (Hulin 1925:109). The expiration of the Pittman Act (which guaranteed a domestic price of $1 an ounce for silver) in 1923 did not seem to immediately affect the California Rand Silver Mining Company, but it did stop exploration. Over the long run, it was probably the lack of a good price that slowly forced the end of large scale mining activities. By 1925 the mill was running only one shift a day and most people had left the area. There is still mining activity today, although it is on a very small scale.

The major non-mine related activity of the Mining Period was the construction of the aqueduct from Owens Valley to Los Angeles. The drought which occurred during the summer of 1904 convinced the residents of Los Angeles that they needed more water (Los Angeles Department of Public Service 1916:9). After a feasibility study, the Owens River was chosen as the best source for this water. During 1904 and 1905, routes were surveyed and land rights were quietly secured (Los Angeles Department of Public Service 1916:10, 47). A bond issue was passed in 1906, and by 1908 work crews had been hired and assigned to camps built along the project route. Lines of communication, including roads, trails, telephone, and telegraph were constructed and water sources located and improved (Los Angeles Department of Public Service 1961:14, 18).

The actual construction of the aqueduct began in 1908 and was completed by 1913 at a cost of $23,000,000 (Los Angeles Department of Public Service 1916:9). Within the planning units, the plan of the aqueduct, as defined by William Mullholand, was as follows:

> Little Lake to Indian Wells . . . 24 miles of conduit, tunnels, and siphon pipes . . . Indian Wells to Red Rock Summit . . . 20 miles of conduit flumes and siphon . . . Red Rock Canyon through Jawbone Canyon to the Mojave Desert . . . 19 miles of conduit, siphons, and tunnels . . . Mojave Desert to the west end of Antelope Valley . . . 68 miles of concrete conduit [Los Angeles Department of Public Service 1916:18].

The impact of the building of the aqueduct was not limited to the actual route of the project. For example, the cement used was obtained from Cuddeback Ranch and a Tufa mill was constructed there.

HISTORIC REMAINS: AN INVENTORY

Part I of this section (History and Ethnohistory: An Overview) is an outline of the major historic events which occurred in the planning units between 1772 and 1925. It serves as background material to put the following inventory into perspective. This inventory is structured in terms of the 15 minute USGS quadrangles that make up the planning units. The Bureau of Land Management has numbered these quads from north to east beginning in the northwest corner of the planning units. This order is followed in the inventory.

Quadrangle Number 1: Little Lake

The major historic remains in the Little Lake quadrangle are associated with the settlement known as Brown (Section 12, T25, R38E, SBB&M). Brown was settled in 1909 as a work camp for the Los Angeles Aqueduct. Brown contained a saloon, hotel, several businesses, and the Mount Owen School, a one-room school which was open until 1951 (Pierson 1964:18). Aqueduct workers were housed in temporary barracks and were fed in the Diamond mess tent, which was the largest structure in the town. The animals for the aqueduct were stabled in a large corral located just outside of town.

In 1909, the Owenyo branch of the Southern Pacific Railroad railroad reached Brown and a large corrugated iron shed was built to house railroad operations (Pierson 1964:19). In 1909-10, Brown also served as a supply center for the miners and prospectors who came to the area as a result of the 1909 gold strike in Wilson Canyon.

Pierson (1964:18) reported that in 1964 all that remained of Brown, which once had a population of over 2,000, was a few random buildings and not more than three or four people.

Quadrangle Number 2: Trona

The Slate Range Mining District was formed on November 10, 1861 for the purpose of exploiting gold deposits (Chalfant 1922:135). The Albany and Morrow mines produced more than 3,000 tons of gold ore valued at $35 a ton. The ore was first crushed in an arrastra and processed in a mill. In the rush to claim Slate Range gold, over 300 claims were staked and in the rush to claim the resources of greenhorns from the east many floating stock companies were created. Speculators were said to have floated the Francis mine with more than one million dollars worth of stock (Chalfant 1922:136). Floating stock companies, hard sell over speculation, and a lack of new strikes contributed to the end of the Slate Range gold rush. By the 1870s, most of the ore produced in the district was from the Haggin Mine. This ore was either milled at the Riely mill in the Argus Mountains or it was shipped to San Francisco (DeGroot 1890:533).

The major problems in working the Slate Range deposits were centered around transportation. Due to distance, shipping rates to and from the railroads were prohibitive.

To cut down on these costs, the San Bernardino/Panamint stage road was built in 1873. It ran parallel to Highway 178.

In August of 1873, from 45 to 100 Chinese workers were imported to construct the road across the Slate Range (Starry 1969:12). Chinese workers were used to fill all the washes on the route and to level steep inclines. They did this using only picks, shovels, and wheelbarrows (Starry 1969:12). These workers were housed in one large camp where they lived in one-room structures made from mesquite stumps and boards from wrecked wagons. Anti-Chinese feelings led to an attack on the Chinese camp, and as a result of this the Chinese left the area in the fall of 1873. The ruins of the Chinese camp were visited in 1969, and it was reported that only scattered rock ruins remained of the camp (Starry 1969:13).

The road which the Chinese started was finished by October 1873, and it was rapidly over-used for freight traffic. It was a hazardous route and soon became littered with the wrecks of wagons that had skidded out of control (Starry 1969:12-13). Way stations were built at one-day intervals (ca. 10 miles) by the Meyerson Stage and Freight Line which maintained the road between 1873 and 1890. In the 1890s this road served as the main freight line between the railroad station at Johannesburg and Ballarat and Death Valley (Starry 1969:11).

Borax was discovered on the playa of Searles Lake in 1862, however these were not worked until 1873 when a processing plant was built by the Searles brothers in the vicinity of present day Trona (Hanks 1883:26; DeGroot 1890:534; Bailey 1902:37; Thompson 1929:176). In the period between 1862 and 1873, there was intense competition over control of the deposits. In 1873, the Searles brothers emerged as the victors with the only borate operation on the lake (Chickering 1938:III; Oberteuffer 1942:12). From 1873 to 1881, the Searles brothers were the major California producers of borax (Chickering 1938:116). In 1874, the Searles borax works consisted of:

> . . . a little cabin of boards, in which they (the Searles brothers) lodged in very tight quarters, while a half a dozen Chinese, whom they employed sheltered themselves under a sort of construction of earth (adobe) [Leuba in Chickering 1938:11].

Throughout the 1870s and 1880s, the Searles borax works were expanded and modified until, in 1890:

> . . . these works were very complete in all their appointments, the several departments consisting of a concentrator, a refining, and boiler house. For doing the moving and hoisting, derricks, tramways, and similar appliances are provided, every labor saving device known, having been introduced here. Shops and outbuildings of all needed kinds; a cooperage and wharehouse, dwellings, barn, sheds, stables, corrals, etc., are all on the premises [DeGroot 1890:538].

This physical plant was operated by some 50 workers who used about 50 draft animals (DeGroot 1890:539).

Water for the works was obtained from springs in the Argus Mountains. It was piped, under a 1,000-foot pressure head, through 7.5 miles of iron pipes (DeGroot 1890:539). Prior to the late 1880s, mesquite wood and sagebrush were used as fuel for the boilers. It was reported that the desert from the works to eight miles up the valley was stripped bare to provide this fuel (Spears 1892:112). Wood fuel was replaced in 1887 by crude petroleum which was hauled to the works from Mojave. At maximum production, the Searles plant operated at a capacity of 100 tons of processed borax a month, although it was not continuously operated at this level (DeGroot 1890:537). Both Searles brothers were dead by 1898, and their borax works were closed with the death of John Searles.

The Searles brothers worked the lake bed for borax, although they knew of the presence of other marketable borates and rare earths (DeGroot 1890:176). In 1913, the Searles holdings were taken over by the American Potash and Chemical Corporation. This group developed these other deposits, founded the present town of Trona, and built the rail spur to it. Their plant is still in operation.

Quadrangle Number 3: Onyx

About 90% of the Onyx quadrangle falls outside of the planning units. Except for numerous small mines and a short segment of the Los Angeles Aqueduct, there are no significant historic resources in the portion of this quadrangle which is in the planning units.

Quadrangle Number 4: Inyokern

In 1919, the town of Inyokern (then called Siding 16) was settled. It was built to house and supply aqueduct workers and served as a freight siding on the Southern Pacific Railroad (Pierson 1964:46). In 1910, most of the aqueduct workers were moved to new sections and the people who remained in Inyokern turned to agriculture, cattle shipping, and freight handling. In 1943, Harvey Airfield was the site of a temporary camp which the Navy set up while the Naval Ordinance Testing Site was being constructed. The facility at China Lake insured that the town of Inyokern would survive as a rail station (Pierson 1964:48-49).

The major mining activity in the Inyokern quad took place in Indian Wells Canyon, the site of both gold and scheelite deposits. The largest producer of scheelite was the Hi-Peak Mine, located north of the mouth of Jawbone Canyon. A tungsten mill, built in the 1940s, was located on the northwest side of Indian Wells Canyon, about four miles west of the point at which U.S. Highway 6 crosses the canyon mouth (Troxel and Morton 1962:37). Another tungsten mill was constructed near the Fernandez Mine. It was reported that in 1957 the mill at Indian Wells Canyon was nearly intact, while by 1962 there was no trace of the Fernandez Mine mill (Troxel and Morton 1962:37).

Coyote Holes Station, an overnight stop for the Remi Nadeu freighting company, was located at the junction of the Walker Pass and Owens River roads. In the 1870s it was a major stop for both stages and freight wagons. It was reported in 1874 that Coyote Holes

Station consisted of a large wooden building and several stables (Chickering 1938:108). The famous bandit, Tiburcio Vasquez robbed this station on February 25, 1874 (Edwards 1964:17).

E. I. Edwards visited the site of Coyote Holes Station in the spring of 1964. He reported that the remains of the ¼-mile-long water pipe were still present along with the concrete smokehouse foundation and a storage cave (Edwards 1964:17). In August of 1964, he returned to the station and noted that the smokehouse foundation had been removed (Edwards 1964:42). This indicates the extent of the vandalism that is taking place within the planning units.

Two rhyolite rocks located one mile south of Coyote Holes Station have been dubbed "Robber's Roost" because they were reputed to be the hideout of Tiburcio Vasquez (Edwards 1964:21).

Quadrangle Number 5: Ridgecrest

The town of Ridgecrest began in the early 1900s as a collection of small homesteads and ranches. A dairy was established on the site of present day Ridgecrest, and the settlement became known as Crumville, after its owner (Pierson 1964:51). In 1941, with the establishment of a post office, the town was officially named Ridgecrest (Pierson 1964:52).

In 1943, the arrival of the U.S. Navy lent a sense of permanence to the town. It still serves the base as its closest town.

The Rademacher Gold Mining District was the site of most of the mining activity within the Ridgecrest quad. The district encompassed Laurel Mountain, El Paso Peaks, and some territory north of them (Starry 1974:70). The Southern Pacific Railroad built a siding at Rademacher sometime in the early 1900s.

Quadrangle Number 6: Searles Lake

The majority of the Searles Lake quadrangle is filled with Searles Lake playa. It is the site of the borax deposits that were processed at the Searles Mill located in the Trona quad.

In 1896, the Spangler Mining District was formed to exploit a gold strike northeast of Randsburg and in the south part of the quad (Starry 1974:36). Ore from this district was hauled to Garlock for milling. After several years mining activity ceased. Today there are over 4,000 feet of tunnels and drifts that remain as markers of the mines in the district (Starry 1974:36).

The most unusual feature that once existed in the Searles Lake quadrangle is the monorail railroad that was constructed and operated in 1917 and 1918 (Thompson 1929:591). It ran across the southern end of the lake, between the Trona rail line and the epsomite deposits on the other side of the Slate Range. The monorail train consisted of a single engine which pulled pairs of cars balanced on the sides of the track (Chalfant 1951:118). It attained a top speed of 15 miles per hour and could haul up to 60 tons.

The trestles for the monorail were used for fire wood by campers, and in the late 1930s scrap dealers salvaged the steel track. Today nothing remains of the monorail (McInnes 1969:35). The destruction of this unique rail line was so complete that in the 1940s, the I-bolts and nuts that once littered the line were gathered as souvenirs by trophy hunters (Keagle 1944:12).

Quadrangle Number 7: Cross Mountain

Mining was the major historic activity in the Cross Mountain quadrangle. Prior to 1900, placer gold deposits were worked in the Jawbone and Water Canyon areas. In later years, most of the gold production was at two mines, namely the Skyline Mine on Antimony Flats and the San Antonio Mine (Troxel and Morton 1962:37).

Clay was mined from the White Swan deposit, but this ceased in 1962 (Troxel and Morton 1962:37-38). Scheelite was mined at the Hi-Low Mine, and Blue Point Mine produced roofing granules (Troxel and Morton 1962:38). In 1958, three of the mines in the area (the Silver Lady, Beryl #4, and Miller Ranch) were prospected and staked for uranium; however, they have never produced (Troxel and Morton 1962:38).

In 1909, Cinco was founded as a siding on the Owenyo Branch of the Southern Pacific Railroad. It served as headquarters for the Jawbone Division of the Los Angeles Aqueduct Project. Cinco was abandoned when the aqueduct was completed.

Quadrangle Number 8: Cuddeback Lake

The major historic activity within the Cuddeback Lake quadrangle consisted of services for the trains along the Borax Road which ran from the Harmony Borax Works in Death Valley, across the quadrangle, to the rail station at Mojave (Mendenhall 1909:52-53). Thus, water sources and the stops associated with them are the major historic remains.

The most important water stop was located at Blackwater Well on the crest of a ridge about 18 miles east of Johannesburg (Mendenhall 1909:52). Mendenhall visited the well in 1909 and noted:

> . . . the well can be located by the bare ground in its neighborhood, from which campers have stripped all vegetation. The well which was dug years ago by government troops, is about 15 feet deep and is in the form of a shaft, 5 by 7 feet. The water in it is usually from 2 to 3 feet deep [Mendenhall 1909:52].

According to Mendenhall (1909:52), the water is free of alkali when the well is kept clean and frequently used, but it turns dark and foul when it is not regularly used. This well was not directly on the Borax Road, and water had to be piped ½-mile to reach it. The remnants of the pipe and its associated trenches are aids that can be used to locate the well (Mendenhall 1909:52).

Willard Well, another stopping place, was located on the Borax Road, next to Cuddeback Lake. This well is reported to have given a good supply of brackish water. When Mendenhall (1909:52) visited the well in 1909, he observed that it was partially caved in.

Quadrangle Number 9: Pilot Knob

About 95% of the Pilot Knob quadrangle is located outside of the planning units. The major point of historic interest within the planning units is Granite Wells, a stopping point on the Borax Road. It was one of the best known camping and watering places on the road (Mendenhall 1909:52). Granite Wells, located to the west of Pilot Knob, was characterized by a frame house and several stone structures in addition to the well itself (Mendenhall 1909:53). As a result of his visit to the well in 1909, Mendenhall reported:

> The best water is found in a short tunnel run through into the granite 50 feet northeast of the cabin. At the end of this tunnel is a sump hole, about 3 feet deep, in which the water collects. This water coming from the granite is cool and pure, but the sump often needs cleaning out. About 2 barrels can be got here in 24 hours [Mendenhall 1909:53].

Quadrangle Number 10: Mojave

Settlement at the present day site of Mojave began in 1876 when the Southern Pacific Railroad extended its line over Tehachapi Pass to connect Los Angeles with the San Joaquin Valley (Wynn 1963:43; Pierson 1964:5). The railroad has maintained the settlement and has provided the stability for its economy. In addition to being a rail depot, Mojave has functioned as a major center for prospectors and miners entering the Mojave Desert (Wynn 1963:45).

In the 1870s and 1880s, borax from Searles Lake as well as freight from Owens Valley was hauled to Mojave prior to being shipped by rail to Los Angeles and San Francisco. Mojave was the southern terminus for the Death Valley Borax Road. As such it was a major terminal for borax shipped in the 1880s from Death Valley (Pierson 1964:5).

In 1894, a gold strike at Soledad Mountain created a gold rush in the Mojave area (Wynn 1963:51). Some of the more important gold mines were the Queen Ester, Gray Eagle, Karma, Gypsy, and Echo (Pierson 1964:7). At this time Mojave also served as a stage stop for the hopefuls traveling to the gold strike near Randsburg (Greene 1897:558).

During the first decade of the twentieth century, Mojave was the primary supply terminal for the construction of the Los Angeles Aqueduct (Shrader 1912:538). After this Mojave remained, as it does today, the first major rail terminal on the line between Los Angeles and the San Joaquin Valley.

Quadrangle Number 11: Castle Butte

The background research for this report failed to discover remains of significant historic interest in the Castle Butte quadrangle. It was, however, crossed from northeast to southwest by both the Randsburg/Mojave Road and the Death Valley Borax Road.

Quadrangle Number 12: Boron

In 1913, colemanite, a form of borate, was discovered by J. R. Suckow in the Boron quadrangle. The Suckow Mine became part of the Pacific Borax Company, and it was operated until 1951 (Troxel and Morton 1952:39). There were a series of discoveries which followed this initial find. These included sodium borate in 1925 and rasorite and kernite in 1927 (Troxel and Morton 1962:39). By 1933, all of these holdings were consolidated by the Pacific Borax Company to form the Boron Mine, the largest producing mine in California. The Boron Mine is currently in operation. Prior to 1957, the Boron mine was worked as an underground operation, but after 1957 it was transformed into an open pit operation. The town of Boron houses and serves the employees of the Pacific Borax Company.

Quadrangle Number 13: Fremont Peak

The Gateway Mine, located about one mile west of Fremont Peak, was the site of most of the mining activity in the Fremont Mining District. Its workings consisted of 3,250 feet of drifts and cross-cut tunnels, with a shaft that attained a depth of 185 feet and was accompanied by three adits which varied from 60 to 200 feet in length (Dibblee 1968:58). The Gateway Mine has been idle since 1953.

There was gold prospecting to the northwest of Fremont Peak, and sometime prior to 1934 the Hamburger Mill site was in operation (Hulin 1934:424). The Hamburger Mill site was a gold operation that folded before there was any substantial production. Today all that remains of the mill is a concrete foundation (Dibblee 1968:58).

Quadrangle Number 14: Opal Mountain

The most well-known example of Opal Mountain mining activity is called "Scout's Cove." This mining locus has been described as follows:

> The most enduring ghost of that era of lost dreams is the sturdily constructed semi-dugout of the Opal Mining Company cut in the tufa about one mile up from the Opal Mountain Road junction. In the '40's it sometimes was referred to as the mystery hut, and this spring I was surprised to find 'Scout's Cove' painted on the door arch. There is no mystery about the dugout, and scouts didn't build it. Once on the same door arch was printed 'American Opal Company, 1910' [Weight 1958:20].

Randsburg and Barstow were connected by a road that ran across Harper Dry Lake

(Mendenhall 1909:57). Black's Well is located on this road, and it was also an important water stop on what was once known as the Panamint-San Bernardino Road (Mendenhall 1909:58). Black's Well has been described as follows:

> An adobe house which served as the headquarters of an old ranch is still standing near the well and is in good condition. The well is covered with a platform and the water stands within a few feet of the top [Mendenhall 1909:58].

Mendenhall (1909:58) also observed that the water sources in the Opal Mountain area included Murphy's Well, located on the route between Barstow and Copper City, and that all of the water holes were interconnected by a series of roads and trails.

Quadrangle Number 15: Kramer

About 95% of the Kramer quadrangle is outside of the planning units. The only point of historic interest that is within the units is Kramer Junction, the southern terminus of the Randsburg rail branch. This branch ran the 29 miles between Kramer Junction and Johannesburg (Hulin 1925:13). The Randsburg Railway Company began operation on January 17, 1898 and continued until May of 1903 when it was absorbed by the Atchison, Topeka, and Santa Fe Railorad (Wynn 1963:256). The Atchison, Topeka, and Santa Fe maintained service on the line until December 30, 1933, at which time the line was closed and the rails taken up (Wynn 1963:257).

Quadrangle Number 16: Hawes

Approximately 60% of the Hawes quadrangle is outside of the planning units. The only points of interest within the units are the three sidings—Eads, Hawes, and Jimgrey—maintained by the Atchison, Topeka, and Santa Fe Railroad. These sidings serve the rail line between Barstow and Mojave.

Quadrangles Numbered 17, 18, 19, 20: Saltdale and Quadrangles Numbered 21, 22, 23, 24: Randsburg

The Saltdale USGS 15-minute quadrangle and the Randsburg USGS 15-minute quadrangle have been divided into eight USGS 7.5-minute quadrangles. The four 7.5-minute quadrangles that make up the Saltdale 15-minute quadrangle have been numbered 17, 18, 19, and 20 by the Bureau of Land Management. The four 7.5-minute quadrangles that make up the Randsburg 15-minute quadrangle have been numbered 21, 22, 23, and 24 by the Bureau of Land Management. For this inventory, each of these groups of four numbered quadrangles will be considered as a single 15-minute quadrangle.

The Saltdale and Randsburg quadrangles were the scene of the most intensive and well-known activity of any quadrangles in the planning units. Due to the magnitude of the activity and the extent of the remains in these two quadrangles and because the majority of the land in them is privately owned, they will not be treated in detail.

The history of these two quadrangles is fully treated in two recent works. The first is *Gold Gamble*, published in 1974 by Roberta Martin Starry, and the second is *Desert Bonanza*, published in 1963 by Marcia Rittenhouse Wynn. The mining activities in the Randsburg quadrangle were documented in *Geology and Ore Deposits of the Randsburg Quadrangle, California* published by C. D. Hulin in 1925, as California State Mining Bureau Bulletin No. 95. The early mining activity in the Randsburg quadrangle was documented in *Gold Mining in the Randsburg Quadrangle, California*, published by Hess in 1910 as USGS Bulletin No. 30. The mining activity in the Saltdale quadrangle was documented in *Geology of the Saltdale Quadrangle, California* by Dibblee and Gay in 1952, published as California Division of Mines Bulletin No. 160 and in *Mines and Mineral Resources of Kern County, California*, published by B. W. Troxel and P. K. Morton in 1962 as California Division of Mines and Geology County Report No. 1.

ETHNOGRAPHIC SKETCH OF THE EL PASO/RED MOUNTAIN PLANNING UNITS

INTRODUCTION

Kroeber (1925:Pl. 1) assigned seven aboriginal groups to locations within the boundaries of the El Paso/Red Mountain Planning Units. Only two of these groups—the Kawaiisu and Koso (Panamint)—appear to have used the region as a major resource base. The others—Chemehuevi, Serrano, Vanyume, Kitanemuk, and Tübatulabal—seem to have had territorial claims to portions of the area, although not using it as a major part of their subsistence base.

The focus of Serrano and Vanyume activity was the San Bernardino Mountains and portions of the Mojave River (Kroeber 1925:Pl. 1, 611; Strong 1929:5-11). The Kitanemuk and Tübatulabal were concentrated in the drainages of the Kern and San Joaquin rivers (Kroeber 1925:612). The Chemehuevi were centered in the eastern Mojave Desert and seem to have been concentrated mostly between Twentynine Palms and the Colorado River (Kroeber 1925:593-594; Laird n.d.). For this reason, primary emphasis in the discussion that follows will be placed on the Koso, Kawaiisu, and Tübatulabal, although some attention will be given to the other groups (Fig. 6).

The general ethnographic record for the El Paso/Red Mountain Planning Units is extremely sparse. The record for two of these groups, Kitanemuk and Vanyume, consists of some conflict over the use of these designations, mention of linguistic affiliation, a population estimate, and a vague assignment of territories. For the other groups, the ethnographic record focuses on their activities in areas outside of the planning units. However, it is possible to reconstruct from the total record a general picture of the aboriginal occupation of the El Paso/Red Mountain Planning Units.

POPULATION

There is very little hard demographic evidence for Indian groups in the El Paso/Red Mountain Planning Units. Kroeber (1925:590, 595, 603, 608, 614-615, 617) presented contemporary census data and extrapolated aboriginal populations as follows: (1) Chemehuevi, 1920 federal census estimate of 350 with 260 living in California, and an estimate of a maximum of 1,000 in aboriginal times; (2) Kawaiisu, an estimate of 150 to 500 in aboriginal times; (3) Tübatulabal, 1920 federal census estimate of 100 to 150, and an estimate of up to 1,000 in aboriginal times; (4) Vanyume, estimate of a very small aboriginal population and a reference to Garcés' mention of 65 people in two villages in 1776; (5) Serrano, 1910 federal census estimate of over 100, and an estimate of up to 1,500 in aboriginal times; and, (6) Koso, an 1883 estimate of 150, an 1891 estimate of 100, 1920 federal census estimate of 100 to 150, and an estimate of not more than 500 in aboriginal times. Kroeber is careful to indicate that there is no real basis for his extrapolation of aboriginal populations, although he believes them to be ample. No data is provided by Kroeber on the age/sex breakdown of any of his populations.

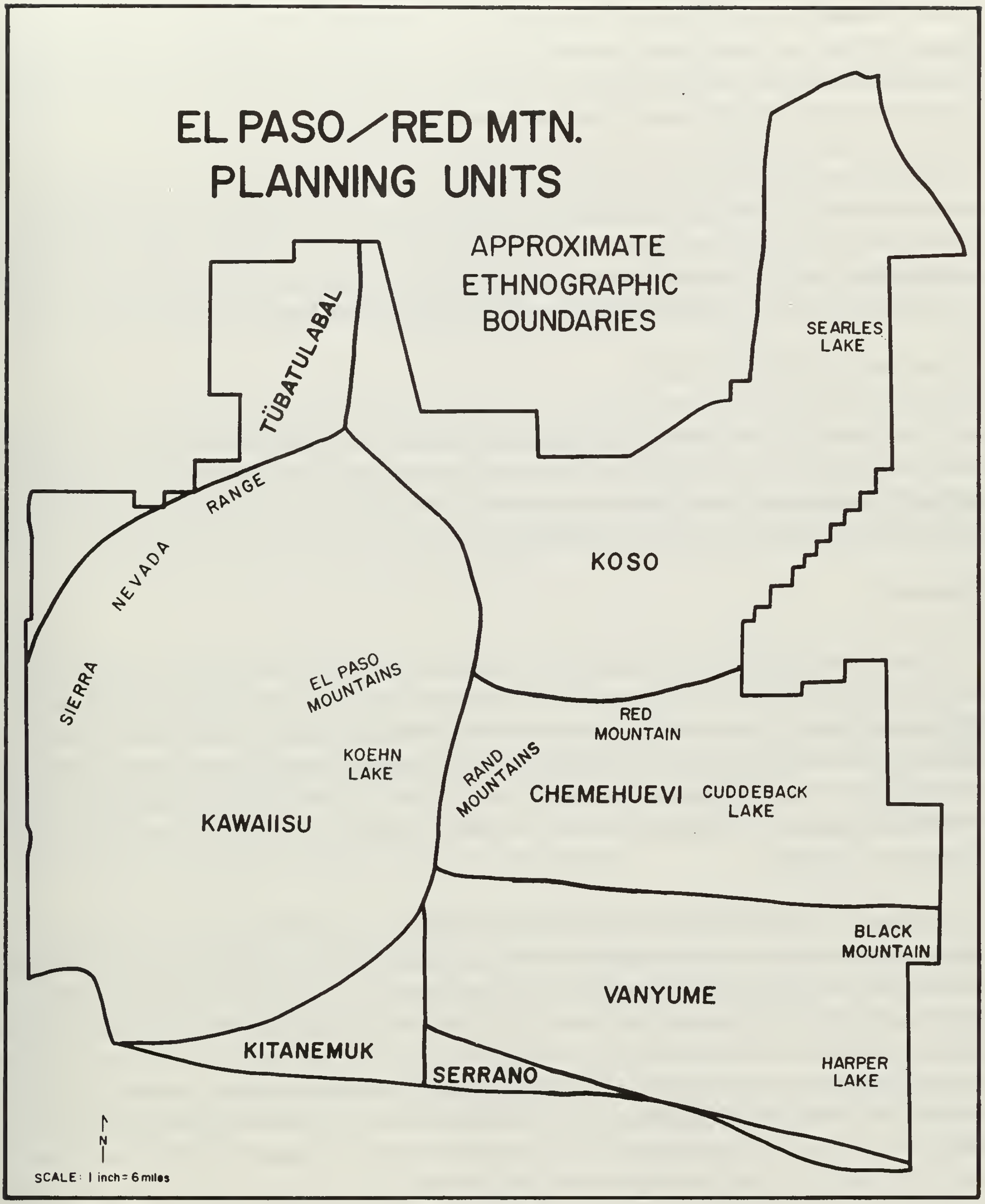
EL PASO/RED MTN.
PLANNING UNITS
APPROXIMATE
ETHNOGRAPHIC
BOUNDARIES
TÜBATULABAL
SEARLES
LAKE
KOSO
SIERRA
NEVADA
RANGE
EL PASO
MOUNTAINS
RED
MOUNTAIN
KOEHN
LAKE
RAND
MOUNTAINS
CHEMEHUEVI
CUDDEBACK
LAKE
KAWAIISU
BLACK
MOUNTAIN
VANYUME
KITANEMUK
SERRANO
HARPER
LAKE
N
SCALE: 1 inch = 6 miles

FIGURE 6

Voegelin (1938) reported that there were 145 Tübatulabal in 1938, and he estimated that the population was between 300 and 500 in aboriginal times. In 1854, Henley (1855) reported a Tübatulabal population of 100 persons. Steward (1933:237) estimated that there were 250 Koso during aboriginal times. However, Coville (1892:352) noted that there were only 25 Koso in 1892, and asserted there were never very many more of this group. Swanton (1952:48) estimated that at the time of Spanish contact there were a combined total of 3,500 Alliklik, Serrano, Vanyume, and Kitanemuk.

The conclusion to be drawn from these vague estimates and partial data is that there was most probably a very low population density for the El Paso/Red Mountain Units as a whole. However, given the resource distribution of the region and the nature of aboriginal exploitation (see Seasonal Round below), undoubtedly there were relatively high population concentrations in the region at specific places during certain times of the year.

HUNTING AND GATHERING

The progression of seasonal movements within the El Paso/Red Mountain Units can be seen as a response to the differential ripening of major plant food resources. Hunting was probably carried out as an adjunct to gathering, and hunting methods appear to have been tailored to the exigencies of plant gathering.

Gathering

The ethnographic record indicates that the most important plant resources for groups in the El Paso/Red Mountain Planning Units was the piñon pine nut (*Pinus monophylla* Torr. & Frem.). Piñon pine occurs as a co-dominant in Piñon-Juniper Woodland areas between 6,000 and 8,000 feet on the eastern slopes of the Sierra Nevada Mountains and on the upper slopes of the Coso Mountains (Ornduff 1974:6, 106). These nuts were harvested in early autumn and formed the basis for the winter diet (Coville 1892:352; Dutcher 1893:377-380; Kroeber 1925:592).

Dutcher (1893:377-380) recorded a detailed description of a Koso pine nut harvest. The Koso pine nut camps were located within the piñon groves near the ecotone between the woodland and the sage communities. They were temporary camps composed of five or six brush and wood windbreaks (Dutcher 1893:377). The nuts were collected by women, using long thin poles to knock the cones from the trees. The cones were then collected in large conical baskets and transported to the camp. In camp, nuts were removed from the cones by placing the cones on a large (6 to 8 ft. diameter by 2 ft. high) slow-burning brush fire (Dutcher 1893:379). This process dried the pitch in the cones and forced the cone scales to open. On the day that Dutcher (1893:380) observed the process, there were about two bushels of pine nuts collected. This yield seems low compared to the 30 to 40 bushels per day estimate that Steward (1938) gives for pine nut collecting in the Owens Valley. However, pine nuts are more plentiful and easier to reach in the Owens Valley than they are in the El Paso/Red Mountain Units. While pine nut use is specifically mentioned only for the

Koso and Tübatulabal (Voegelin 1938), their use and significance can be inferred for the other groups in the area.

The second most important plant resource used during aboriginal times in the El Paso/Red Mountain Units was bunchgrass seeds (*Poa* spp.). Bunchgrass seeds were collected in the spring and represented the major component of diet during the period from the exhaustion of stored winter resources (primarily piñon pine nuts) and the beginning of the piñon nut harvest (Coville 1892:353). Bunchgrasses occur as part of the Valley grassland community and are found on large alluvial plains throughout the area (Ornduff 1974:97). These seeds were collected by women, who beat the seeds free of stalks and collected them in shallow baskets (Coville 1892:353). Either at the time of collection or later in temporary camps, these seeds were winnowed to remove chaff and sifted through wicker-work sieves to remove unwanted stems, chaff, and dirt. The seeds were then ground and re-winnowed prior to cooking.

Other plants used include mesquite (*Prosopis* spp.), digger pine (*Pinus Sabiniana* Dougl.), chia (*Salvia Columbariae* Benth.), thistle sage (*Salvia carduacea* Benth.), cattail (*Typha latifolia* L.), juniper (*Juniperus californica* Carr.), devil's pincushion (*Echinocactus polycephalus* Engelm & Bigel.), beavertail (*Opuntia basilaris* Engel & Bigel.), Mormon tea (*Ephedra* spp.), evening primrose (*Enothera brevipes*), reeds (*Phragmites* spp.), and Joshua tree (*Yucca brevifolia* Engelm.) (Coville 1892; Voegelin 1938).

Hunting

The Koso hunted deer (*Odocoileus hemiones*), mountain sheep (*Ovis canadensis*), antelope (*Antilocapra americana*), jackrabbits (*Lepus californicus*), cottontail rabbits (*Syvilagus* spp.), wood rats (*Neotoma* spp.), Kangaroo rats (*Dipodomys* sp.), mice (*Peromyscus* spp.; *Microtus* spp.), and chuckawalla lizards (*Sauromalus* obesus) (Coville 1892:352). Coville does not discuss Koso hunting practices, although Voegelin (1938) does discuss how these animals were hunted by the Tübatulabal.

Deer and mountain sheep were hunted by individuals or small groups (three to four persons), who either stalked these animals or waited in blinds while the animals were driven to them (Voegelin 1938:12). Near each blind a small space was cleared, and eagle down, tobacco, and beads were offered for a successful hunt (C. Voegelin 1935:219). These large animals were shot with a sinew-backed bow and cane arrow. Voegelin (1938:12) claimed that these weapons were accurate at 600 feet. Wounded game was chased until it collapsed and could be killed. Antelope were sometimes hunted by a small group in which one hunter was concealed behind a rock blind while other hunters drove the antelope to him (Voegelin 1938:13).

It was common for antelope and jackrabbits to be hunted communally. As many as 500 people participated in these communal efforts (Voegelin 1938:13). The usual method of hunting antelope was to space hunters behind rock walls along the rim of a small canyon.

These men then ambushed antelope that were driven up the valley by a line of beaters (Voegelin 1938:13). After the hunt, antelope meat was distributed to all the participants. Rabbits were hunted communally by setting up a line of nets and then setting fire to the brush or beating it to chase the game into the nets (Voegelin 1938:13). At the nets, rabbits were killed with clubs or shot with bow and arrow. Sometimes a secondary net was set up to trap any animals that escaped the first net (Voegelin 1938:13). The catch was distributed to all participants at the end of the hunt. Large communal hunts, either for rabbits or antelope, tended to take place near gathering time for pine nuts. This meant that an already assembled population could be diverted for use in the communal hunts.

Small game was generally captured in small rock fall traps. These traps consisted of a shallow hole (three to four inches deep) over which a rock was balanced. When an animal took the bait, the rock fell and trapped the animal in the hole (Voegelin 1938:13). The animal was not crushed, but only trapped. Trapping was most intense during autumn, when as many as 20 traps were set by an individual and checked every two days (Voegelin 1938:13).

Small willow blinds were constructed near springs and water sources. From these blinds, birds and small game were shot with a bow and arrow (Voegelin 1938:13). Voegelin reports that lighted torches were used at night to "bring" birds out of trees so that they could be clubbed.

It must be stressed that these hunting methods were reported for the Tübatulabal only. Therefore, the practices of other groups may have varied somewhat, although probably being similar in general.

SEASONAL ROUND

The winter months, from about mid-November to about the end of February, were the time of least food procurement activity in the seasonal round (Voegelin 1938:11). Subsistence during this period was mainly dependent on stored foods, such as pine nuts and occasional supplements of fresh game. Villages were located either on the valley floor or at the base of a mountain in close proximity to a good water source (Coville 1892:352; Voegelin 1938:11). Within the El Paso/Red Mountain Units, an ideal region for winter camp location would have been along the Garlock Fault where it runs along the base of the foothills of the Sierra Nevada Mountains. There were springs along the fault, and its proximity to the foothills would have offered some protection from the elements. Indeed, Kroeber (1925:590) reports that Kawaiisu and Koso settlements were scattered at spots usually in or at the foot of a mountain. If by settlements, Kroeber meant winter villages, then his report is in agreement with the geographic situation.

By the end of winter, stored supplies would have run low or become exhausted. At this time, from about the end of February to about May, winter camps would have begun breaking up and the people would have split into nuclear family units to begin food procurement activities (Voegelin 1938:11). The major resources exploited during this early spring period probably were Joshua tree pods and stalks (*Yucca brevifolia*), mesquite beans (*Prosopis* spp.), and other early spring seeds and tubers. Tule roots, if available, also would have been heavily exploited during this period. Joshua trees occur abundantly in certain portions of the El Paso Mountains. Mesquite occurs on sand dunes around dry lake beds, especially in the dunes at the south end of Koehn Lake. Tule would have occurred in marsh areas, particularly in the vicinity of Little Lake. Therefore, these areas would have been the location of intense early spring food procurement activity.

During late spring and summer, from about May to the end of July, the population would have been at its lowest density because nuclear family groups would be widely dispersed to exploit bunchgrasses (Voegelin 1938:11). Food procurement activity was localized on large alluvial fans, particularly in the area south and east of Red Mountain. Very temporary shelters and very short-term camps would have been characteristic of this period. Because of the replacement of bunchgrasses by introduced grasses, archaeological evidence of these camps and summer activities can be expected to occur in areas which do not now have a bunchgrass cover.

During late summer and autumn, from about August through mid-October, the native population would have begun leaving the grasslands to gather for the piñon harvest (Voegelin 1938:11). The bulk of nut harvesting would have taken place during September and October. The people would have made temporary camps (see Gathering section above) and conducted periodic trips to winter camp locations to store nuts. Most major hunting activities, such as communal rabbit, deer, and antelope hunts would have been carried out during this period. The annual calendar round would have ended by about the middle of November. The population was then at its greatest and most sedentary concentration. Activity again centered on equipment maintenance in winter villages.

STRUCTURES

Koso piñon camps consisted of several circles or corrals built out of a piñon branch framework covered with light brush (Dutcher 1893:379). These circles had walls up to three feet thick and up to three feet high. They were eight to 10 feet in diameter and usually accommodated a single family. Such shelters functioned to secure privacy, break the wind, and hold possessions. There was a small fire in the center of the circle, and the floor was kept smooth and free of weeds and debris.

The only other major structures reported for Koso piñon camps were fire rings, used to open the cones prior to nut removal (Dutcher 1893:379). Such rings consisted of a single tier circle of rocks, about six to eight feet in diameter, in which cones were placed on top of a two-foot-high pile of slow-burning brush. In an archaeological context, cone fire rings should be distinguishable from house remains through an examination of their interior contents. Within a cone fire ring, there should be only ash and carbonized cone fragments, while within a house there should be concentrations of charcoal and artifacts. Kroeber

(1925:591) mentioned that the Koso also used the earth-covered sweathouse. He reported that these were large enough for a man to stand in and were covered by soil that was heaped over a layer of arrowweed (*Pluchea sericea* [Nutt.] Cov.). Unfortunately, he does not provide any more details. It is highly likely that these sweathouses were associated with winter villages, and their remains could be used to classify a site as a winter village.

Voegelin (1938:24) described Tübatulabal winter houses and said that they were all located west of the Sierra crest. He reported that the Tübatulabal summer shelter consisted of a small rectangular four-post foundation with an open front, brush sides, and a brush roof. These were mainly used as shades for women while they were working. There was a small fire in front of these shelters, and they faced east to catch the morning sun.

The Tübatulabal also used the earth-covered sweathouse, and it can be inferred that they were similar to those used by the Koso. Tübatulabal sweathouses were described as consisting of a round hole, four feet deep by 15 feet in diameter, covered by an earth and brush roof (Voegelin 1938:25). This roof was supported by three posts, and a fire was built between the door and the middle post. The roof was high enough so that the men could sit upright around the fire. Sweathouses were located near a stream, spring, or artificial pool, and were associated with winter villages (Voegelin 1938:25).

MATERIAL CULTURE

The Koso and Tübatulabal used a short (up to three feet) sinew-backed bow, made from seasoned juniper wood (Kroeber 1925:59; Coville 1892:359-360; Voegelin 1938:27-28). These bows were strung with either sinew or Indian hemp (*Apocynum* spp.). Coville (1892: 359) reported that these bows were remarkable accurate and had great force on impact. There is no information in the literature on the bows of other groups in the area, although it can be assumed that they were similar to those described for the Koso and Tübatulabal.

Arrows were made from a 3.5-foot length of either willow or cane (*Phragmites* spp.) (Voegelin 1938:27-28; Kroeber 1925:59; Coville 1892:359-360). These shafts were straightened on a heated stone shaft straightener which had two grooves (Coville 1892:359-360). The Koso used three half-feathers, and these were bound to the notched end by sinew (Coville 1892:359-360).

Neither Kroeber (1925) nor Coville (1892) reported the Koso as using stone arrow points. However, Coville (1892:360) does say that stone points were formerly used for war and large game hunting. The Koso did use wooden foreshafts. These were made from five-inch lengths of sage or greasewood tapered to a blunt point (Coville 1892:360). Tübatulabal stone points were made from obsidian and a bluish grey rock (Voegelin 1928:28). These materials were collected from the Mount Whitney area, from Coso, and from the Tejon area near Mojave (Voegelin 1938:28). The points were made in various shoulder shapes by chipping the material with a deer bone awl. The points then were attached to the arrows with asphalt (Voegelin 1938:28).

There was no reported use of ceramics in the planning units, but there was extensive use of basketry. Basket-making materials were willow (*Salix lasiandra* Benth.), aromatic sumac (*Rhus trilobata* Nutt. ex. T. & G.), devil's horn (*Martynia probascidea*), yucca roots (*Yucca brevifolia* Engelm.), and a tall grass (*Muhlenbergia rigens* [Benth.] Hitch.) (Coville 1892:358-359). These materials were made into baskets using coil techniques as well as weaving techniques such as twining and wicker. Baskets were used as packs, cooking pots, storage vessels, seed beaters, cooking trays, water containers, and sifters (Coville 1892:357-359; Kroeber 1925:59; Dutcher 1893:378-379; Voegelin 1938:31-33).

The Tübatulabal used both the mortar/pestle and the mano/metate (Voegelin 1938:17). Pit mortars (two to 10 inches deep by three to five inches wide) were located on level, gently sloping granite bedrock outcrops. Portable mortars (six to 35 inches in diameter) were pecked out of soft stone with a pointed rock. These were transported to the piñon camps. Large portable wooden mortars were made from a cylinder of oak or juniper by burning out the center and smoothing the hole with rocks. In all of these mortars, a cylindrical granite or slate pestle was used. These pestles were not shaped, but were selected from the stones in a stream bed. Metates were oval or rectangular slabs of granite or black slate. They were generally 14 to 20 inches long by 10 to 15 inches wide by two to four inches thick. Through use, metates developed a flat or slightly concave surface. Metates were portable and when not in use were stored next to the wall of a house. A basketry hopper was attached to the working surface of a metate to prevent flour from spilling. There were both large and small manos, but both tended to be thick with a flat top and bottom.

Voegelin (1938:35) noted, but did not describe, the steatite bowls, tubular pipes, whistles, flutes, musical bows, and bullroarer used by the Tübatulabal. Most probably, arrowshaft straighteners were made from steatite. Coville (1892:352) noted that the Koso used a wooden mortar in plant processing, but he did not describe it. Obsidian was also reportedly used for knives, scrapers, and spear points, but these artifacts were not described (Voegelin 1938:28).

TRADE

There was extensive trade between the groups within the El Paso/Red Mountain Units and Indian groups located on the coast and in the Colorado River area (Farmer 1935:155-157; Walker 1937:189-194; Sample 1950:1-30; Kroeber 1925:589-592; Ruby 1970). This trade system can be separated into two types: (1) a limited trade between coastal and El Paso/Red Mountain groups in which goods traded were intended for local consumption; and, (2) an extended trade between the coast and the greater Southwest, with the El Paso/Red Mountain groups acting as middlemen. In the latter type of trade, goods did not stay in the local area.

In the localized trade, the major activity seems to have been between the Koso and Kawaiisu on the desert side of the Sierra Nevada and the Yokuts on the Central Valley side (Kroeber 1925:591; Walker 1937:193; Sample 1950:19). However, there was some local trade between the Owens Valley and groups in the planning units area and between the Tübatulabal and the Chumash (Sample 1950:4, 19; Voegelin 1938:28). The trade centered on exchanging local goods such as piñon nuts, dried meats, salt, cryptocrystalline rock, and basketry materials for steatite beads, steatite, shell beads, raw abalone shell, asphalt, feathers, fish, feather bands, ceremonial eagle down skirts, and baskets (Kroeber 1925:591; Walker 1937:194; Voegelin 1938:52; Sample 1950:19). The trade between the Owens Valley and the Tübatulabal is indicated by the reference in Voegelin (1938:28) to the Mount Whitney area as an obsidian source.

On the basis of this limited ethnographic data, it has been argued that, in general, east/west trade was more common and important than was north/south trade (Sample 1950:5). This differential emphasis is usually attributed to the greater east/west variation in environmental factors (Sample 1950:5).

The other trade, which extended from the Pacific Coast to the greater Southwest, is not as well documented in the ethnographic literature. In 1776, Garcés was guided from the Colorado River to the Central Valley by Mohave Indians who said that they regularly made such trips to trade for shell. They made this trip in four days. Garcés reported that the Mohave stopped at the edge of the Central Valley and refused to go north because they were afraid of the Indians in the valley (Sample 1950:4-5). Sample (1950:4-5) interpreted this hesitation to mean that the Mohave did not regularly trade with the northern groups, but used groups in the El Paso/Red Mountain Units as middlemen. In another early account, Font said that the Mohave regularly traded with the Serrano and Indian groups along the Santa Barbara channel. Both of these early accounts indicate that the Mohave were heavily involved in the Coastal/Southwestern trade and that El Paso/Red Mountain groups were also involved as middlemen (Sample 1950:5). The major trade items seem to have been Southwestern pottery and Pacific shells and shell beads (Sample 1950:5). An archaeologic investigation of this trade (Ruby 1970:160-167) reached essentially the same conclusion, i.e., that Coastal/Southwestern trade was the result of a series of peaceful, reciprocal exchanges of shell for ceramics between trading partners from both areas. Ruby (1970:161) argued further that shell moved indirectly through intermediary Mojave desert groups, while Southwestern goods moved both indirectly and directly.

A CULTURAL SEQUENCE FOR THE EL PASO/RED MOUNTAIN PLANNING UNITS

INTRODUCTION

Over the last 20 years, American archaeology has undergone self-evaluation and a reorientation of goals. Whether the resultant changes reflect a revolution in archaeology, i.e., the "new archaeology" (Morwood 1975), or simply a more rapid rate of change is a moot issue; a transformation has begun and continues to develop (Leone 1972). For example, it has been advocated by Binford (1962, 1964, 1965, 1968a, 1968b) and others that the ultimate goal of the "new archaeology" is the formulation of laws of cultural process—attained by the explication and explanation of cultural similarities and differences. This goal is presumably divorced, for instance, from the more traditional, or normative, archaeological concern with reconstruction of culture history (Deetz 1970:115). Yet it has been concisely argued that both historical and processual approaches are useful and mutually dependent (Flannery 1967), and that there are not two archaeological strategies (Thompson 1972). In other words, fruitful research can most profitably occur when recent innovations in method and theory are coupled with essential and established practices. It is in this context that the bulk of information presented below falls into the category of culture history. This "elementary data" (Thomas 1970:54) is provided for the simple reason that a chronology of prehistoric cultural activities, an initial step in archaeological endeavors, for the El Paso/Red Mountain Planning Units has yet to be constructed on the basis of research within the defined territories. Further, by organizing the material in terms of a cultural sequence, a temporal context can be suggested which serves as a backdrop in the formulation of possible research questions focusing on cultural processes (see Meighan n.d.; Trigger 1970).

Although there are several published accounts of cultural material discovered in the planning units, these reports are limited in usefulness for any broad discussion of culture history. Therefore, this report of necessity relies primarily on the comparatively more extensive information generated from investigations in adjacent localities. Of particular interest in the structuring of culture history within the El Paso/Red Mountain Planning Units is the sequential pattern of projectile point types in the Great Basin (see Lanning 1963; Clewlow 1967; O'Connell 1967; Hester 1973; Bettinger and Taylor 1974). Lithic points can effectively serve as criteria with which to temporally and spatially organize cultural remains because of their durability and their often diagnostic variability in size, weight, form, and material (cf. W. Davis 1966:151; Swanson and Sneed 1966:24; Clewlow 1967:143; Roust and Clewlow 1968:103; Walter 1970:50). In essence, a projectile point type is "an artifactual construct" based on morphology and inferred function (Wormington 1957:2; Irwin and Wormington 1970:25). Ideally a type shall "have demonstrable historical meaning in terms of behavior patterns" (Krieger 1944:272; e.g., Black and Weer 1936). The main difficulty here, however, is that there are no published absolute archaeometric data for either general cultural manifestations or certain artifact forms within the El Paso/Red Mountain Planning Units. Obviously then, the reader must be cautioned to view the following presentation only in its most general sense and not to be disturbed by the large role that inference shall implicitly perform.

Archaeological research in the El Paso/Red Mountain Planning Units is hardly sufficient to warrant treatment in a separate section, thus the following brief summary is provided. The Black Canyon-Black Mountain area in the southeast corner of the Red Mountain Planning Unit has been studied by various members of the Archaeological Survey Association of Southern California, whose observations have been published in the ASA *Newsletter* and in the *Masterkey* (Southwest Museum). Petroglyphs have been a common subject of these reports (Peck 1953; Pederson 1956; Gruber 1961), and archaeological remains, except in a few cases, have been more or less casually described (Simpson 1952b; F. Curtis 1955, 1956). Schwacofer (1946) has also written about Black Canyon petroglyphs. Petroglyphs in the southern Argus Range have been described by Johnston (1933). In the El Paso Mountains, casual remarks about the archaeology of this locality were given by Starry (n.d.), Perison (1956), and Lawbaugh (1950). Apostolides (1968) provided the only published data on excavation in the study area, reporting on artifacts recovered from several small, probably late-dating rockshelters in the El Pasos' Last Chance Canyon. It should be noted that Apostolides has done a large amount of reconnaissance in the El Paso Mountains and that when his data become available a more substantial assessment of prehistory in the area will be possible. Hillebrand (1972) has also conducted several surveys in the El Pasos, one in conjunction with Apostolides. W. Bliss has headed several San Fernando Valley State College archaeological field classes around Harper, Cuddeback, and Koehn Dry Lakes (Hanks 1968, 1970). The Harper Dry Lake survey resulted in the collection of artifacts indicative of a long culture history in the area (Hanks 1968). G. Smith's (1963) compilation of San Bernardino County Museum records on sites in the Mojave River drainage system included several isolated incidents of artifacts found within the study area. In the mountains bordering the El Paso Planning Unit on the west, a small rockshelter near Walker Pass dating from the late prehistoric and early historic was excavated by Harrington (1950). Sherds of Owens Valley Brown Ware have been collected by Heizer (1952) and Griffin (1963) in places east of Kelso Valley.

As the El Paso/Red Mountain Planning Units fall within the southwestern limits of the Great Basin, this report adopts the general temporal scheme for the Great Basin proposed by T. R. Hester (1973). To date, Hester's presentation and synthesis of Great Basin chronology is by far the most explicit statement available on culture history and is particularly suitable as it is done by area. Hester's ordering of prehistory in the southwestern Great Basin (1973:Fig. 25) will be examined in the light of what meager evidence exists for the study area, and with respect to data from the following surrounding localities: northern Tehachapi and southernmost Sierra Nevada mountains, China Basin, Coso Mountains, Little Lake and Owens Valley, Panamint Valley, Panamint Mountains, Death Valley, the greater Mojave Desert, and the Colorado Desert. Where pertinent, archaeometric and typological data from other areas within the Great Basin will be drawn upon. This is done for two reasons: (1) it might be expected that future archaeological investigators of either planning unit would consult the listed references; and, (2) at least some of the results of these future studies would be expected to correspond to those already made by other archaeologists in the Great Basin.

The format below essentially follows that of Hester (1973) except that a discussion of pre-projectile point cultures has been added and Hester's tentative suggestion of an occupational hiatus in the southwestern Great Basin (ca. 6,000-4,000 B.C.) has been omitted for reasons outlined in the section under Great Basin Archaic (Fig. 7).

PRE-PROJECTILE POINT CULTURES

The possible existence of "pre-projectile point" or equally ancient cultures in the New World has developed into a vexing problem that remains far from resolution (cf. Morris-Gell 1969:351). Among notable advocates of such a culture stratum are Krieger (1962, 1964), Willey and Phillips (1955, 1958), MacNeish (1958, 1961, 1962), Jennings (1964), Irwin-Williams (1967, 1968a), and Cressman (1968). The technical sophistication of the earliest well-defined projectile point in the Americas—the Clovis—"leads most archaeologists to believe that there must have been developmental stages of this unique style in the western Hemisphere, and therefore, there must be earlier cultures as yet undiscovered in the Americas" (Agogino 1968:1). Furthermore, an apparent tendency among the archaeologists to equate initial New World populations with the earliest documented projectile point forms may be a factor in the absence of recognized pre-projectile point cultures (Krieger 1964:23; cf. Jennings 1957:265). Pre-projectile point proponents assume that points were not included in the tool-kits carried by peoples utilizing the Bering Land Bridge. Although there is little evidence with which to counter this assumption (Agogino 1968:2), a few authors have suggested alternative scenarios for the appearance of points in the New World (e.g., Haynes 1964; Epstein 1966; cf. W. Davis 1966:154). Aside from Krieger's postulated age of 35,000 to 40,000 B.P. for a "Pre-Projectile Point Stage (1964:68), and the probable presence of man in central Mexico ca. 20,000-35,000 B.P. (Irwin-Williams 1968a:40), evidence of very early cultures in the New World remains undatable and for the most part questionable (cf. Haynes 1969:712; Hester 1973:123).

In the Desert West of North America (Jennings 1964:Fig. 1), discussion of early man "runs the gamut" from the "cautious, scientific, conservatism" of Baumhoff and Heizer (1965), and Heizer and Baumhoff (1970) to the "less guarded, or more expansive, thinking" of Jennings (1964), Cressman (1960), and C. Borden (1968) (Tuohy 1970:146). More importantly, despite the fact that evidence of the earliest Americans is rarest in the Desert West (Jennings 1964:151; W. Davis 1966:152), the "most vociferous claims of man's great antiquity in the New World emanates from the deserts of southern California" (Hester 1973:59). Three of the principal localities involved are the Manix Lake area (which includes Troy Dry Lake, Afton Canyon, and Coyote Basin), Coyote Gulch, and the Calico Hills. These localities are immediately southeast of the Red Mountain Planning Unit, and provide data, albeit highly speculative, on possible early occupation of the planning units (e.g., Gros 1956:6).

The Manix Lake area has been investigated primarily by R. Simpson (1952a, 1956,

CULTURAL SEQUENCE: EL PASO/RED MOUNTAIN PLANNING UNITS

	Southwestern Great Basin	Local Phase Name	Diagnostic Artifacts
	LATE PREHISTORIC	Early Mohave Death Valley IV Early-Late Cottonwood Marana	Pottery Cottonwood points Desert Side-Notched points
1000	ROSE SPRING/ EASTGATE COMPLEX	Amargosa II Death Valley III ? Late Rose Spring Haiwee	Rose Spring points Eastgate points
AD BC 0 1000 2000 3000 4000	GREAT BASIN ARCHAIC	Early Milling, Archaic Transition Little Lake and Newberry Early-Middle Rose Spring Death Valley II Pinto Basin	Grinding tools Elko points Gypsum Cave points Pinto/Little Lake pts. Humboldt points Silver Lake points
5000 6000	scanty occupation ?	none definite	Silver Lake points ?
7000 8000	WESTERN PLUVIAL LAKES TRADITION	Western Lithic Co-Tradition Death Valley I Lake Mohave Complex San Dieguito Complex	Silver Lake points Lake Mohave points Crescents/Transverse points
9000 10000	FLUTED POINT ? TRADITION	Fluted Co-Tradition	Folsom points ? Clovis points
	PRE-PROJECTILE POINT CULTURES ?		choppers teshoa flakes scraper planes

FIGURE 7

1958, 1961, 1965). Simpson's original evaluation led her to the conclusion that so-called "core-and-flake tool sites" found on recessive shorelines of this pluvial basin represented a "basic, generalized culture horizon" predating the Lake Mohave complex (Campbell *et al.* 1937), and falling somewhere between 8,000-10,000 B.C. (1952a:63; see H. Curtis 1954:3). The most abundant "Early Paleolithic-like material" (i.e., heavy, crude uniface-biface tools, choppers, scrapers), situated on slopes and hill tops south of high desert pavement sites, were given an age of greater than 20,000 years (Simpson 1958:8-9). Hester reports that in 1960 Simpson obtained radiocarbon dates of 15,390 B.C. ± 400 (UCLA-121) and 15,590 B.C. ± 400 (LJ-269) on tufa samples collected just below the high stand line of the pluvial lake (1973:59). Simpson postulated a "Manix Lake Lithic Industry" on the basis of the distinctiveness of a "scraper-chopper-coup de poing-like assemblage" (1960:27). Also included were hammerstones, "Clactonian flakes," pointed tools, bifacially and unifacially worked tools, and utilized flakes (Simpson 1960:33-35).

Simpson has also investigated the Coyote Gulch area located between Black Canyon and Coyote Basin (1961). As with most early sites in the southern California deserts, the Coyote Gulch sites were all surface occurrences (Simpson 1961:12). Cores, bifacial core tools, a variety of scrapers, flake perforators, and pointed tools were recovered (Simpson 1961:17). Interestingly, 350 of the 993 specimens collected were later eliminated from the artifact category, 522 were designated "shapeless or atypical," and only 121 were listed as definite artifacts (Simpson 1961:13). The "shapeless or atypical" items corresponded well with MacDonald's observation that a prominent aspect of Paleo-Indian technology was the large proportion of tools fashioned from irregular flakes with only a minor amount of retouch modification (1966:65). As to the age of the materials, Simpson (1961:34) placed the Coyote Gulch sites in "later Pluvial times" based on evidence:

> . . . from Early Paleolithic-like sites in Wyoming (Renaud 1936, 1938, 1940) and on the records of classic Old World stations . . . the Coyote Gulch artifact assemblage may be assigned to a stage typologically similar to the later portion of the Old World Lower Paleolithic.

There is little doubt that at least some of the Manix Lake and Coyote Gulch finds represent early occupations in this area of the Mojave Desert, but there are several drawbacks to acceptance of Simpson's postulated dates. First, there is no assurance that remains found on pluvial lake terraces can be securely linked to geologic or relict hydrologic features determined to be of a specific age (cf. Tuohy 1970:147; Hester 1973:59). Second, to infer typological similarity of local artifacts and artifacts removed at a great distance, and then to estimate an age of local material on the basis of this tenuous connection may be a grave mishandling of the data and "harkens back to the time in the late 19th century when quarry and workshop materials in the eastern United States were being attributed to 'Paleolithic' because of their morphological similarities to ancient specimens in Europe" (Hester 1973:60). Third, many of Simpson's finds are probably "quarry blanks," rather than representatives of an ancient culture. Blanks occur frequently in more recent sites, and there is limited criteria to distinguish older from younger blanks (cf. Wallace 1962:174).

The extremely aged artifacts reported in the Calico Hills have been the subject of much doubt and debate in recent years. Prior to 1964, artifacts similar to Simpson's "Manix Lake Lithic Industry" were noted on eroded alluvium ridges in the eastern Calicos (B. H. McCown 1954; Simpson 1960). Since 1964, Simpson in collaboration with the late L. S. B. Leakey and T. Clements have conducted excavations in a gravelly alluvial fan with a probable age of 400,000-120,000 B.P. (Leakey, Simpson, and T. Clements 1968:1022; T. Clements 1970b:2). A total of 170 supposed artifacts have been taken from the deposit, and are, by geologic inference, dated 50,000-80,000 B.P. (Leakey, Simpson, and T. Clements 1968:1022; T. Clements 1970a:2; T. Clements 1970b:2; cf. Simpson 1969). Paleomagnetic data on a presumed "hearth" at the site supporting the dates were discussed by R. Berger at a conference on the site in 1970 (T. Clements 1970b:2).

Although the Calico finds are provocative, most archaeologists are reluctant to accept the basic premise that the stone specimens were modified by human hands, much less that the cluster of burned rocks constitutes a hearth (cf. Irwin 1971:45). Haynes (1969:713) suggested that:

> [The] . . . main difficulty [with the] . . . situation there [at Calico] does not lend itself to definitive solution. The question is whether the flints are of archaeological or of geological origin, but as with 'coliths' the two could be indistinguishable at very early levels and under geological conditions where natural flints are a significant component of the deposit.

Moreover, Hester (1973:59) stated in regard to the Calico specimens:

> . . . most believe that they are of natural manufacture—fortuitously chipped pieces picked (or better, *selected*) from among hundreds of thousands of fractured gravels in the alluvial fan . . . If man was actually in this region at such an early time, much better evidence will have to be found [Hester's emphasis].

E. L. Davis (1970:Table 11) suggested that there may possibly be some unrecognized early hunter-collectors ca. 10,000-40,000 B.C. in Panamint Valley. The limited evidence includes a few choppers, chopping tools, and crude, heart-shaped knife/points. Davis (1970:117) noted that these artifacts are "much more heavily patinated than their neighbors within a single pavement" (see also L. Clements 1956).

An early occupation, at least 20,000 B.P., has been argued for Death Valley (Clements and Clements 1953; L. Clements 1954, 1955). A collection of 500 pieces of chipped stone are described as crude scrapers, knives, choppers, drills, and microliths. Although a Pleistocene inhabitation of Death Valley cannot be summarily dismissed, one cannot rely too heavily on the Clements' collection as evidence; most of these specimens, if not all, are probably products of natural processes (cf. Wallace 1958:10, 1962:174; Hester 1973:59).

Further evidence of pre-projectile point cultures in southern California deserts may come from the Colorado desert, although the definition and dating of these remains have yet to be widely accepted by archaeologists (cf. Weide and Barker 1974:76). Rogers (1939:6-24) suggested the term Malpais to represent these early remains, based on a lithic industry he located on the surface of the lowest terrace along the Colorado River. Weide and Barker (1974:76) provided a succinct summary of supposed Malpais artifacts as indicated by Rogers (1939, 1950, 1958); noting that they were:

> . . . represented by simple lithic forms chipped by stone on stone percussion. The bluk of the pieces are primary flakes including teshoa flakes, struck from the unprepared shoulders of cobbles, and flakes in which the striking platform is a flake scar and whose exterior face reveals the scars of previous flakes removed from the core. Choppers, scraper planes and ovate bifaces may also be found.

Rogers (1939:Pl. 21) originally estimated the age of the Malpais Industry at 2,000 B.C. In subsequent articles, Rogers (1950, 1958) recognized it as the earliest form of San Dieguito, renaming it San Dieguito I to emphasize its inclusion within the San Dieguito Complex (Warren and True 1961:273). Before his death, Rogers accepted a possible date of ca. 6,000 B.C. (Warren 1966:18).

The basic problem with Malpais Industry-San Dieguito I is one of definition, consequently its chronological significance is difficult to assess. Rogers (1939:70) noted a lack of conformity in Malpais artifacts. Later, Rogers (1958:9) wrote: "This lack of conformity within a class is a typical San Dieguito trait in the first place. Convention is not present and individualism is rampant." Warren (1967:171) in a discussion of the San Dieguito Complex felt that there was insufficient evidence to link Malpais and San Dieguito I into a single cultural unit, and preferred to delete San Dieguito I and retain Malpais as a separate complex:

> 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 [Warren 1967:170].

Moreover, Harner (1955) tested the very assumption that Malpais materials are even artifacts by subjecting them to thermal-fracturing experiments. In certain instances, fire-fracturing did duplicate Malpais characteristics but not all characteristics could be reproduced (Harner 1955:42). Perhaps, a more significant observation that Harner (1955:42) made was that Malpais materials are essentially indistinguishable from much of the waste chipping that normally occurs in lithic industries, which supports the idea of wide temporal distribution (cf. Wormington 1957:164). Hence, until more evidence can be accumulated and compiled, reference to Malpais can be regarded only lightly in terms of culture history.

An expected characteristic of pre-projectile point cultures in western North America, if they did indeed exist, would have been a lack of a specialized economy (Warren 1967:182). Small groups, each consisting of a few related families, would have "pursued an unspecialized hunting and collecting lifeway, moving frequently from one camp to another within a loosely bounded area with which they were highly familiar" (Weide and Barker 1974:78). Food procurement would have involved gathering of such resources as seeds, greens, fruit, insects, and grubs. Small game could have been trapped, driven, or simply caught by hand. Large game may have been bagged on occasion, or opportunistically taken when a beast had been caught in a bog or severely wounded by some non-human agency.

In conclusion, although there have been no published accounts of possible pre-projectile point cultural remains in the El Paso/Red Mountain Planning Units, the numerous reports of such findings in nearby areas suggest that the discovery of similar materials in the study area would hardly be surprising. This is strengthened by the fact that the large proportion of supposed early man evidence in southern California deserts occur in the vicinity of relict water sources. The El Paso/Red Mountain Planning Units encompass or abut several basins which are associated with Pleistocene pluvial activity—specifically Koehn, Rogers, Cuddeback, Harper, Searles, and China basins (Blanc and Cleveland 1961b:5)—all of which could have played an important role in late Pleistocene or early Holocene occupation of the area.

FLUTED POINT TRADITION

Fluted projectile points have been found throughout the Great Basin, most frequently in western and southern Nevada and in southeastern California (Warren and Ranere 1968:9; Hester 1973:123). Many of these artifacts are typologically similar to Clovis (Sellards 1952) and Folsom (Roberts 1935, 1936) projectile points of the Great Plains and Southwest. Folsom points are considered as the "fluted-point step-child of the Clovis tradition" (Stuckenrath 1966:77). Although there are only two published accounts of fluted points in the El Paso/Red Mountain Planning Units, in the El Paso Mountains (Hillebrand 1972b:48), and at Searles Lake (Warren and Ranere 1968:9), such implements are far from uncommon in surrounding regions (cf. E. Davis 1968b:44). Fluted points have usually been discovered along post-Pleistocene lake shores or in mountain passes connecting these ancient water sources (Tadlock 1966:664; E. Davis and Shutler 1969:156).

E. Davis has recovered fluted points from the northwest portion of China Basin and just west of China Lake proper (E. Davis and Shutler 1961:163; E. Davis 1973:2, Fig. 2, 1975:44). The basal half of a large Clovis point was discovered in the Tehachapi Mountains (Meighan, personal communication to Riddell (F. Riddell and Olsen 1969:128; see also Glennan 1971:30-31). Fluted points have been found at Little Lake (Warren and Ranere 1968) and all around Owens Lake (Amsden 1937; Campbell 1949; E. Davis 1963; Bryan 1965; Walter 1970). Similar points have also been found in Panamint Valley (E. Davis 1970) and at Death Valley I sites (Hunt 1960). East of the study area fluted points have been collected in Pilot Knob Valley (Amsden 1937), in Tiefort Basin (E. Davis and Shutler 1969), and at Lake Mojave (Amsden 1937; Rogers 1939; Simpson 1947; E. Davis and Shutler 1969). It should be noted that in the Lake Mojave report, though unwilling to postulate that the basin "has its Yuma-Folsom horizon," Amsden included eight points under this typological heading (Amsden 1937:85, Pl. 44a-h). "Yuma" points (named for the Colorado county in which they were first found) were originally attributed to people who, as did the producers of Folsom points, hunted bison now extinct. Yet, as Wormington (1957:103) pointed out:

> This category [Yuma] became a catchall in which to place any well-flaked point that was unfluted and lacked the notches and barbs that characterize many more recent types . . . Much nonsense continues to be written about a 'Folsom-Yuma Complex' although there is now ample evidence that a number of complexes are represented in the so-called Yuma category, and not one of these has been shown to be directly linked with Folsom.

The term "Yuma" was dropped out altogether, and points previously known as Eden Yumans and Scottsbluff Yumans became known as simply Eden and Scottsbluff, and Oblique Yumans were left unnamed (Wormington 1948). Eden and Scottsbluff forms have become accepted as manifestations of the Cody complex of big-game hunting tradition complexes in the Plains (Willey 1966:47). The five specimens from Lake Mojave designated as Yuma by Amsden (1937:Pl. 44a-e), as well as Hunt's "Yuma" type from Death Valley (1960:36, Fig. 7e), bear little resemblance to Eden or Scottsbluff points or to Oblique Yumans. A reanalysis of these finds, if possible, would be helpful and may prove significant. Fluted points are also not uncommon in the Mojave Desert (Amsden 1935; B. H. McCown 1954; Brott 1966; E. Davis and Shutler 1969).

The difficulties involved in assessing the chronological significance of fluted points in southeastern California and the western Great Basin are many. While a primary problem has been, of course, cultural identity, spatial and temporal relationships are equally ill-defined (Brott 1969). Thus, most archaeologists show a reluctance to perceive these distinctive artifacts as representatives of an early far western "assemblage" (Warren and Ranere 1968:8; see also Wilke, King, and Bettinger 1974). Another obstacle in analyzing the situation is the fact that fluted points are almost exclusively surface occurrences (Hester 1973:62; Warren and Ranere 1968:9). Although fluted points in the western Great Basin are thought of as more or less coeval with their counterparts in the Plains and Southwest, ca. 8,000-10,000 B.C. (Meighan 1963; Haynes 1964, 1969; Byers 1966; Tuohy 1968, 1974; Meighan and Haynes 1968, 1970a, 1970b; E. Davis and Shutler 1969; E. Davis 1970), possible association of Great Basin fluted points with material attributed to younger dates precludes easy acceptance of datings based on typological similarity. For example, certain crescentic-shaped artifacts or Great Basin Transverse Points (Clewlow 1968:48) are often found in apparent association with fluted points (E. Davis and Shutler 1969:156), yet crescents date to 7,000-5,000 B.C., and perhaps earlier (Tadlock 1966:672-673). Considering that fluted points are usually surface finds, "it remains for future research to firmly establish both their temporal span and cultural association in the Great Basin" (Hester 1973:62).

A major element in the interpretation of fluted points in southeastern California and the western Great Basin is the controversy over whether these artifacts are manifestations of an early big-game hunting tradition analogous to the big-game hunting complexes defined for the Plains and Southwest. The debate revolves around the question of inferrable association of fluted and other early point forms with extinct megafauna, an association which has yet to be stratigraphically demonstrated in the Great Basin (Wallace 1962:173; Baumhoff and Heizer 1965:699; Heizer and Baumhoff 1970:1; Hester 1973:62). Proponents of big-game hunting have had to contend with skeptical attitudes on the part of many archaeologists fostered by previously proven spurious claims of man-megafauna associations at, for instance, Gypsum Cave and Tule Springs (Graham and Heizer 1967; Shutler *et al.* 1967; Shutler 1968b; Heizer and Berger 1970). These attitudes are effective, not as deterrents to substantive discussion of early economies in the Great Basin, but as controls on putative associations such as was the case with Harrington's (1933) investigation of Gypsum Cave. Others have felt, however, that these attitudes have done more harm than good (cf. Meighan 1959a; Cressman 1966). Tuohy (1968:31), for one, believes that:

> . . . statements denying the existence of early man as a hunter in the Great Basin (Jennings 1964:151; Heizer 1964:120-121) have served to inhibit the study of Great Basin culture history and to impair the development of Great Basin culture theory.

Tuohy (1968:31, 35) prefers to perceive a "free roaming, big-game hunting" pattern in the western Great Basin, and believes that big-game hunting camp associations with ancient lake shores in the western Great Basin were correctly identified by the Campbells (cf. Amsden 1937:90). On the other hand, belief in a "free roaming, big-game hunting" pattern is seen by Heizer and Baumhoff as "a statement of faith and not of fact" (1970:1). Although Heizer and Baumhoff (1970:7) do not discount the possibility of such a subsistence pattern, "the close association of transverse points and early projectile point forms such as noted by Clewlow (1968), Tuohy (1968), and Shutler and Shutler (1959) with lake basins seems to hint at a lacustrine rather than a big-game hunting economy in the western Great Basin about ten millennia ago." Furthermore, no case can be made at present for big-game hunting having occurred at Lake Mojave on the basis of megafaunal remains.

So what is to be said? Was early man in the western Great Basin primarily a big-game hunter or was he primarily adapted to lacustrine resources? Even more so, can the assumption be made that the makers of fluted points were one and the same as those manufacturing crescents/transverse points and other tools presumably tied in with lacustrine exploitation? Warren and Ranere (1968:16) saw fluted points as evidence that "small hunting parties [were] penetrating the region in some number," while E. Davis (1975:52) suggested that such early materials are parts of total assemblages. Ultimately perhaps, as is so often the case in archaeology, if man-megafauna associations can be shown in at least a few incidents (e.g., China Basin), a "compromise of data" of sorts will be reached in which certain localities of the western Great Basin are seen as expressing varying degrees of big-game hunting and/or lacustrine adaptation. While fluted points in the areas discussed suggest "typological contemporaneity" with counterparts in the Plains, until more evidence is gathered this "does not necessarily mean that similar subsistence patterns were being followed in both areas" (Hester 1973:62). Moreover, "nothing stands against the possibility that the fluted points thus far found in the western Great Basin were used to kill anything but 'microfauna' " (Hester and Baumhoff 1970:7).

Future archaeological research in the El Paso/Red Mountain Planning Units—assuming that fluted points will be found at least in a few instances—would benefit the general interpretation of fluted point occurrences in the southwestern Great Basin. A helpful line of endeavor would be analysis of fluted point distribution with respect to hydrologic features such as Searles, Rogers, and Harper dry lake beds. Although the cultural significance of fluted points in the Desert West may remain an analytical problem for years to come, finding of such implements in the study area would aid the clarification of problems. The discovery of fluted points in apparent associations with materials attributed to later periods (i.e., Western Pluvial Lakes Tradition), may help in the general question of whether certain putatively early Great Basin lithic implements are classifiable as discrete chronological and/or functional entities, as many archaeologists have thus far assumed, or whether these tools reflect a general, temporally-deep multi-component assemblage whose constituents received varying degrees of emphasis in different areas of the Great Basin.

WESTERN PLUVIAL LAKES TRADITION

The Western Pluvial Lakes Tradition was defined by Bedwell (1970:231) as "a general way of life directed toward the . . . exploitation of a lake environment," and he assigned a temporal range of ca. 6,000-9,000 B.C. to the tradition based on research in Fort Rock Valley, Oregon. This tradition effectively encompasses a number of early lithic assemblages in the Great Basin associated with pluvial lakeshores (Hester 1973:62). In the southwestern Great Basin, the Western Pluvial Lakes Tradition is represented by the Lake Mohave/San Dieguito complex (Mojave Desert, Death Valley, Owens Valley) and the Western Lithic Co-Tradition (Panamint Valley).

Lake Mohave projectile points have been noted in the El Paso Mountains by Hillebrand (1972b:48), and E. Davis recorded a site near Freeman Gulch in 1961 that contained Lake Mohave and Silver Lake points (Hanks, personal communication). The authors have reviewed photographs of Lake Mohave and Silver Lake points reportedly found on the west side of Black Mountain (in the El Pasos) and near Walker Pass by a local collector. Lake Mohave points were found in Black Canyon in the southeastern portion of the study area (Simpson 1952b:141). South of Black Canyon, a possible Silver Lake point was recovered at Harper Dry Lake (Hanks 1968:24).

In areas adjacent to the El Paso/Red Mountain Planning Units, Lake Mohave and Silver Lake points are common occurrences: at China Lake (E. Davis 1973, 1975), in the Little Lake-Owens Valley vicinity (Harrington 1948, 1957; Campbell 1940; H. Riddell and Riddell 1956; Lanning 1963; E. Davis 1964; Bryan 1965; Walter 1970), in Panamint Valley (E. Davis 1970), in Death Valley (Hunt 1960; Wallace 1958), and throughout the Mojave Desert (Campbell and Campbell 1935; Campbell *et al.* 1937; Rogers 1939; Lawbaugh 1952; Simpson 1960; J. Davis 1962; G. Smith 1963; Donnan 1964; True, Davis, and Sterud 1966).

The Lake Mohave complex initially was defined by the Campbells (Campbell *et al.* 1937) on the basis of artifacts described as occurring along fossil Lake Mojave shorelines roughly equivalent in elevation to the outlet channel at the northern end of Silver Lake (Campbell and Campbell 1937:42). With respect to their previous finds at Pinto Basin (Campbell and Campbell 1935), the Campbells (1937:42) felt that the "paucity of pressure retouch on the Lake Mohave artifacts and the fact that they were more worn and sand-blasted than the Pinto Basin implements, imply an older culture on the former site." The presence of metates at Pinto Basin, and their absence at Lake Mojave was also considered indicative of the greater age of cultural remains at Lake Mojave (Campbell 1936:297). Antevs (1937:48) felt that Lake Mohave complex artifacts were "exclusively associated" with overflow levels and attributed this run-off, thus the artifacts, to a wet period during the late Pleistocene, ca. 15,000 B.P. Later Antevs (1952:26) revised the date in the light of his postulated tripartite Neothermal climatic sequence (Anathermal, Altithermal, Medithermal), suggesting an Anathermal-derived date of ca. 7,000 B.C. for the Lake Mojave artifacts. Artifacts were fashioned primarily by percussion, although pressure retouch occurred to a limited degree on thinner specimens such as points and crescentic stones (Barbieri 1937:101). Known best for its Lake Mohave and Silver Lake points (Amsden 1937:80-84), the complex also contained hammerstones, unifacial and bifacial tools, choppers, a variety of scraper forms, flake-knives, drills or perforators, crescentic stones, oval knives, and leaf-like blades (Amsden 1937:51-80). The cultural remains were interpreted as reflective of a hunting economy, with little, if any, seed-grinding and fishing (Amsden 1937:90-91). A hunting emphasis, as noted earlier, has yet to be substantiated by human-fauna stratigraphic associations at Lake Mojave. Thus, it is not surprising that Amsden (1937:92) rather cautiously added: "Fishing and seed-gathering are not wholly dependent on stone implements, however, so judgement must be withheld."

While there has been much questioning of the Campbell's and later interpretations of chronology at Lake Mojave (cf. Adams 1938; Rogers 1939; Roberts 1940, 1951; Strong 1941; Wormington 1949; Agogino 1961; Heizer 1965, 1970), there has been an equally considerable amount written in support of the complex's presumed antiquity. The supporters also have delineated a few critical errors of record made by those dissatisfied with chronological assessments (cf. Brainerd 1953; Warren and True 1961; Warren and DeCosta 1964; Woodward and Woodward 1966; Carter 1967; E. Davis 1967; Warren 1967, 1970; Ore and Warren 1971).

A brief review of relative and absolute dates assigned to the Lake Mohave complex reveals a strong correspondence with Bedwell's estimated range of 9,000-6,000 B.C. for the Western Pluvial Lakes Tradition, thus indicating that the El Paso/Red Mountain Planning Units were probably occupied to some extent during this period.

Antevs' (1952:26) estimate of ca. 7,000 B.C. has been accepted by Brainerd (1953:271), Warren and True (1961:271), and Bennyhoff (1958:Fig. 1). Wallace (1962:174) dated the complex at ca. 7,000-5,000 B.C. Warren and DeCosta (1964:206-208) associated radiocarbon assays for freshwater mussel shells (*Anadonata*) obtained from the 925-930 ft. level below beaches covered with Lake Mohave artifacts in the northwest corner of the basin. The dates are 7,690 B.C. ± 240 (LJ-200) and an unpublished date of 8,050 B.C. ± 300 given Hubbs by H. T. C. Smith (Hubbs, Bien, and Suess 1962:208-209). Heizer

(1965:127) questioned this association on the basis of the drawbacks to correlating environmental dates with archaeological remains, but E. Davis (1967:352) countered with a statement that "the association in this case has been investigated with such care that it must be kept in mind as highly probable." Woodward and Woodward (1966:102) suggested that man could have occupied Lake Mojave beaches anywhere from 11,500 to 4,500 B.C. Bettinger and Taylor (1974:13) suggested Lake Mohave and Silver Lake points date to at least 6,000 B.C. In general, dates for Lake Mohave and Silver Lake points correspond well with the sequence of projectile points in the Mojave Desert devised by F. Borden (1971) on the basis of relative degrees of artifact surface erosion. Indirect dates for the complex may be inferrable from Tadlock's (1966:668) identification of a Type III crescent from Lake Mojave (see Amsden 1937:76-78, Pl. 38a). This crescent form or Great Basin Transverse point (Clewlow 1968) is dated at ca. 7,000-5,000 B.C., and perhaps earlier (Tadlock 1966:672-673).

The "San Dieguito Complex" has been defined by Warren (1967), who groups within it a variety of presumably pluvial lake associated sites, localities, and complexes in the Desert West. These are as follows: C. W. Harris site (type site); Lake Mojave materials; Playa I-II, San Dieguito I-III (Rogers 1939, 1950, 1958, 1966; Warren and True 1961; Warren 1966; Hayden 1966); Owens Lake sites containing assemblages similar to those at Lake Mojave (Antevs 1952; Campbell 1949); Panamint Basin (E. Davis, personal communication to Warren 1967:77); and Tonopah sites containing Lake Mohave points (Campbell 1949). San Dieguito materials include "leaf-shaped knives of several varieties; small leaf-shaped points; stemmed and shouldered points generally termed 'Lake Mohave' and 'Silver Lake' points; ovoid, large domed and rectangular end and side scrapers; engraving tools; and crescents" (Warren 1967:177). Warren (1967:179) dated the complex on the basis of radiocarbon dates ranging from 1,950 B.C. ± 5,350 B.C. ± 200 for coastal sites featuring La Jollan complex materials, a component of which overlaid San Dieguito deposits at the type site (Warren and True 1961:260), and three radiocarbon determinations of the San Dieguito component at the type site, 6,540 B.C. ± 400 (A-724), 6,540 B.C. ± 400 (A-725), and 7,080 B.C. ± 350 (A-722A). Warren correlated the later dates with the various datings at Lake Mojave, and Antevs' (1952:28) suggestion that Lake Mohave artifacts at Owens Lake exceed 7,000 years in age. On the southern California coast, the San Dieguito Complex is dated ca. 7,000 B.C. (Warren and Crabtree n.d.). In general, Irwin-Williams (1968b:50) believed that San Dieguito artifacts predate at least a portion of the assemblage attributed to Lake Mohave (see also Treganza 1947).

E. Davis, Brott, and Weide (1969; see also E. Davis 1967, 1970, 1973) have postulated the "Western Lithic Co-Tradition" ca. 6,000-8,000 B.C. as a result of work in Panamint Valley. This co-tradition existed alongside the "Fluted Co-Tradition" and is comprised of artifacts common to the Lake Mohave and San Dieguito complexes. E. Davis' (1970:122) description of artifacts attributed to the "Panamint Variant of the Lake Mohave Pattern" included ovate bifaces, crescents, ovate and stemmed knife/points, large triangular borers, and scrapers and planes. However, Tuohy (1971:417-418) felt that the proposed co-tradition "apparently lacks solid supportive data," and "without data from Panamint

Valley one wonders if the author Davis would have conceived of 'The Western Lithic Co-Tradition' hypothesis at all."

Expressions of the Western Pluvial Lakes Tradition have yet to be adequately evaluated in terms of the economic patterns that produced the artifact distributions. To be sure, location of these assemblages along pluvial lakeshores, especially in light of Clewlow's (1968:47) suggestion that the widespread crescents described by Tadlock (1966) functioned as stunning points in the capture of waterfowl, putatively indicates that the lake environment was an elemental facet of early subsistence practices. The problem to be resolved, however, as is the case with fluted point distribution, is the degree to which the focus of lakeside subsistence was given to lacustrine exploitation, seed-gathering, hunting, or any combination of these. Advocates of a hunting emphasis, who presume that this focus stemmed from an even earlier hunting orientation utilizing, perhaps, fluted points, claim that the absence of artifacts attributable to lacustrine and/or seed-gathering activities offer negative evidence in support of a hunting tradition (cf. Amsden 1937; Rogers 1939; Wallace 1958; Hunt 1960; Warren and True 1961; Warren 1967; Warren and Ranere 1968; Tuohy 1968, 1970). Those suggesting alternative subsistence patterns point out that there is dismally little stratigraphic and associational evidence of a hunting emphasis, and that it is exceedingly difficult to establish that specific lithic implements were exclusively utilized in the processing of meat products (cf. Jennings and Norbeck 1955; Jennings *et al.* 1956; Jennings 1957, 1964; Rozaire 1963; Heizer 1964, 1966; W. Davis 1966; Clewlow 1968; Heizer and Baumhoff 1970; Hester 1973). With regard to this latter problem, a possibly significant endeavor would be to conduct edge-wear analyses of certain heretofore presumably ancient projectile points to establish whether they could have functioned equally as well as cutting or scraping tools. Once again, the need for further fieldwork, especially in the study area, cannot be over-stressed. More than likely, "as research progresses, we shall find that there are localized developments within the Western Pluvial Lakes Tradition" (Hester 1937:68).

In general, problems pertaining to manifestations of the Western Pluvial Lakes Tradition which could be attacked on the basis of research in the study area are much the same as those characterizing fluted points (i.e., artifact distributions, geological and archaeological associations, and, ultimately, cultural significance). A provocative idea advanced by Heizer (1970:71-72) may have relevance to archaeological investigation of pluvial shorelines such as those at Searles Basin. Heizer suggests that the presumably heightened deflation during the Altithermal (cf. H. Smith 1967) may have either uncovered shoreline cultural deposits subsequently covered with alluvium or, alternatively, aeolian deposits may have been laid down over artifacts at elevations above high lake stands attributed to the Anathermal. In either case, explorations of stratigraphy at points where "demonstrably ancient artifacts" are found would provide a good geological datum with which to associate artifacts (Heizer 1970:72). This would aid not only temporal consideration of the Western Pluvial Lakes Tradition, but may also further enhance understanding of the economic patterns identified with this tradition.

GREAT BASIN ARCHAIC

In his discussion of cultural chronology in the Great Basin, Hester considered the possibility of an occupational hiatus occurring in the southwestern Great Basin ca. 6,000-4,000 B.C. (1973:Fig. 25). This temporal span falls roughly between termination of the Western Pluvial Lakes Tradition (ca. 9,000-6,000 B.C.) and the appearance of assemblages attributed to a period which Hester (1973:125) termed the "Great Basin Archaic," ca. 4,000 B.C.-A.D. 250 (cf. Shutler 1961:69). A number of authors (among others, Wallace 1962:175; Kowta 1969; Hillebrand 1972b) have suggested that this gap in the archaeological record may be correlative with the concept of the Altithermal presented by Antevs (1948, 1952, 1953a, 1953b, 1955; cf. Willey 1966:353). Although there has been much debate over the validity of the Altithermal as Antevs conceived it, there seems to be a consensus that a period of hot and dry climate, distinctly more intense than today, did prevail in post-Pleistocene times. As Jennings (1968:60) writes, "that there was heat is not debated; its significance for man is at issue" (cf. Baumhoff and Heizer 1965:706).

Jennings (1966:86-87) noted the apparent gap between Lerma (ca. 8,000-6,000 B.C.) and Nogales (ca. 5,000-3,000 B.C.) complexes in Mexico (MacNeish 1958) and correlated this hiatus with similar observations made by others in the American West. However, Jennings (1968:87) suggested that the gap may be a function of site discovery and that "these apparent breaks in the sequence are of restricted and local significance and represent no significant period of regional abandonment." Bettinger and Taylor (1974:14) feel that there is no "archaeological or chronological evidence" substantiating an Altithermal-derived abandonment of southern California deserts (cf. Shutler 1967:305). In extreme southeastern California, although Rogers encountered no sites away from the Colorado River that he would date from 5,000 B.C.-A.D. 500, subsequent work has indicated that the area was not entirely unoccupied during this period (Weide and Barker 1974:81; cf. Treganza 1942:Fig. 11, 1 and 3; B. E. McCown 1955, 1957). Weide and Barker (1974:81) suggested:

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

It is probable that a climatic optimum of the sort Antevs delineated did occur in southern California deserts, and presumably had adverse effects on subsistence practices, but to infer an occupational hiatus may be more an accident of available dates than a truly complete removal of peoples from the region. The gap seen by many archaeologists correlates nicely with a "Terminal Paleo-Indian" phase in the Panamint Basin (E. Davis 1970:Table 11) and may correspond with what E. Davis (1968a:15) calls a "Transitional Stage" in eastern California, an ill-defined period following a "Paleo-Indian Stage" (i.e., Pre-Projectile Point Cultures, Fluted Point Tradition, Western Pluvial Lakes Tradition) and preceding an "Archaic" (i.e., Great Basin Archaic, Rose Spring-Eastgate Complex, Late Prehistoric) (cf. Brott 1969). As Altithermal conditions waned (Malde 1964b:126), archaeological evidence throughout the western Great Basin indicates that there was an abrupt increase in population, reflective of "more surface water and greater amounts of plant and animal food" (Baumhoff and Heizer 1965:705). If drought-like conditions ca. 5,000 B.C. did precipitate at least a partial abandonment of low-lying portions of the El Paso/Red Mountain Planning Units, it is conceivable that resources available at higher elevations, such as the uppermost slopes of the El Paso Mountains and, of course, the Tehachapi and southern Sierra Nevada Mountain to the west, would have been attractive localities for exploitation (cf. Grant, Baird, and Pringle 1968:112; Hillebrand 1972b).

The Great Basin Archaic as defined by Shutler (1961:69; 1968a:24) and adopted by Hester (1973:125-126) featured "exploitation of both desert and lacustrine resources, and certainly the utilization of other resources, such as those provided by mountain environments." As defined, the Great Basin Archaic combines and emphasizes the contemporaneity of subsistence patterns commonly attributed to the Desert Culture or Desert Archaic (Jennings 1953, 1957, 1964; Jennings and Norbeck 1955; Jennings *et al.* 1956) and lacustrine or lake margin accommodation (Heizer and Krieger 1956; Meighan 1959a; Rozaire 1963; Cowan 1967; Napton 1969; Heizer and Napton 1970). Several local designations for the period under discussion which may apply to the El Paso/Red Mountain Planning Units can be subsumed in the Great Basin Archaic, namely: Pinto-Gypsum and possibly Amargosa Phase I (Rogers 1939:47-64), Death Valley II (Wallace 1958:12-13; Hunt 1960:62-109), Period II (Pinto Basin) and possibly Period III-Phase I (Phase I Amargosa) (Wallace 1962:175-176), Little Lake, Early and Middle Rose Spring (Lanning 1963:281), Archaic Substage One or Early Milling, Archaic Transition (E. Davis 1968a:15, 1970:Table 11), and Little Lake and Newberry phases (Bettinger and Taylor 1974:Table 1).

Characteristic of Great Basin Archaic sites is the occurrence of Silver Lake, Humboldt, Pinto, Gypsum, or Elko series dart points (Hester 1973:126). As already noted, Silver Lake points were first recognized at Lake Mojave (Amsden 1937) and although generally considered as a component of assemblage attributed to the Western Pluvial Lakes Tradition, Silver Lake points appear to have survived later in time than Lake Mohave points (cf. Harrington 1957; E. Davis 1970; F. Borden 1971). Humboldt series points, as defined by Heizer and Clewlow (1968), feature three varieties: "Concave Base A," "Concave Base B," and "Basal-Notched."

Pinto points were originally defined by Campbell and Amsden (1934) (type site) and Amsden (1935). These forms were later re-evaluated by Harrington (1957) and Lanning (1963). On the basis of abundant Pinto deposits at the Stahl site near Little Lake, Harrington (1957:51-52) delineated five "subtypes" of Pinto points: "shoulderless," "sloping shoulders," "square shoulders," "barbed shoulders," and "one-shoulder." Lanning (1963:250-251) preferred to delete the term Pinto and insert the term Little Lake to identify "Pinto" points at the Stahl and Rose Spring (Iny-372) sites. Several authors have felt that "Pinto" has been rather loosely applied (cf. O'Connell 1971; Bettinger and Taylor

1974). For instance, Clewlow (1967:144) noted that Pinto "shoulderless" bear strong similarities to Humboldt Concave Base A and treats them as equivalent. Bettinger and Taylor (1974:13) felt that "this lumping of widely separated specimens within a single 'Pinto' type obscures what seems to be significant stylistic variation" and observed that the points from Pinto Basin are thick and percussion-flaked, whereas Little Lake "Pinto" points are long, thick, extensively pressure-flaked and exhibit deep basal notches. Furthermore, Bettinger and Taylor (1974:13) observed a striking similarity between points from Pinto Basin and the Lower Moist Midden at Ventana Cave (Haury 1950:284). They suggested that this similarity may imply a general confinement of Pinto Basin points to lower southeastern California (eastern Mojave and Colorado deserts) and western Arizona (see also True 1958). Meanwhile, Little Lake points have been found in the Mojave Desert, Death Valley, Panamint Valley, Owens Valley, and northwards.

Elko points were first defined by Heizer and Baumhoff (1961; see also O'Connell 1967; Heizer, Baumhoff, and Clewlow 1968) and include three varieties: "side-notched," "corner-notched," and "eared." It has been suggested that the Gypsum Cave point form (Harrington 1933) be referred to as Elko "contracting stem" (Clewlow 1967; Thomas 1970). Elko "eared" points closely resemble Little Lake forms, but the former features expanding stems in contrast to the straight stems of the latter.

Silver Lake points found within the planning units and their distribution in adjacent areas have been described in the previous section. "Pinto" points have been noted in the El Paso Mountains (Hillebrand 1972b:48; Apostolides, personal communication) and Elko and Gypsum Cave points from Black Canyon are described and illustrated in G. Smith's (1963) synthesis of San Bernardino County Museum records on sites within the Mojave River drainage system. Also, Simpson (1952b:141) reported "Pinto" points from Black Canyon. Possible Humboldt and Elko points were found at Harper Dry Lake (Hanks 1968:23). The authors also have reviewed photographs of Humboldt (Concave Base A, Concave Base B), Elko (Corner-Notched, Eared), and Gypsum Cave points collected by a local resident at Walker Pass and on the west side of Black Mountain (in the El Pasos).

"Pinto" and Gypsum Cave points have been reported in the southernmost Sierra Nevada and northern Tehachapi Mountains (Price 1954b; Elsasser 1960; Griffin 1963). "Pinto" and Elko points occur in the Coso Mountains at the northern end of China Basin (Grant, Baird, and Pringle 1968; Hillebrand 1972a). The Little Lake-Owens Valley area has produced Humboldt, Pinto-Little Lake, Elko, and Gypsum Cave points (Harrington 1948, 1952, 1953, 1957; H. Riddell and Riddell 1956; Redtfeldt 1962; Lanning 1963; E. Davis 1963, 1964; Walter 1970). Humboldt, Pinto-Little Lake, Elko, and Gypsum Cave points have been found in Panamint Valley (True, Sterud, and Davis 1967; E. Davis 1970). In the Panamint Mountains, possible Humboldt Concave Base A and Elko Eared points are described by Wallace and Taylor (1955a), and Humboldt, Pinto-Little Lake, Elko, and Gypsum Cave points have been found in Death Valley (Wallace and Taylor 1955b; Wallace 1958; Hunt 1960). Though not always referred to by the terms Humboldt, Pinto, Little Lake, Elko, or Gypsum Cave, such point types are not uncommon finds in the Mojave Desert (Campbell and Amsden 1934; Cambell and Campbell 1935; Campbell 1936; Campbell *et al.* 1937; Rogers 1939; Lawbaugh 1952; Peck and Smith 1957; G. Smith *et al.* 1957; Simpson 1958, 1960, 1965; J. Davis 1962; G. Smith 1963; Donnan 1964; True, Davis, and Sterud 1966).

In general, these point series follow a general temporal sequence, "roughly Humboldt-Pinto-Elko-Gypsum" (Hester 1973:126). Radiocarbon determinations for deposits containing Humboldt points generally fall between 3,500 B.C. and 1,100 B.C. (cf. Fowler 1968b; Roust and Clewlow 1968; Heizer, Baumhoff, and Clewlow 1968), and although Danger Cave dates suggest a much greater age, many argue that the Danger Cave data has been misinterpreted and that the deposits have been subjected to vertical mixing (cf. Lanning 1963:275; Warren and Ranere 1968:8; Hester 1973:126). A radiocarbon floruit of 3,300-1,200 B.C. applies to Pinto-Little Lake points in the Great Basin, and may date earlier (cf. Shutler, Shutler, and Griffith 1960; Heizer, Baumhoff, and Clewlow 1968; O'Connell and Ambro 1968; O'Connell 1971; Clewlow, Heizer, and Berger 1970; Hester and Heizer 1973; Bettinger and Taylor 1974). Although Elko points may date earlier in the eastern Great Basin (see Heizer, Baumhoff, and Clewlow 1968; Hester and Heizer 1973), a radiocarbon range of 1,200 B.C. to A.D. 200-600 is common for deposits containing these and Gypsum Cave points in the western and southwestern Great Basin (cf. F. Riddell 1960; O'Connell 1967, 1971; Roust and Clewlow 1968; Tuohy and Stein 1969; Clewlow, Heizer and Berger 1970; Heizer and Berger 1970; Hillebrand 1972a; Bettinger and Taylor 1974).

Aside from the distinctive projectile points characterizing the Great Basin Archaic, the period saw the appearance (or possible expansion) of stone implements utilized in the processing of plant foods (Jennings and Norbeck 1955:3; Jennings 1966:85; E. Davis 1968a:17). Early Great Basin Archaic sites contain milling stones in low proportion to chipped stone tools which dominate the assemblages (Susia 1964:30-31) and by 3,000-2,000 B.C. sites featuring artifacts (e.g., grinding tools) affiliated with a food-collecting subsistence pattern are known in the southwestern Great Basin (cf. Wallace 1962; Williams and Orlins 1963). Jennings (1965:85) described the Desert Archaic inventory as including:

> . . . basketry, netting, fur cloth, woven sandles, the spear thrower, hardwood dart points, stone tools preferrably of basalt and quartzite in the early stages (with a shift toward obsidian and other glassy materials later), flat milling stone, many specialized stone tools, scrapers, choppers, pulping planes of crude appearance, digging stick, curved wooden clubs, fire drill and hearth, tubular pipes, and imported shells from California for ornaments.

Great Basin Archaic materials in the southwestern Great Basin, usually comprised of lithic artifacts, are often located along presently anhydrous drainages, or near basins sometimes filled with shallow, ephemeral lakes (Harrington 1948:116; Wallace 1962:176; Susia 1964:31). Late Great Basin Archaic site locations and assemblages (e.g., Elko, Gypsum, or perhaps Amargosa Phase I points) are not well-defined in southern California deserts (cf. Wallace 1962:176), a "situation which stands in strong contrast to the northern Great Basin where materials from this period are well known, evidencing a well-developed hunting and collecting subsistence with specialized adaptations including use of lacustrine resources" (Weide and Barker 1974:82). Archaeological investigations in the El Paso/Red Mountain Planning Units might possibly improve the definition of Great Basin Archaic sites in southern California in the light of the many playas that are encompassed by the study area. Moreover, as indicated earlier, analysis of highland-lowland relationships during the early Great Basin Archaic may also be enhanced by research in the planning units.

ROSE SPRING-EASTGATE COMPLEX

This complex is set apart from the Great Basin Archaic by Hester (1973:34) on the premise that projectile points of the Rose Spring and Eastgate series represent the introduction of the bow and arrow into the Great Basin (cf. Lanning 1963:268). With the appearance of these points "larger dart point forms previously in use appear to have subsided in popularity, and in some instances, disappeared altogether" (Hester 1973:126). Defined by Lanning (1963), Rose Spring points come in three forms: "corner-notched" (most common), "side-notched," and "contracting stem." Eastgate "expanding stem" and "split-stem" points were first recognized by Heizer and Baumhoff (1961; see also Heizer and Clewlow 1968; O'Connell and Ambro 1968). Over the past few years, Rose Spring and Eastgate points, on the basis of their consistent association with each other, have become regarded as members of a single continuum with only minor morphological differences (Heizer and Baumhoff 1961:128; Hester and Heizer 1973:7). Hester's correlation of these point forms with the introduction of the bow corresponds well with Fenenga's (1953) analysis of chipped stone weights and functions. The idea here is that points become progressively lighter and smaller as the bow replaced the atlatl, an evolution noted often in the west and southwest Great Basin (among others, Meighan 1955:13; H. Riddell and Riddell 1956:30; F. Riddell 1958:46; Wallace and Taylor 1960:74; Elsasser 1960:29-30; J. Davis 1962:39; Clewlow 1967:145; Heizer and Clewlow 1968:67; E. Davis 1970:123; Bettinger and Taylor 1974:19). Heizer and Baumhoff (1961) and O'Connell (1971) have suggested that these two point series developed out of the larger Elko points in response to the need for smaller points when the bow was introduced (Hester 1973:34). This coincides with W. Davis' (1966:153) observation that the difficulty in separating arrows from darts (cf. Grosscup 1960:32-36) indicates: (1) that the dart served as the prototype of the arrow; and, (2) that the transition was a relatively easy one (cf. Jennings 1957:183).

Several local designations for assemblages that may come under the heading of Rose Springs-Eastgate Complex and which may apply to the study area are: later aspects of Amargosa Phase II (Rogers 1939:64-65), possibly Period III-Phase II (Phase II Amargosa) (Wallace 1962:176), late Death Valley II-Death Valley III (Wallace 1958:13-14; Hunt 1960:102-106, 111-163), Late Rose Spring (Lanning 1963:281), Non-Ceramic Yuman Horizon (Donnan 1964:11; cf. J. Davis 1962:47), Milling Archaic (E. Davis 1970:Table 11), and Haiwee (Bettinger and Taylor 1974:Table 1).

No published accounts of Rose Spring or Eastgate points exist for the study area, although the authors have seen photographs of Rose Spring Corner-Notched points supposedly found near Walker Pass by a resident of Inyokern. In adjacent areas, Rose Spring (predominant) and Eastgate points have been found in the Coso Mountains (Hillebrand 1972a), possibly in the southernmost Sierra Nevadas, and northern Tehachapi Mountains (Elsasser 1960; Guthrie 1957), in the Little Lake-Owens Valley area (Harrington 1952, 1953, 1957; H. Riddell 1951; H. Riddell and Riddell 1956; Redtfeldt 1962; Lanning 1963; Walter 1970), in Panamint Valley (True, Sterud, and Davis 1967; E. Davis 1970), possibly in the Panamint Mountains (Wallace and Taylor 1955a), in Death Valley (Wallace and Taylor 1955b, 1959; Wallace 1957, 1958; Wallace, Hunt, and Redwine 1959; Hunt 1960) and quite generally in the Mojave Desert (Rogers 1939; Peck and Smith 1957; J. Davis 1962; G. Smith 1963; Donnan 1964; McKinney, Hafner, and Gothold 1971).

Radiocarbon determinations from a wide variety of midden sites containing Rose Spring and Eastgate point forms show a floruit of A.D. 500-600 to A.D. 1,300 (cf. Clewlow 1967; Fowler 1968b; O'Connell and Ambro 1968; Heizer and Napton 1970; O'Connell 1971; Hester and Heizer 1973; Bettinger and Taylor 1974). As Hester (1973:34) noted, estimates for the introduction date of the bow range from 1,250 B.C. to A.D. 1 (cf. Grosscup 1957:380, 1960:32; W. A. Davis 1966:151; Grant, Baird, and Pringle 1968:51; Aikens 1970:200), yet Hester reasons that if it can be assumed that, for the most part, Elko points were attached to darts and Rose Spring and Eastgate points to arrows, then on the basis of radiocarbon assays the bow appeared ca. A.D. 500. This contradicts, however, Hester's (1973:Fig. 25) temporal positioning of the Rose Spring-Eastgate Complex in the southwestern Great Basin ca. A.D. 250-1,250. No explicit explanation is provided, but it is possible that Hester gave the complex an earlier initial date on the basis of Grant, Baird, and Pringle's (1968:51) suggestion that the bow appeared in the Coso Mountains ca. 200 B.C.

With respect to the economic patterns exhibited by the Rose Spring-Eastgate Complex, Hester (1973:126) stated: "There is no substantial evidence that the use of the bow and arrow brought about any significant economic changes." However, at Danger Cave a sudden 280% increase of ungulate bones between Levels IV and V (Jennings 1957:Table 21) indirectly suggests that there was at least some change in economic pattern after the bow showed up at the site. Moreover, a bow-caused decimation of Bighorn sheep populations in the Coso Mountains (at the opposite end of China Basin from the study area) has been hypothesized as a factor in an increase of Coso rock art ca. A.D. 1,000 (Grant, Baird, and Pringle 1968:112-115). The presumably adverse effects of the bow and arrow on game populations in the northern Mojave Desert may correlate with the lexicostatistical indications of a movement of peoples out of this area ca. A.D. 900-1,000 (cf. Lamb 1958; see discussion of Late Prehistoric). Hence, the archaeological record that might exist in the El Paso/Red Mountain Planning Units could provide processual information as to the bow's impact on economic factors. Future investigation of the effects of the bow on prehistoric populations in the southern California deserts would seem to dictate that close attention be paid to faunal assemblage reconstruction in the localities under study.

LATE PREHISTORIC

Hester (1973:127) defined the Late Prehistoric as "the introduction of brownware ceramics and Desert Side-Notched and Cottonwood series projectile points ca. A.D. 1,000 or somewhat later" which identifies "the advent of Paiute and Shoshonean peoples." In regards to the latter statement, it might be helpful to briefly review Lamb's (1958) lexicostatistic-derived explanation of Numic speaker dispersal in the western Great Basin, a postulate which has been accepted by most linguists (cf. Hopkins 1965; Miller 1966; Jacobsen 1966; Goss 1968). According to Lamb's hypothesis (1958:99), about 2,000 years ago Numic speakers (hailing from the Takic or Southern California Shoshoneans at a more remote time) separated into three mutually unintelligible, yet still "obviously related" (Spencer and Jennings 1965:274) familiar dialects: Northern Paiute, Shoshoni-Comanche, and Ute-Southern Paiute-Chemehuevi. Thereafter, ca. A.D. 950, these groups distributed themselves from southeastern California (in the vicinity of Death Valley) into the Great Basin. In the process of moving, the Kawaiisu, probable historic inhabitants of most of the study area, split off from the Ute-Chemehuevi (Lamb 1968:99-100). Two other glottochronological estimates of a Kawaiisu-Ute-Chemehuevi separation are A.D. 1,000 (Hale 1958:107) and A.D. 1,450 at the very latest (Goss 1966:272). Madsen (1975:82-85) has associated the dating of Paiute-Shoshoni pottery ca. A.D. 1,000 with the northward expansion of Numic speakers from the Southwestern Great Basin.

Desert Side-Notched points were originally defined by Baumhoff and Bryne (1959), who described four varieties: "General," "Sierra," "Redding," and "Delta." The Cottonwood series was first proposed by Lanning (1963) and included "triangular" and "leaf-shaped" forms. Heizer and Clewlow (1968) added a third variation, "bipointed." All three Cottonwood forms occur in late prehistoric and historic sites (see H. Riddell 1951) and are often in association with Desert Side-Notched points, which also are found in historic sites. Both Desert Side-Notched and Cottonwood points were products of an improving expansion of the bow and arrow complex. Radiocarbon determinations indicate that Desert Side-Notched points appeared ca. A.D. 1,100-1,200 and Cottonwood points ca. A.D. 1,300 (cf. Clewlow 1967; Fowler 1968b; Clewlow, Heizer, and Berger 1970; Elston and Davis 1972; Hester and Heizer 1973; Bettinger and Taylor 1974).

In the southwestern Great Basin, pottery is represented by two roughly contemporaneous traditions separated by a border that "lies somewhere between Joshua Tree National Monument and Death Valley" (Wallace 1962:177). The northern tradition is identified as Owens Valley Brown Ware (H. Riddell 1951:20-23) while to the south it is Tizon Brown Ware (Euler and Dobyns 1958) of the Palomar type (Meighan 1959b:36-39). The more rough-textured Owens Valley Brown Ware has been associated with Northern Paiutes and their neighbors (Steward 1933; E. Davis 1963) and is dated to A.D. 1,650 by H. Riddell (1951:20-23; see also Fowler 1968a:10). Tizon Brown pottery "exhibits close accordance to ceramic wares of the lower Colorado River Valley and upland northern Arizona" (Wallace 1962:177).

Late Prehistoric materials are found within the study area (Lawbaugh 1950; Harrington

1950; Heizer 1952; F. Curtis 1955; Pierson 1956; G. Smith 1963; Griffin 1963; Apostolides 1968; Hanks 1968), in the southernmost Sierra Nevada and northern Tehachapi Mountains (Heizer 1951; Price 1954a, 1954b; Guthrie 1957; Baumhoff and Bryne 1959; Elsasser 1960; Griffin 1963), in the Coso Mountains (Hillebrand 1972a), in the Little Lake-Owens Valley vicinity (H. Riddell 1951; Harrington 1952, 1953, 1957; H. Riddell and Riddell 1956; F. Riddell 1958; Redtfeldt 1962; Lanning 1963; Walter 1970), in Panamint Valley (True, Sterud, and Davis 1967; Davis 1970), in the Panamint Mountains (Lathrap and Meighan 1951; Meighan 1953; Wallace and Taylor 1955a), in Death Valley (Wallace and Taylor 1955b; Wallace 1957, 1958; Hunt 1960), and throughout the Mojave Desert (Campbell 1931; Rogers 1939; Babcock 1956; Peck and Smith 1957; G. Smith *et al.* 1957; Simpson 1958; Wallace and Desautels 1960; J. Davis 1962; G. Smith 1963; Donnan 1964; Wallace 1964; True, Davis, and Sterud 1966; McKinney, Hafner, and Gothold 1971; Bettinger and Taylor 1974).

Designations for Late Prehistoric remains in southern California deserts are many: Early, Late Desert Mohave (Rogers 1939:Pl. 18), Yuman I-III (Rogers 1945), Death Valley IV (Wallace 1958:14-15; Hunt 1960:163-284), Period IV (Shoshonean-Yuman) (Wallace 1962:177-178), possibly the Providence Complex (J. Davis 1962:45-46), Early, Late Cottonwood phases (Lanning 1963:281), Shoshonean Horizon (Donnan 1964:13), Pottery Archaic (E. Davis 1968a:15, 1970:Table 11), and Marana (Bettinger and Taylor 1974:Table 1).

During the Late Prehistoric, a food-collecting lifeway persisted and, aside from sherds, artifacts associated with plant food processing (e.g., manos, metates, bedrock mortars, pestles) are the most common component of sites (Wallace 1962:178). Campsites attributable to this period are usually found in locations affording shelter from the wind, such as among sand dunes, around boulder clusters, and beneath rock overhangs (Wallace 1962:178). The sites usually are at a convenient distance from some water source, although historic sites far removed from water have been noted throughout the Great Basin (Heizer 1965:127; cf. Steward 1937:105).

There is little doubt that a wide variety of Late Prehistoric sites can be located within the El Paso/Red Mountain Planning Units, ranging from simple quarrying sites to occupational sites such as the shelter excavated by Apostolides (1968). Further archaeological investigation of the planning units, of course, would serve to enlarge the corpus of data on Late Prehistoric site distribution and composition, as well as increase knowledge of ecological adaptations developed in response to an arid habitat.

SUMMARY

From the few accounts of archaeological remains in the El Paso/Red Mountain Planning Units, and from the more substantive data available for adjacent areas, the following synopsis of occupational history in the two planning units is tentatively offered. It is likely that man was in this region of the northern Mojave Desert ca. 10,000 B.C., although his activities at this early date have yet to be clearly recognized or understood. Although there have been claims of so-called "pre-projectile point" cultures in the general vicinity of the study area, these postulations are far from general acceptance by the archaeological community and are in dire need of corroborative evidence from other areas in the American West. During the period from 10,000 B.C. to 6,000 B.C., cultural activities were probably characterized by a generalized subsistence pattern focusing at times on resources available along pluvial lake margins. Whether lacustrine or megafauna food sources were primary has yet to be delineated. It may be that neither source offered any selective advantage and thus both were simultaneously exploited. That the area was more watered and richly vegetated than at present seems to be indicated by paleoecologic information from Searles Lake (see Roosma 1958).

Between 6,000 to 4,000 B.C. the desiccating effects of a hypothesized post-Pleistocene climatic optimum may have been responsible for a partial abandonment of low-lying portions of the region for more attractive resources available at higher elevations, but the lack of data precludes any definitive statement on this period. By 4,000-3,000 B.C. a basic food-collecting lifeway seems to have been established that persisted into the historic period. This period featured the appearance of food-processing tools such as manos, metates, mortars, and pestles and in the early stages, Humboldt, Pinto, and Little Lake, and later on Elko and Gypsum series projectile points. The bow may have been introduced as early as 2,000 years ago as is indicated by the transition from larger and heavier dart points to the smaller and lighter point forms such as those of the Rose Spring and Eastgate series. The late prehistoric introduction of Desert Side-Notched and Cottonwood points represents an expanding development of bow and arrow technology, and are roughly associated with the appearance of ceramics and a recognizable trade system between the Great Basin and the Southwest and between the Great Basin and Central California.

POTENTIAL ARCHAEOLOGICAL SIGNIFICANCE OF THE EL PASO/RED MOUNTAIN PLANNING UNITS

The concern in this brief section is with some of the broader, anthropological implications of archaeological research in the El Paso/Red Mountain Planning Units. Specific regional research questions are considered in the concluding section that follows.

Assuming that the El Paso/Red Mountain Planning Units have witnessed cultural occupation and activity over a long period of time, there is a forseeable potential for the study of interaction between an evolving environment and the adaptive systems of hunting and gathering peoples. For example, extraction of economic rosources was a significant determinant of the land use patterns practiced by the aboriginal inhabitants of the California Desert (Weide 1973:6). Hence, possibly significant, and complementary, goals for archaeological research in the planning units would be clarification of past economic systems, and the explanation of the relationship between these systems and temporal shifts in the distribution of economic resources.

Examination of the environment's role in human activity is the study of "technoenvironmental transactions" (Harris 1971:657). Analysis of such transactions requires consideration of the interaction between technology and environment—a phenomenon common to all human ecological situations. Such transactions can be studied in terms of a dynamic equilibrium system operating between the cultural system and the coupled environing system (Clarke 1968:129). The technoevnironmental character of the preceding section on culture history is obvious and believed to be helpful. It must be emphasized, however, that determination of technoenvironmental transactions are not sole objectives of archaeological research. To explain culture (if such is conceivable) is to explain its processes, and to perceive these to the greatest accuracy involves, for one, an understanding of the processes of culture brought to the fore by adaptation to the physical environment. For instance, it is reasonably certain that subsistence-settlement patterns and technologies identified with early inhabitants of the El Paso/Red Mountain Planning Units differed to some degree from those characterizing more recent occupants of the region. Immediately one might attribute differences in the archaeological record to distinctly different ecological contexts. Yet delineation of contrasting culture-habitat articulations does not explicate or explain the processes involved in cultural responses to a transition from a better watered environment to a markedly arid one.

Archaeological research in the El Paso/Red Mountain Planning Units may be amenable to the application and evaluation of such broad dynamic equilibrium system models as carrying capacity (Zubrow 1971). According to Zubrow (1971:128), carrying capacity is the:

> . . . maximum number of organisms or amounts of biomass which can maintain itself indefinitely in an area, in other words, a homeostatic equilibrium point. It is homeostatic equilibrium in that there is a tendency toward the maintenance of a state of balance between opposite forces or processes which result in a diminishing net change or

a stable constant. It is dynamic in that the point at which the state of balance exists may change over time and space.

Such a model can be tied in with study of land use patterns, site composition, distribution, and density (such as in the El Paso Mountains and in the Black Canyon vicinity), and changes in the availability of economic resources. On the other hand, with the understanding that culture operates as a system (G. Weiss 1973:1384), modifications in exploitative techniques can affect carrying capacity equally as well as changes in economic resource status. For instance, the aforementioned hypothesis proposed by Grant, Baird, and Pringle (1968), which has significance for the understanding of prehistory in the El Paso/Red Mountain Planning Units, can be visualized in the perspective of a carrying capacity model. To reiterate, their hypothesis associates the introduction of the bow and arrow with a subsequent decimation of Bighorn sheep populations, an increase in rock art, and an eventual movement of groups out of the Coso Mountains (Grant, Baird, and Pringle 1968:112-115). In this case, the greater effectiveness of the bow over the atlatl gradually lowered the carrying capacity by reducing the availability of a certain economic resource, while the bow initially allowed an increase in the rate of population growth–ergo, the growth rate eventually overshot the "carrying capacity point" (Zubrow 1971:134), causing disequilibrium and bringing about a rise in the rate of out-migration (see Matras 1973). Although there are, of course, certain inherent difficulties in Grant, Baird, and Pringle's hypothesis, such as the lack of evidence with which to estimate pre-bow sheep populations or the lack of sites containing the faunal remains datable to the period following the appearance of the bow, the example serves to indicate the potential for model development and testing within the El Paso/Red Mountain Planning Units.

Models dealing with settlement patterns (e.g., Thomas 1971) and the concept of site catchment (Vita-Finzi and Higgs 1970) or "refuging" (Hamilton and Watt 1970), with expansive fieldwork and rigid statistical controls, could also be devised to cover and extract anthropological data from the differential patterning of archaeological sites (see base map) within the planning units. Furthermore, situated as they are in an area once bordered on the west and south by Californian cultures and on the east and southeast by the cultures of the greater American Southwest, the El Paso/Red Mountain Planning Units offer the potentially significant opportunity for the study of cultural interaction (e.g., Grant 1971; Ruby 1970). In this context, there are a whole variety of distribution and diffusion models which could be adopted, or modified, then applied (Clarke 1968:413-431).

SITE DISTRIBUTION, RESEARCH OPPORTUNITIES, AND SENSITIVE ARCHAEOLOGICAL AREAS IN THE EL PASO/RED MOUNTAIN PLANNING UNITS

Objectives in this final portion of the report are threefold. First, to roughly describe the distribution of known archaeological sites (specific locations are given on the accompanying base map). Second, in light of the information summarized in the preceding sections of the report and the distributional data, to briefly consider some possible and preliminary regional research questions that could be pursued by future archaeological endeavors within the El Paso/Red Mountain Planning Units. Third, to delineate particular areas of the planning units which show a sensitivity to archaeological site locations.

Any assessment of site distribution within the planning units demands the realization that the known pattern of site locations is more likely a function of discovery rather than of acutal site frequencies. There are clearly areas within the planning units which should not, necessarily, be interpreted as areas less attractive for prehistoric exploitation or occupation simply by reason of a comparatively lesser number of recorded sites. Without belaboring the point, these statements emphasize the general lack of systematic study of a large portion of the two planning units and, concomitantly, the enduring need for more fieldwork.

Nonetheless, aside from empirical drawbacks to formulating specific conclusions about site distribution, notable concentrations of recorded sites merit description. From a cursory examination of the records, it is obvious that the two most sensitive archaeological site localities are the El Paso Mountains (El Paso Planning Unit) and the general area in and around Black Canyon (Red Mountain Planning Unit). More specifically, in the El Paso Mountains, temporary camps, rockshelters, milling stations, and lithic scatters are common in the area northeast of Black Mountain and immediately northwest of Sheep Spring, while similar sites, rock alignments, and rock art sites are recorded for the Black Hills and for the west-central El Pasos in the vicinity of Bonanza Gulch and upper Last Chance Canyon. Alex Apostolides has informed the authors that there may be as many as 700 unrecorded sites in the El Paso Mountains, including a large number of petroglyph sites. Along the northwestern edge of the El Pasos, unofficial records suggest an impressive concentration of "rock rings" (Apostolides, personal communication; author's own notes). Apostolides has also indicated that there are many unreported petroglyph and occupation sites in the eastern El Paso Mountains. Temporary camps, rockshelters, a cemetery (?), and rock art sites are recorded for the southern edge of the El Pasos (i.e., Garlock Fault zone, northern Fremont Valley) in the vicinity of Mesquite Springs, the mouth of Iron Canyon, and just east of Goler Heights. Lithic scatters, temporary camps and, primarily, a huge number of rock art sites characterize the Black Canyon area.

In the El Paso Planning Unit, sporadic incidents of temporary camps, milling stations, a possible cremation, and rock art sites are recorded for the eastern slopes of the southernmost Sierra Nevada and northern Tehachapi Mountains: in Sand Canyon, Sage Canyon, below the mouth of Bird Spring Canyon (western Indian Wells Valley), around southern Kelso Valley, just south of Cross Mountain, and in Jawbone Canyon (at mouth and south of Blue Point). Rockshelters, lithic scatters, and rock art sites have also been recorded for areas at and around Desert Butte and Castle Butte.

In the Red Mountain Planning Unit, temporary camps and rock art sites are recorded for areas immediately east of Red Mountain, and in the northeastern Rand Mountains and southern Lava Mountains. Apostolides (personal communication) reports an extensive petroglyph concentration covering a quarter-mile of one ridge near Steam Wells in the Red Mountain vicinity. Rock art sites, temporary camps, and lithic scatters characterize areas north and northeast of Fremont Peak. Temporary camps, lithic scatters, and pottery loci have been found in eastern Searles Valley. To the north, unofficial information locates sites along the southwestern edge of Searles Lake (including The Pinnacles) and in Poison Canyon.

In the immediately preceding section, some broad potentialities for archaeological research in the El Paso/Red Mountain Planning Units were offered. The second objective in the current section attempts to break down these general opportunities into specific regional research questions. However, before presenting these, particular problems that exist in structuring culture history in the planning units should be noted for they also require further study.

Considering that the El Paso/Red Mountain Planning Units encompass or abut several pluvial basins (Koehn, Rogers, Cuddeback, Harper, Searles, China), one question of culture historical interest focuses on the definition, distribution, and dating (if possible) of early occupations in the planning units. If such finds were made under carefully and effectively implemented programs of site survey and surface collection, e.g., "exposed archaeology" (E. Davis 1975), a wealth of information might be generated that would lend itself to comparative analysis with other early complexes in the Desert West such as San Dieguito, Lake Mohave, and Hascomat (cf. Warren and Ranere 1968; Tuohy 1969). Particular problems that could be attacked with this data are the determination of economic patterns reflected by the archaeological remains and temporal and/or economic relationships between certain diagnostic artifact forms, e.g., fluted and concave-based lanceolate, and stemmed projectile points.

Likewise, the period ca. 6,000 B.C. to ca. 4,000 B.C. (see Fig. 7) needs a great deal of clarification in terms of diagnostic assemblages and their significance in the prehistory of the El Paso/Red Mountain Planning Units. More recently, certain problems of a culture historical hue are the dating of and diffusion of the bow and arrow, ceramics, and the definition and delineation of the factors surrounding the lexicostatistic implication of a dispersal of Numic speakers from the southwestern Great Basin ca. A.D. 1,000. Moreover, a specific research opportunity that should be pursued is the functional analysis of and dating of the rock ring concentrations in the northwestern El Paso Mountains. Despite the fact that such structures are common throughout the western and southwestern Great Basin, their purpose is still only vaguely understood. Some investigators prefer to consider them as cache pits (Cowan and Wallof 1974), while others consider them as supportive mechanisms for small brush shelters (Steward 1933).

Certain portions of the El Paso/Red Mountain Planning Units offer excellent opportunities for the archaeological appraisal of propositions, generated on the basis of ethnological data, dealing with cultural articulation between a number of systems, each of which encompasses both cultural and non-cultural phenomena. The assumption is that " . . . cultural change comes about through minor variations in one or more systems, which grow, displace or reinforce others and reach equilibrium on a different plane" (Flannery 1967:20). Moreover, " . . . it is hardly coincidental that the popularity of multivariate statistical tecnhiques in archaeology arose with the emergence of the 'new' or 'systemic' archaeology" (Thomas 1971:viii).

An area within the El Paso Planning Unit that could be studied in light of these ideas is that of Indian Wells Valley, bordered by the eastern slopes of the Sierra Nevada (Scodie Mountains) on the west, and on the east by the El Paso Mountains. According to the ethnographic data, the aboriginal seasonal round was keyed into the differential ripening of major plant food resources. Presumably, piñon nuts were collected during autumn for winter consumption while bunchgrasses, mesquite, and Joshua tree pods were gathered in the spring and summer. If such a pattern was actually the case, the archaeological remains should reflect the pattern. Much like Thomas' (1971) project in Reese River Valley, Nevada, a systematic program of site survey and surface collection in Indian Wells Valley could test the validity of the ethnographic model of subsistence-settlement patterns. Ideally the distribution, density, and composition of sites would reflect the land use patterns practiced by aboriginal inhabitants over the course of a year. For example, sites indicative of seasonal fall or winter occupation could be located in piñon zones on the eastern Sierra Nevada slopes or at the base of these same mountains. Meanwhile, the dispersal and temporary camps associated with subsistence-settlement patterns in the spring and summer could be found in Indian Wells Valley and on westward facing alluvial fans of the El Paso Mountains (the noted rock ring concentrations in the northwestern El Pasos may be significant in this regard).

Assuming such an investigation were undertaken, and the resultant data corresponded at least roughly with the ethnographic model, what would be the value of the information produced? One obvious contribution would be a general indication of the role played by certain archaeological sites in the El Paso/Red Mountain Planning Units with respect to aboriginal land use patterns. This, in turn, could be helpful in assessing patterns of site location and density for their significance to long term planning of use and development in the planning units. More conceptually, such an investigation could enhance understanding of the prehistoric relationship between economic resources and such things as population dynamics (e.g., K. Weiss 1973) or adaptive systems of hunting and gathering peoples inhabiting an arid environment. The conclusions derived from archaeological research could then be compared and contrasted with ethnographic data for contemporary hunters and gatherers occupying similar habitats (e.g., Berndt and Berndt 1964; Lee 1969, 1972).

Another research opportunity in the El Paso/Red Mountain Planning Units is the examination of the aboriginal network of trade relations as reflected in the archaeological record. The data presented earlier in the ethnographic section indicates that there was a system of trade between the planning units and Central California (trans-sierran), and between the planning units and the Southwest (e.g., the so-called Mohave trade route). The presence of two major passes across the Sierra Nevada and Tehachapi Mountains (Tehachapi, Walker passes) in the western part of the El Paso Planning Unit would seem to dictate that attention be given to cultural interaction between areas of fundamentally different ecological orientations (cf. Ruby 1970).

The high frequency of rock art sites in the El Paso/Red Mountain Planning Units offers several research opportunities. Initially, a considerable contribution would be a systematic examination of Black Canyon-Inscription Canyon petroglyphs, especially if study is oriented toward a comparative analysis with other notable rock art localities in the western and southwestern Great Basin (e.g., Baumhoff, Elsasser, and Heizer 1958; Heizer and Baumhoff 1962; Grant, Baird, and Pringle 1968). Such research may shed light on the symbolic role of rock art in aboriginal society, and generate insights into the relationship between subsistence techniques and rock art site locations (cf. Heizer and Baumhoff 1959). Throughout California, although prehistoric rock art has historically received limited attention from archaeologists, the study of such phenomena from an archaeological rather than an artistic perspective offers an ideal opportunity to broaden current understanding of California prehistory (Meighan, personal communication).

Finally, one problem that can be considered under the guise of both historical and processual approaches is the possible transition from an orientation toward lake-margin accommodation (Western Pluvial Lakes Tradition) to a lifeway identified by such food-processing tools as manos and metates (Great Basin Archaic) (see Fig. 7). It seems that this transition is co-terminous with a post-pluvial period of heightened aridity (Altithermal?). Specific questions would focus on the interaction between culture and an evolving environment, i.e., why and by what means were changes in economic patterns brought about in response to increasing aridity? There is a possibility that such a transition was tied in with a, as yet undefined, lowland-highland or highland-lowland relationship. If such was the case, the variable terrain (in terms of elevation) covered by the planning units offers an ideal context in which to develop and test hypotheses of a processual nature.

Given the distribution of recorded archaeological sites, and some possible future directions for research in the El Paso/Red Mountain Planning Units, several specific areas within the defined territories can be considered as valuable or "sensitive" archaeological localities.

Two areas whose site sensitivity has already been established are the El Paso Mountains and the area in and around Black Canyon. Although many of the recorded sites in the El Paso Mountains have been entered on the National Register of Historic Places, there is a distinct possibility of an even greater number of unrecorded sites in the El Paso Mountains.

Another area that can be considered archaeologically sensitive is the desert-facing slopes of the southernmost Sierra Nevada and northern Tehachapi Mountains. Ethnographic and ethnohistoric data, as well as the limited number of recorded sites, suggest that the numerous drainages coming off these slopes were often loci of aboriginal land-use. This is supported, furthermore, by the presence of two major passes in the area connecting the planning units with Central California.

Finally, although many of the pluvial shorelines with the El Paso/Red Mountain Planning Units are relatively unexplored, it is probable that these areas are site sensitive. The difficulty here, however, is estimating the amount of basin margin area that would offer the greatest likelihood of site location. A somewhat arbitrary area between a mile or so beyond the highest discernible shoreline and the edge of the playa floor may be appropriate.

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APPENDIX I

MAJOR PLANT COMMUNITIES

Proper Name	Common Name	Family
		(After Munz & Keck 1968)
I. NORTHERN JUNIPER WOODLAND		
Juniperus occidentalis	Sierra Juniper	Cupressaceae
Pinus jeffreyi	Jeffrey Pine	Pinaceae
Pinus monophylla	Single-leaf Piñon	Cupressaceae
Artemisia tridentata	Basin Sagebrush	Compositae
Penstemon speciosus	Penstemon	Scrophulariaceae
II. PIÑON-JUNIPER WOODLAND		(After Munz & Keck 1968)
Pinus monophylla	Single-leaf Piñon	Cupressaceae
Juniperus californica	California Juniper	Cupressaceae
Juniperus osteosperma	Utah Juniper	Cupressaceae
Quercus turbinella	Desert Scrub Oak	Fagaceae
Purshia spp.	Antelope Brush	Rosaceae
Cowania stansburiana	(Rose Family)	Rosaceae
Fallugia paradoxa	Apache Plume	Rosaceae
Cercocarpus ledifalius	Mountain Mahogany	Rosaceae
Yucca schidigera	Mojave Yucca	Agavaceae
Yucca baccata	None	Agavaceae
III. JOSHUA TREE WOODLAND		(After Ornduff 1974)
Yucca brevifolia	Spanish Bayonet	Agavadeae
Atriplex spp.	Saltbush	Chenopodiceae
Ephedra spp.	Mormon Tea	Ephedraceae
Eriogonum fasciculatum	Wild Buckwheat	Polygonaceae
Haplopappus spp.	Bristlewood	Compositae
Juniperus californica	California Juniper	Cupressaceae
Lycium spp.	Box Thorn	Solanaceae
Opuntia spp.	Cholla, Prickly Pear	Cactaceae
Salazaria mexicana	Bladder Sage	Labiatae
Tetradymia axillaris	Cotton Thorn	Compositae
Yucca schidigera	Mojave Yucca	Agavaceae
IV. VALLEY GRASSLAND		
Aristida (many species)	Three-Awn	Gramineae
Poa (many species)	Bunch Grass	Gramineae
Stipa (many species)	Needle Grass	Gramineae
V. SAGEBRUSH SCRUB		
Artemisia tridentata	Basin Sagebrush	Compositae
Atriplex spp.	Saltbush	Chenopodiaceae
Chrysothamnus nauseosus	Rabbit Brush	Compositae
Coleogyne ramosissima	Blackbush	Rosaceae
Purshia	Antelope Brush	Rosaceae
Tetradymia spp.	Cotton Thorn	Compositae

APPENDIX I (Cont.)

Proper Name	Common Name	Family
VI. SHADSCALE SCRUB		
Artemisia spinescens	Spiny Sagebrush	Compositae
Atriplex spp.	Saltbush, Shadscale	Chenopodiaceae
Coleogyne ramosissima	Blackbush	Rosaceae
Ephedra spp.	Mormon Tea	Ephedraceae
Eurotia lanata	Winter Fat	Compositae
VII. CREOSOTE BUSH SCRUB		
Encelia farinosa	Brittle Bush	Compositae
Fouquieria splendens	Ocotillo	Fourquieriaceae
Franseria dumosa	Burro Weed	Compositae
Hymenoclea salsola	Cheese Bush	Compositae
Larrea divaricata	Creosote Bush	Zygophyllaceae
Opuntia spp.	Cholla, Prickly Pear	Cactaceae
VIII. ALKALI SINK SCRUB		
Allenrolfea occidentalis	Iodine Bush	Chenopodiaceae
Atriplex spp.	Saltbush	Chenopodiaceae
Salicornia spp.	Pickleweed	Chenopodiaceae
Sarcobatus vermiculatus	Greasewood	Chenopodiaceae
Suadea spp.	Seep Weed	Chenopodiaceae

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