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**A Cultural Resource Overview of the
Eureka, Saline, Panamint and Darwin
Region, East Central, California**

by

Richard H. Norwood

Charles S. Bull

Ronald Quinn

cultural resources publications

anthropology—history

Cover design represents a red pictograph from Panamint City, Inyo County, California.

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A CULTURAL RESOURCE OVERVIEW
OF THE
EUREKA, SALINE, PANAMINT, AND DARWIN REGION;
EAST CENTRAL CALIFORNIA

by

Richard H. Norwood and Charles S. Bull
Regional Environmental Consultants
San Diego, California

written in collaboration with Emma Lou Davis

with a section by

Ronald Quinn

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Eric W. Ritter
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FOREWORD

This report represents one of a series of seven cultural resource overviews covering the southern California deserts completed between 1974 and 1981. These overviews were contracted by the Bureau of Land Management, Desert Planning Staff, to aid in the formulation of a desert-wide land use plan and to judge impacts projected from plan implementation. Not only has this overview served a useful purpose but it has also aided, and continues to aid in the day-to-day management of cultural resources in the region. Further, it serves as a useful background document for regional research and provides an informative publication to the interested reader of both the public and private sectors.

Ideally, planning process overviews like this provide the necessary background information for designing and implementing subsequent field inventories. However, the nature of the planning process in this unusual and far-reaching program, and time constraints dictated by the Federal Land Policy and Management Act (1976) necessitated both study and action almost concurrently. In fact, some of the inventory data has been discussed in this document. Subsequent analyses of the data have resulted in reports on file with the BLM in Riverside which provide both additional and some alternative conclusions.

The final report manuscript was submitted by RECON to BLM in October of 1979. Many months of intense labor had gone into the document following contract initiation in September, 1977.

As in many fields of study, anthropological and historical researchers bring certain biases and orientations to their work even while constrained by contract direction. The authors are to be congratulated in their successful attempt to handle these various interpretive bents in their summary chapters and to provide new ideas and inferences on the various aspects of anthropology and history discussed herein.

I believe this publication will be useful and informative to readers from different walks of life as a document on which to build in archaeology, ethnography-ethnohistory and history of the southwestern Great Basin.

Eric W. Ritter
General Editor



TABLE OF CONTENTS

	<u>Page</u>
I. INTRODUCTION	1
A. STATEMENT OF PURPOSE	1
B. DESCRIPTION OF STUDY AREA LOCATION	3
1. Eureka Planning Unit	3
2. Saline Planning Unit	3
3. Panamint Planning Unit	7
4. Darwin Planning Unit	7
C. PROJECT TACTICS	9
II. ENVIRONMENTAL SETTING AND RESEARCH BACKGROUND	10
A. ENVIRONMENTAL SETTING	10
1. Physical Environment	12
2. Biotic Environment	24
B. PAST AND CURRENT RESEARCH	32
III. CULTURAL RESOURCE NARRATIVE	40
A. INTRODUCTION	40
B. PERIOD I: CHOPPER/SCRAPER HORIZON	45
C. PERIOD II: PROJECTILE POINT HORIZON	50
D. PERIOD III: MILLING HORIZON	58
E. PERIOD IV: CERAMIC HORIZON	69
F. PERIOD V: ETHNOGRAPHY	83
G. HISTORICAL SETTING	116
IV. EXISTING DATA SUMMARY	155
A. INTRODUCTION	155
B. RESULTS	160
V. MANAGEMENT CONCERNS	178

TABLE OF CONTENTS
(continued)

	<u>Page</u>
VI. PROJECT STAFF	185
VII. REFERENCES CITED	186

APPENDICES

Appendix A: Trade in Obsidian and Other Materials	
Appendix B: Collections	
Appendix C: Bureau of Land Management Site Type Definitions	
Appendix D: General Information on Planning Units	

TABLES

Table 1: Depth Distribution of Projectile Point Types (Iny-372)	72
Table 2: Shoshonean Branches, Divisions and Groups in California	86
Table 3: Population Estimates for Portions of the Study Area	90
Table 4: Sampling Domains	157
Table 5: Site Totals by Planning Unit within Probabilistic Sample	161
Table 6: Site Type by Biotic Setting	162
Table 7: Lambda Values for Site Type by Setting	163
Table 8: Site Type by Land Form	165
Table 9: Site Type by Biotic Setting: Darwin Planning Unit	166
Table 10: Site Type by Biotic Setting: Panamint Plan- ning Unit	167
Table 11: Site Type by Biotic Setting: Eureka Planning Unit	168
Table 12: Site Type by Biotic Setting: Saline Planning Unit	169
Table 13: Site Type by Land Form: Darwin Planning Unit	171
Table 14: Site Type by Land Form: Panamint Planning Unit	172
Table 15: Site Type by Land Form: Eureka Planning Unit	173
Table 16: Site Type by Land Form: Saline Planning Unit	174
Table 17: Site Type by Type of Sample	176
Table 18: Recorded Slopes of Cultural Resources	177

TABLE OF CONTENTS
(continued)

Page

FIGURES

Figure 1:	Project area topographic map	4
Figure 2:	Project area quadrangle map	5
Figure 3:	Vicinity map	6
Figure 4:	General regional reconstructions	43
Figure 5:	Relationships of periods, horizons and traditions	44
Figure 6:	Lake Mojave projectile point	53
Figure 7:	Silver Lake projectile point	54
Figure 8:	Pinto projectile point	61
Figure 9:	Occupation periods and point types according to Bettinger and Taylor (1974) and Hester (1973)	63
Figure 10:	Lanning's Owens Valley development scheme	64
Figure 11:	Elko Series projectile points	65
Figure 12:	Rose Spring projectile points	66
Figure 13:	Desert Side Notched and Cottonwood Triangular projectile points	71
Figure 14:	Goss' language development relationship	78
Figure 15:	Map illustrating positions of study area language groups	85
Figure 16:	Settlement patterns map, taken from Steward (1938)	95
Figure 17:	Map illustrating historic settlements and features	117

PHOTOGRAPHS

Photograph 1:	Borax Works	146
Photograph 2:	Saline Valley Salt Works	147
Photograph 3:	Saline Valley Salt Tram	148
Photograph 4:	Saline Salt Playa	149



I. INTRODUCTION

A. STATEMENT OF PURPOSE

In September 1977 the Bureau of Land Management contracted with RECON for the completion of a Class I cultural resource inventory for the Darwin, Eureka, Saline, and Panamint Planning Units within the California desert. The purpose of this project was to evaluate the existing information available about the cultural record of the area.

The project was conducted for several reasons, including legal requirements of the Department of the Interior, Bureau of Land Management; the need for detailed information for incorporation of cultural information into the planning process; and the accumulation of a previously highly scattered body of information into one manageable element.

Cultural resources are defined as fragile and nonrenewable evidences of human activity, occupation, and endeavor as reflected in districts, sites, structures, artifacts, objects, ruins, works of art, architecture, and natural features that were of importance in human events. While cultural resources are further categorized as having prehistoric or historic values, each of these aspects represents part of a continuum of events from the earliest evidences of human activity to the present time.

This project is part of a comprehensive study of the cultural resources of the Darwin, Eureka, Panamint and Saline Planning Units, California, which is being performed by the Bureau of Land Management's Desert Planning Staff. The data will be used for Environmental Analysis Records, Environmental Statements, Unit Resource Analyses, Management Fieldwork Plans, and other BLM projects.

There are a series of legal requirements that the Bureau of Land Management must meet which directly affect the processing of cultural resources. These include the Land and Water Conservation Fund Act of 1965 (amended 1976), the National Environmental Policy Act of 1969 as applied through the Council on Environmental Quality guidelines, the Antiquities Act of 1906, the Historic Sites Act of 1935, Executive Order 11593, the Reservoir Salvage Act of 1960 as amended by the Archaeological and Historic Preservation Act of 1974, and Secretarial Order Number 3017.

It is obviously not within the scope of this presentation to present an in-depth discussion of these legal mandates for the completion of the present study. Needless

to say, the Bureau of Land Management has developed the cultural resource management program on a firm foundation of legal requirements. A summary of these requirements and the approach employed by the Bureau have been well summarized by Eric W. Ritter (1977 and 1978).

To meet the requirements of the Bureau of Land Management, it was necessary to contact many individuals with potential interest in the cultural record of the area, to examine a variety of unpublished and published documents available for the history and prehistory of the area, and to evaluate this information from an interpretive standpoint. As a result of these activities, the present study does some interpretation and provides some suggestions and recommendations. It must be remembered that these are simply points of discussion and not an attempt to participate directly in the decision-making process. Implementation of the complex cultural resource management program, of which this presentation is only a part, rests with the Bureau of Land Management staff.

B. DESCRIPTION OF STUDY AREA LOCATION

The study area consists of four contiguous Bureau of Land Management planning units in east-central California: the Eureka, Saline, Panamint and Darwin Planning Units. Combined, these planning units occupy a large portion of Inyo County and a small segment of Mono County (Figure 1). Figure 2 illustrates the 29 U.S.G.S. 15 minute quadrangle maps which contain the study area.

Eureka, the northernmost planning unit, encompasses 792 square miles. Saline, the central planning unit, is somewhat smaller, consisting of 647 square miles. The Panamint Planning Unit, the southeast portion of the study area, includes 707 square miles, and the Darwin Planning Unit, which comprises the southwest portion of the study area, includes 740 square miles. The entire study area consists of 2,886 square miles.

The southern portion of the study area surrounds another large tract of land, the China Lake Naval Weapons Center, which includes roughly 1,200 square miles. The study area is bounded on the west, for the most part, by the Inyo National Forest and Owens Valley. Beyond these lie the Sierra Nevada. The Nevada state boundary marks the northern boundary of the study area which roughly bisects the Fish Lake Valley. To the east lies the Death Valley National Monument, and to the south lies the northern Mojave Desert (Figure 3).

1. Eureka Planning Unit. The northern portion of the Eureka Planning Unit is dominated by a southern extension of Fish Lake Valley. The northeast portion encompasses a segment of the Sylvania Mountains, and to the east lies the Last Chance Range. Beyond the Last Chance Range, a portion of Death Valley Wash is included within this planning unit. The Saline Range is situated in the southern portion of the planning unit and the massive Inyo and White mountains follow the western boundary. To the west, a small extension of the planning unit encompasses Deep Springs Valley. The Eureka Valley dominates the central portion of the planning unit.

The Eureka Planning Unit is accessible by two paved roads; the southern route is Loretta Mine Road and the northern route is State Highway 168. This northern route passes the only settlements in the area, Oasis and Deep Springs.

2. Saline Planning Unit. The northern portion of the Saline Planning Unit encompasses the Saline Range. To

Figure 1. This map indicates study area boundaries relative to its local physiographic features. It is based on U.S.G.S. 1 to 500,000 topographic maps, reduced 50 percent.

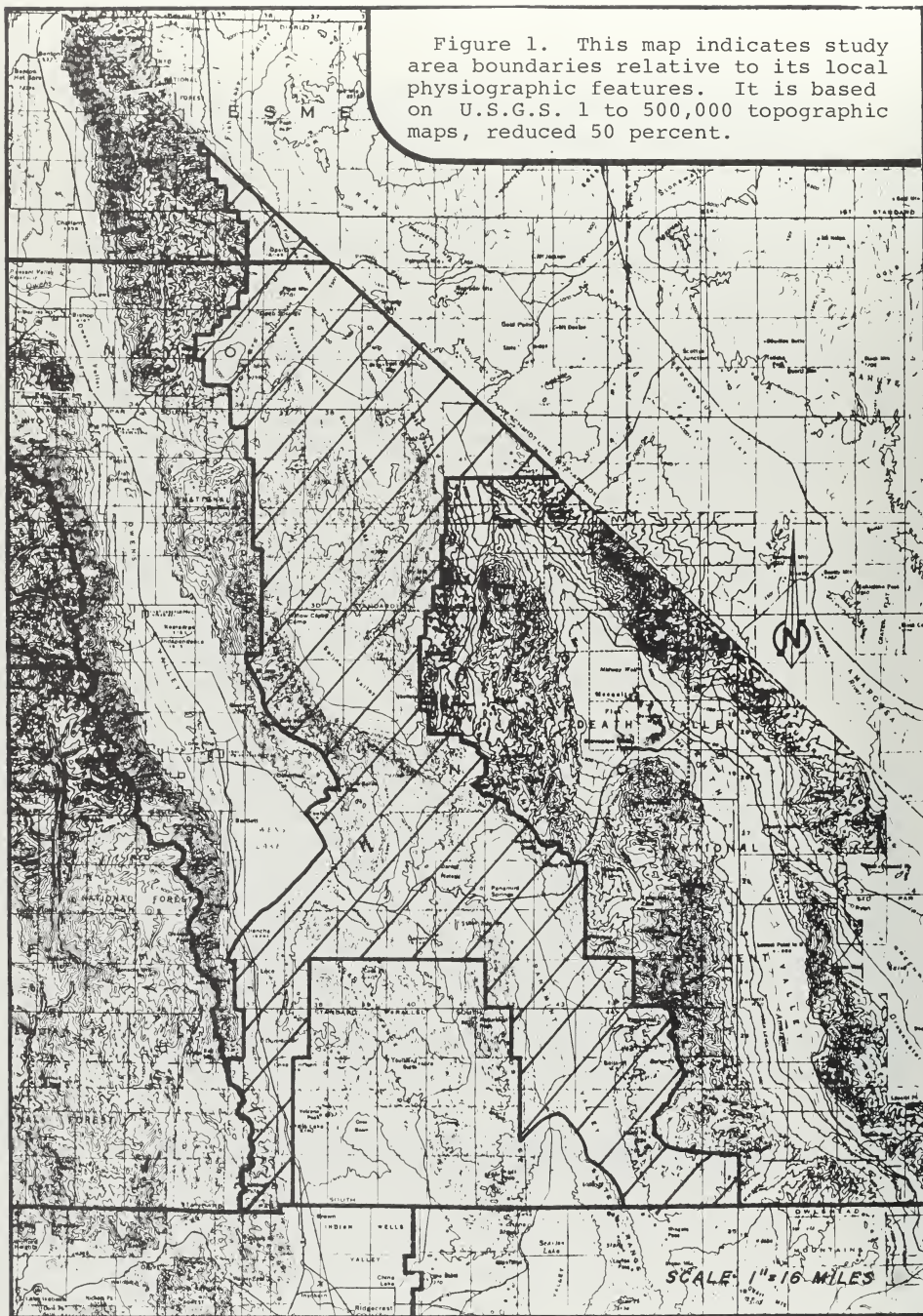


Figure 2. This map indicates the U.S.G.S. quadrangles that include the study area, based on the index to topographic maps of California. No scale.

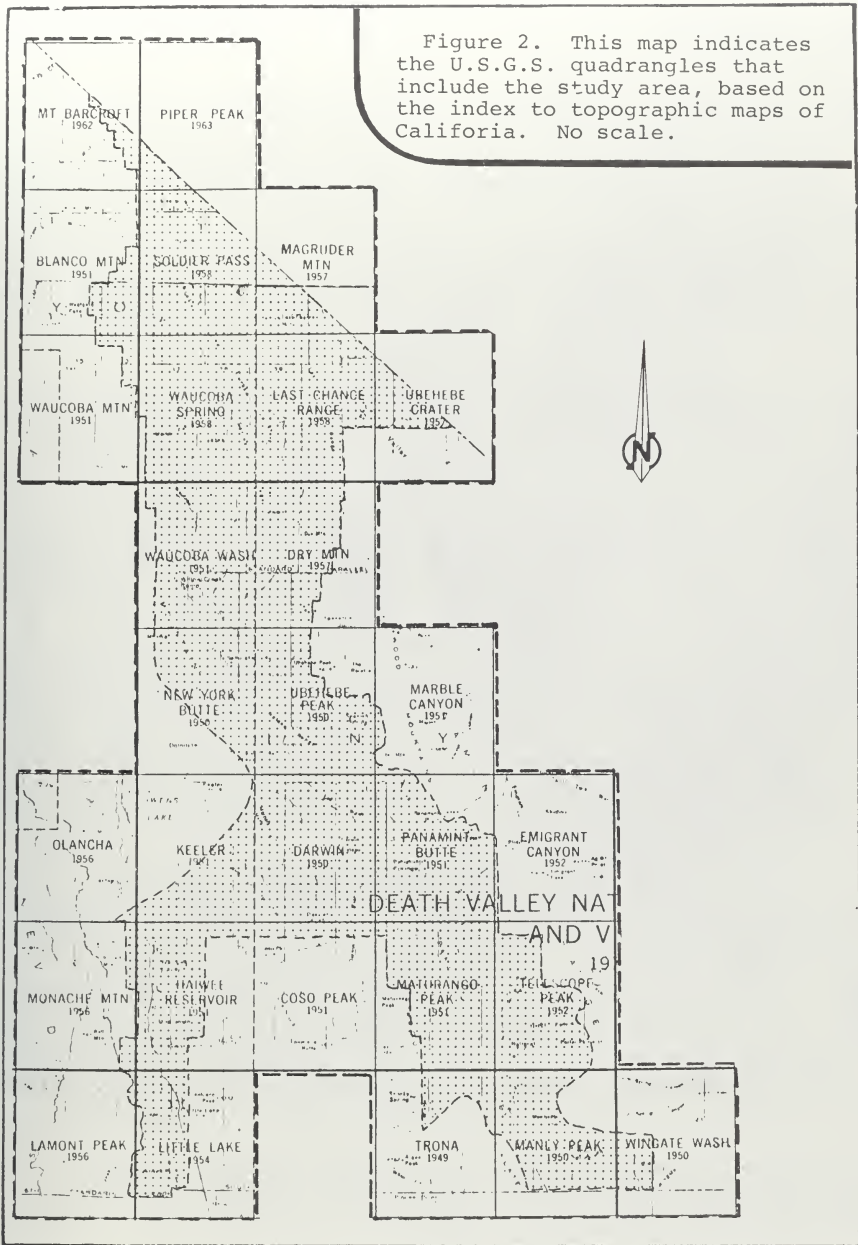




Figure 3. This map indicates the general vicinity of the study area in relation to main physiographic features. The base map is from Landforms of California and Nevada, by N. W. Atwood, revised edition, 1965.

the east lies the northern extension of the Panamint Range and beyond it, Death Valley National Monument. The Nelson Range is to the south. The entire western portion of the Saline Planning Unit is dominated by the Inyo Range. The deep, roughly Y-shaped Saline Valley comprises the central portion of the planning unit.

Access to the Saline Planning Unit is the most difficult of the four. Three dirt roads lead into the Saline Valley, the best of which, for most vehicle use, is the southern entrance on BLM road 1385. There are no towns or facilities in the Saline Valley.

3. Panamint Planning Unit. The northern extent of this planning unit is marked by Hunter Mountain, and the eastern portion is dominated by the lofty Panamint Range. Beyond this range lies the southern portion of Death Valley National Monument. Wingate Pass and the Trona vicinity mark the southern boundary of the planning unit. To the southwest lies the Slate Range and to the west are the Argus Range and Darwin Plateau. China Lake Naval Weapons Center borders the west and southern portions of the planning unit. The central portion of the planning unit is the Panamint Valley.

The planning unit is easily accessible by two paved roads. A north-south route passes through Trona, California, and joins State Highway 190 in the northern part of the planning unit. East-west trending State Highway 190 is one of the major access routes to Death Valley and crosses the Panamint Valley. There are no substantial modern settlements within the planning unit with a full range of services and supplies. The planning unit was once more populous--in the past, settlements thrived at Ballarat, Panamint City, and Lookout.

4. Darwin Planning Unit. The northern portion of this planning unit is dominated by the Nelson Range and a portion of the Inyo Range. To the east lie portions of the Argus Range and the Darwin Plateau. This irregularly shaped planning unit has a southern arm which encompasses a small portion of the southern Owens Valley, Rose Valley, Haiwee Reservoir, and the Little Lake area. This southward thrusting arm is bounded on the east by the Coso Range and the China Lake Naval Weapons Center, to the south by Sawtooth Peak, and to the west by the Sierra Nevada. In contrast to the other three planning units, the Darwin Planning Unit is not dominated by a large desert valley.

This planning unit is the most accessible and populous of the four. U.S. Highway 395 runs north-south

through the western portion of the planning unit and is roughly paralleled by a Southern Pacific Railroad right-of-way. State Highway 190 provides access to central and eastern portions of the planning unit. There are several settlements within the planning unit. Some services and supplies may be obtained along U.S. Highway 395 at Olancha, Dunmovin and Little Lake. Small populations still persist at both Darwin and Keeler, but the once thriving town of Cerro Gordo is, for the most part, abandoned.

C. PROJECT TACTICS

Completion of any project which encompasses such a wide variety of expertise necessarily involves many people performing many tasks. To complete the present study, RECON called on a team of highly skilled individuals, each responsible for distinct tasks. This team worked in conjunction with professionals at the Bureau of Land Management in the compilation of the following information.

Surprisingly, few difficulties surfaced during completion of the present project. Change in the political structure in California regarding the issue of Native American concerns required a slight modification of the project after its initiation, but the unselfish efforts of the Paiute-Shoshone peoples of the Owens Valley area and the work of the cultural resource managers resulted in prompt solution to any potential problems.

While substantial amounts of time were spent on communication with groups and individuals potentially interested in the area, by far the most time-consuming portion of the present project was the processing of information obtained from the varied sources. Even in an area of relatively little past research, the integration of information was quite difficult. The generous efforts of all those approached for information and the comprehensive nature of the background information compiled by the Desert Planning Staff made collection of information primarily contingent upon finding the sources, not on identifying them. Dr. Davis' previous experience in the area proved invaluable to successful completion of the present study.

Completion of the majority of this study by the core individuals required an unexpected 2,000 hours. This included several unanticipated trips to the study area and all necessary time for writing and completing the final report. It does not include the efforts of Dr. Davis on background information or Dr. Quinn on history.

II. ENVIRONMENTAL SETTING AND RESEARCH BACKGROUND

A. ENVIRONMENTAL SETTING

The four planning units have much in common. All fall within the western Great Basin, which is dominated by alternating northeast-southwest trending ranges and deep, wide alluvium-filled sinks. There are also sharp contrasts in the environments of the four areas, rendering it difficult to make broad generalizations. Although often characterized as a desert area, there is more complexity than generally assumed. The bottoms of the broad, deep sinks are typically desert areas with extremely hot temperatures and mild winters of the Lower Sonoran life zone. With increasing elevation, however, other environments are encountered, such as the more moderate Upper Sonoran life zone and the Transitional zone. Toward the crests of the most prominent ranges, such as the Inyo and Panamint ranges, Hudsonian and Canadian life zones are found. Climatic variability in the region is exemplified by a statement from Grant, Baird and Pringle:

The high country in the Sierra Nevada can have 60 to 70 inches of precipitation (mostly in the form of snow), while the lower desert basins average two inches or less. The winter storms, moving south and east, invariably release most of their rain in the Sierra Nevada, with little left over for the desert ranges farther east. The desert valleys have tremendous temperature ranges. In Death Valley summer temperatures can reach 134°F. and in the winter fall as low as -30°F. near the mountain tops (1968:1).

By no means, however, is variability based solely on elevation, for considerable variation can be found within broad environmental zones. Sand dunes, springs, playas and washes are cases of special microenvironments, each of which offers both opportunities and limitations for human exploitation of the region. In any single year, people may be exposed, or chose to be exposed, to dramatic environmental variation.

Another primary characteristic of the study area has been environmental change. Mehringer's succinct summary of change in the Great Basin is provided below.

During the last pluvial many basins, now dry and salt encrusted, were fed to overflowing by cool waters and joined by great rivers. As woodlands descended to the treeless deserts, glaciers carved beds in the snow capped mountains. Herds of camels,

horses and mammoths grazed the steppes and fertile marshes. And then, within 2000 years (12,000-10,000 B.P.), lakes shrank, rivers ceased to flow, and springs began to dry. Plants and animals began the long retreat northward and to higher elevations and man witnessed demise of the Pleistocene megafauna. By comparison, all subsequent environmental changes have been minor.

A trend toward aridity prevailed for the next few thousand years. As lakes grew even smaller and spring discharge decreased, with the dwindling supply of pluvial age ground water, both plants and animals continued to adjust their ranges. Short term reversals of this trend probably occurred shortly before 10,000 and 8000 B.P. By 7500 radiocarbon years ago conditions were much like the present. . . . Considerably more data are required to establish the detailed chronology and magnitude of Great Basin climatic change from 7500-4000 B.P. As for the rest of post-pluvial time, the influence of climatic change on man is best considered in terms of evidence for its effect on local resources.

Many lines of evidence are suggestive of a significant change to more effective moisture starting about 4000-3000 B.P. and ending before 2000 B.P. . . .

It becomes more difficult to make broad regional generalizations as the data become more abundant. . . . During the past 2000 years, as during the preceding 10,000, there was geological and biological instability of sufficient magnitude to affect the abundance of local resources. . . . Fluctuations in lake levels, lowering of tree line, renewed dune activity and stabilization, peat formation in desert salt marshes, arroyo cutting and filling and significant tectonic and volcanic activity all continued through the past 1000 years (1977:148-149).

There are many elements classified as aspects of the natural environment, all of which articulate in complex ways to influence the cultural environment. Of special concern to a cultural resource manager is how environmental information can be utilized to identify cultural resources, evaluate their importance and assess areas which may contain sensitive cultural resources. Certain patterns can be elucidated and generally favorable and less favorable areas for prehistoric exploitation may be delimited. This does not mean that any

specific area may be declared "free" of cultural resources based on environmental data, only that resources will tend to cluster in certain ways during specific times and in specific places. Details of past human land use patterns cannot be satisfactorily inferred, in many cases, based on the limited environmental data which is applicable to the study area. Nonetheless, an attempt will be made to discuss environmental variables and places of their occurrence which would likely influence human land use patterns and, in general terms, favor the occurrence of cultural resources of various types, as well as aid in interpretation of them.

1. Physical Environment. One of the most prominent aspects of the study area is its geological structure which elicits an aesthetic response from many visitors to the area today, but in the past presented obstacles to early travelers.

The structure of the area is reflected in marked topographic variability. The regional pattern of alternating mountain ranges and broad, deep valleys is largely the result of faulting. The valleys and mountains are primarily fault-controlled, and most of the faults are probably younger than Miocene. During Quaternary time, many displacements along faults occurred, as evidenced by the many fault scarps in Quaternary fan deposits. Many of the mountain ranges have been tilted downward on the east as a result of rotation on large normal faults. Evidence suggesting this includes the fact that ranges have steep west slopes, a common dip of strata to the east, and a tendency for the youngest strata to occur only on the east slopes of ranges. The Panamint Valley, as well as Death Valley, have their lowest parts along the east side of their valleys, which suggests they follow the above pattern and have been rotated (Chapman, Healey, and Troxel 1973; Hunt 1975). Faulting is common throughout the study area. Most recognized faults are normal faults that trend mainly north to northeast. The normal faults are closely related to northwest-trending lateral slip faults. This association is apparent in the Saline Valley fault zone (Wright and Troxel 1967:948).

Tectonic activity, which results in earthquakes and faulting, may have had significant effects on peoples living at the time of the event. According to Mehringer,

From 1961 to 1970, over 200 earthquakes were recorded in the Great Basin (Scholz, Barazangi, and Sbar 1971) . . . and from 1852 to 1961 there were 1173 shocks recorded with Nevada epicenters alone (Slemmons, Jones, and Gimlett 1965). . . . Faults

control the location and discharge of many Great Basin springs; thus, particularly in the more arid regions, their histories may be pertinent to aboriginal demography. Faulting has also altered local patterns of erosion and sedimentation as well as the stratigraphic relationships of major geomorphic features (Clark 1972; Haynes 1967) (Mehring 1977:126).

Earthquakes and faulting, and the volcanic activity which may be associated with it, has undoubtedly been a factor affecting human populations in the western Great Basin. It is, however, not always possible to determine precisely what the effects were in all cases.

One can only speculate on the effect of a prehistoric earthquake such as the Owens Valley disaster of 1872 (Hill 1972; Oakshott, Greensfelder, and Kahle 1972), or the influence of an eruption such as that of Mount Mazama (Williams 1941:30) on, for example, resource availability (including new obsidian sources), settlement patterns or cosmology (Souther 1970). The results of historic volcanic eruptions and ash falls include not only the catastrophic loss of plant and animal life, but both immediate and long term changes in productivity. Along with detrimental effects, these changes may include mineral enrichment and increased soil moisture (Malde 1964; Wilcox 1959:462). The immediate and long term effects of a single major eruption and ash fall could be locally far more important to man than regional climatic change (Mehring 1977:126).

Aside from the effects volcanism may have on cultures exposed to it are the implications volcanic deposits have for archaeologists. One of the most useful implications is that dating may be accomplished by noting the presence of dated ash falls in archaeological contexts. For the study area, the most important regional volcanic deposits were laid down during eruptions from Mono-Inyo craters (Chesterman 1971:141; Sheridan 1971:Table 2). According to Mehring:

A dated stratigraphic sequence, . . . including five distinct layers of Mono Crater pumice, was recovered from 25 miles to the east at Black Lake, California (Batchelder 1970a). These five ash falls date from about 5000 to 1500 B.P. Three postglacial ashes have been recovered from the Sierra Nevada, within or near Yosemite National Park; they may have been partly derived from Mono-Inyo craters (Wood 1972) (1977:126).

Mehringer is optimistic concerning the use of such stratigraphic markers.

It seems only a matter of time until many more archaeological and paleoenvironmental localities from the northern Great Basin of Oregon, California, Nevada, Utah and Idaho will be precisely correlated, by the stratigraphic occurrence of ash marker beds, with time-parallel events throughout the northwestern United States and southwestern Canada (1977:125).

The potential for using volcanic or tectonic evidence for areas within the study area has yet to be assessed. Any future excavation in the area, however, should take into account the possible presence of a datable Inyo-Mono volcanic ash.

The geological makeup of the study area is especially interesting in that it has been a primary factor influencing human land use. Euro-American history of land use is particularly linked to geological phenomenon.

The petrographic makeup of the area is typical of much of the southwestern part of the basin and range province. There is a stratigraphic succession of rocks which is fairly complete representing late Precambrian through Paleozoic age. The Paleozoic rocks rest on metamorphosed Precambrian rocks and are intruded by Mesozoic rocks. These, in turn, are overlain by Cenozoic sedimentary rocks and volcanic rocks (Chapman, Healey and Troxel 1973; Hunt 1975).

The deposits of interest to archaeologists are Quaternary in age. Quaternary deposits within the study area consist primarily of valley playa sediments, coarse fan debris that flanks every mountain range, and extrusive volcanic rocks which vary locally from andesite to basalt.

The study area and surrounding environs are rich in a variety of mineral resources. Mining has occurred in the area since the mid-nineteenth century and has been the primary factor in drawing Euro-American populations into the area. A detailed discussion of the mineral resources of the study area can be found in Norman and Stewart (1951).

The sulfide minerals, and the oxide minerals derived from them, have been the principal sources of a number of elements, including antimony, copper, lead, silver and zinc. Such minerals occur primarily within a belt about ten miles wide which extends between the southern part of the

Inyo Range southeastward to Galena Canyon on the east side of the Panamint Range. These important minerals occur primarily in Paleozoic carbonate rocks.

Scheelite, an important tungsten mineral, occurs in disseminated form and in veins in sedimentary strata adjacent to granitic rocks in the Panamint Range, Hunter Mountain, and the Inyo Mountains.

A number of saline minerals, including borates, are associated with Cenozoic lake bed deposits such as those occurring in the Saline Valley, Owens Valley, and Searles Lake.

Areas where gold occurs are located in the Funeral Mountains, Panamint Range, Inyo Mountains and the Argus Range. Gold-bearing deposits occur primarily adjacent to the sulfide mineral belt described above, and the deposits are characteristically quartz veins either in Mesozoic granitic intrusive rocks or in adjoining sedimentary rocks.

Talc deposits also occur within the study area. In the southern part of the Inyo Range, talc occurs as a product of alteration of Paleozoic sedimentary rocks. In the southern Panamint Range, talc occurs in association with Precambrian diabase where the diabase has intruded and altered Precambrian carbonate rocks.

A thorough review of the minerals and where they occur might potentially be useful to the historical archaeologist. It is likely that many mining camps and settlements that have not been recorded in the literature might be located, interpreted, and evaluated independently of written records based on knowledge of the localities' geology. It is likely that Euro-American cultural resources will be closely associated with mineralized areas. Efforts designed to locate such historic resources through survey might stratify the study area according to the location of mineralized zones.

Much of the geology relevant to Euro-American settlement in the area is irrelevant in assessing Native American settlement as Native Americans did not mine the metallic, and most of the nonmetallic, ores. They did, however, mine salt from the Saline Valley (see Ethnography section), and this salt entered into a trade network extending across the Sierra Nevada.

Most relevant for the archaeologist dealing with prehistoric adaptations is the area's geology in terms of materials which are amenable to the manufacture of flaked

stone tools. Rocks of this type are not widely discussed in the geological literature as they are not now economically important. In recent years, there has been a trend in the archaeological literature to deal more extensively with the relationships between lithic resources, past cultures, and trade and travel. Sources of obsidian, a volcanic glass widely used and traded by Native Americans in the study area, are discussed in Appendix A. Certain areas within the study area may have drawn prehistoric populations because of the presence of obsidian or other rocks, such as the cryptocrystalline silicates, which are very amenable to tool manufacture. Davis, for example, notes the presence of a basalt quarry on the northeast margin of the Panamint Valley and suggests enroute visits to quarry areas during seasonal transhumance in the southern portions of the study area and adjacent areas (1978b). The Panamint Valley basalt appears to have been exploited heavily. Weide notes:

The extensive flows of olivine basalt that cap much of the top and east flank of the Panamint Range north of Towne Pass . . . and parts of the Argus Range west of the valley, have an aggregate thickness of as much as 400 feet. They correlate with the olivine basalt flows of Pleistocene age in the Darwin Quadrangle (Hall and MacKevett 1958, Table 2, p. 13). These uniform flows are the recognized source of most of the artifacts recovered from the Panamint Valley and are [a] major lithologic unit of archaeological interest (Davis, Brott and Weide 1969:81).

In locating additional quarry sites within or near the study area, rock hound guide books, such as Strong (1971), Henry (1974) and Johnson (1966), may be helpful. Very often there is an overlap between what modern rock hounds wish to collect and what Native Americans collected for the manufacture of stone tools. While not inclined toward scientific description of areas, rock hound guidebooks contain brief descriptions, and maps are also provided. Rock hound guidebooks may also be helpful to the cultural resource manager for inferring where the more frequently visited localities in the desert are.

Strong notes the presence of an obsidian source in the Fish Lake Valley (1971:7), clear quartz crystals in the Inyo Mountains near Independence (1971:11), and quartz crystals near Deep Springs Valley (1971:13). Turquoise and jasper are noted by Johnson to occur east of Independence (1966:32). Quartz, jasper, and obsidian fracture conchoidally and would have been likely candidates for stone tool manufacture by Native American populations; thus, archaeological quarry sites are likely to be found in their vicinity.

Wind action is a significant environmental process which has affected localities within the study area. The most prominent features resulting from wind action are sand dunes, which exist in each of the major basins within the study area. The most impressive dune deposits within the study area lie in the southeast portion of the Eureka Valley and the northern portion of the Panamint Valley. Dunes, covered with mesquite, also occur in the central portion of the Saline Valley.

Dunes are of concern within this report for two reasons. First, they are a source of paleoclimatic data, and second, they constitute a special local environment which may have influenced Native American exploitation of the area.

There is considerable variability in the dynamics of dune formation and evolution, both mechanically and temporally. This is comprehensively discussed by Sharp (1966), who performed an investigation of the Kelso Dunes in the Mojave Desert. It is known that despite the fact that wind is especially active now, a more active period of wind action occurred in the past, as well as a period of less wind action. According to Mehringer:

Recurrent eolian activity in the Amargosa Desert is radiocarbon dated from before 5300 to about 2500 B.P. (with probable brief reduction in activity about 4000 B.P.), from 2000 to 1000 B.P., and again within the past 400 years. A chronologically similar sequence occurs at Corn Creek Dunes, Las Vegas Valley, Nevada (Williams and Orlins 1963 . . .), where radiocarbon dated hearths place initial dune activity between 5000 and 4000 B.P. After a minor hiatus, eolian deposition resumes and is followed by stability and soil formation; the soil is partially deflated and buried by younger dunes (Haynes 1967: 60-65 . . .). Absence of pre-Death Valley III artifacts (Hunt 1960:112; Hunt and Mabey 1966:82) places a minimum age of about 2000 years on formation of some existing dune areas in Death Valley (1977:131).

The most spectacular dunes found in the study area are the Eureka dunes which, according to Mawby (1977), cover an area roughly one mile wide and three and one-half miles long. The central ridge of sand, rising nearly 700 feet above the playa at its base, is thought to be the tallest dune in California, perhaps in the nation.

Mawby (1977) feels that the Eureka dunes are older than those of Death Valley. As a basis for this

hypothesis, Mawby notes the presence of unique species of plants and animals associated with the dunes that evolved in this special habitat for at least several thousand years. Aside from their biological importance, the Eureka dunes may therefore hold a record of wind patterns for the Eureka Valley spanning a considerable period of time. Since archaeological phenomena are associated with the dunes, it may be possible to develop a dune chronology. Such may also be the case for dunes in other valleys within the study area boundaries.

Dune environments are thought to be a specially favorable environment for Native American exploitation and may have acted to draw residents to their vicinity. Mehringer states:

Because of their ability to act as sponges, rapidly absorbing occasional rain but releasing it slowly (Sharp 1966:1047), dunes may have been important to aboriginal occupation. Mesquite (Prosopis juliflora), an especially important resource in the arid southern Great Basin, and rice grass (Oryzopsis hymenoides), a favored food throughout the Great Basin . . . , may owe their existence in harvestable numbers to the presence of a semistable sand substrate. In the Death Valley region past dune activity has dammed spring-fed drainages to produce extensive marshes, thereby increasing local productivity and waterfowl and mammal resources (1977:123).

Steward (1938) notes that populations were drawn to the Eureka Valley to gather Oryzopsis seeds, probably located in the vicinity of the dunes. Steward also indicates that people living in the Saline Valley gathered mesquite growing in the Saline Valley dunes.

Considerations of pedology are becoming increasingly important to archaeologists working in the western Great Basin. The ability to recognize, date, and trace paleosols is requisite for understanding both paleoenvironments and paleo-cultures. Knowledge of paleosols is traditionally used for a number of purposes, such as to recognize stratigraphic relationships between cultural materials, to make correlations between different areas, and to make inferences concerning past vegetation and climate. Sediment size analysis, degree of weathering, organic and trace element content, and mode of deposition may all be used to derive insights into past environmental histories (Mehringer 1977).

In her recent work at China Lake, Davis has identified particular paleosols with associated artifacts (1978b:170) and has been able to obtain dates on paleosols, and thus cultures, as well as infer the nature of the environment in which they were formed. Pedology as a tool is therefore of particular importance to archaeology.

Little information on associations between cultural remains and particular paleosols exists within the study area itself. Extrapolating from nearby areas, such as China Lake and Death Valley, it can be hypothesized that cultural material-bearing paleosols may exist in Fish Lake Valley, Deep Springs Valley, Eureka Valley, and Saline Valley. Once identified, the presence of such paleosols might be incorporated into research designs aimed at explicating earlier prehistoric occupations in these areas, as well as identifying potentially sensitive areas.

The nature of the occurrence and distribution of water, past and present, is of crucial importance for human occupation of an area and influences the biotic environment upon which humans subsist. The study area and surrounding region has had a complex hydrologic history from the time of the first inhabitants of the area to the building of the Owens Lake to Los Angeles aqueduct.

Glaciation is a form of water occurrence which may be of interest to archaeologists due to what it may indicate concerning paleoclimates. The study area was glacier-free during the period of time of interest to archaeologists. Nonetheless, knowledge of glacial episodes elsewhere in the vicinity may be helpful in understanding prehistoric adaptation in the Great Basin in the same ways as lake histories. Knowledge of glacial history may provide clues to regional climatic change.

To date, there has not been enough data assembled to establish a Great Basin glacial chronology for the last 40,000 years. Although some work has been done toward this, no chronologies specifically applicable to archaeological problems yet exist. The distribution of glaciers and Pleistocene snowlines are provided in Flint (1971). A number of authors have also summarized glacial chronology for western North America, including Denton and Karlen (1973), Denton and Porter (1970), and Porter (1971).

In the Sierra Nevada, three major Wisconsin glaciations are recognized (Tahoe, Tenaya, and Tioga). Within

the last 10,500 years, four glaciations are recognized: "the Hilgard (10,500-9000 B.P.), Recess Peak (2600-2000 B.P.), Matthes (700 B.P.), and an unnamed advance of about 1100 B.P." (Currey 1971; Sharp 1972). There is no evidence to suggest any significant glaciation in the Panamint Range or Inyo Range, the two highest ranges within the study area.

In recent times, the paucity of water in the area has been a severely limiting factor in human exploitation. Recent conditions, however, stand in stark contrast to periods in the past when a series of large, freshwater lakes existed in the now dry desert valleys. Quite appropriately, Davis has referred to the area as the Lakes County (1978b) since lake environments existed here for considerable spans of time. There is a large amount of evidence relating to the existence of past freshwater lakes, including strand lines, algal tufa, deltas, bars, and subsurface stratigraphy and sediments.

In the region surrounding the study area, a series of lakes, each of which periodically overflowed to the next during periods of maximum moisture, once existed. The headwaters of this system were at Lake Russell which is today Mono Lake. Lake Russell flowed southward through Adobe Valley into the Owens River to Owens Lake. Owens Lake also received moisture from Sierra Nevada runoff. Owens Lake, when full, overflowed southward through the Little Lake/Fossil Falls channel into Lake China. In turn, China Lake overflow passed to Searles Lake, Panamint Lake, and ultimately Lake Manly which occupied Death Valley (Snyder et al 1964). Aside from this system of lakes, other large lakes once existed in Fish Lake Valley, Deep Springs Valley, Eureka Valley, and the Saline Valley; however, these were not tied into the system described above.

These lakes and lake systems were constantly changing entities. Davis characterizes such change for China Lake, which holds true for those lakes and lake associated environments throughout the western Great Basin.

Far from being full/not full, Lake China bobbed up and down continuously: from brimful to nearly dry to many intermediate stages, during which time its broad valley was dotted with sloughs and ponds and was laced with sluggish drainages, which changed from one lake episode to the next as the ephemeral/stable landscape was revised. When the lake rose to full, everything was covered with a blanket of clays, fines and sorted gravels. As waters receded, older, harder surfaces of the mantled countryside were exposed in

varying degrees to excision by wind (which carried away the fines) and then to water. Rill action slowly sculptured dissected beds around the peripheries of knolls (Davis 1978b:16).

The presence of large, freshwater lakes has been traditionally taken as evidence of former moist and cool climatic periods and different patterns of atmospheric circulation (pluvials) associated with maximum glaciation at higher elevations and latitudes. Whether or not these pluvials correspond temporally in a precise way throughout the Great Basin is still a matter for debate. The general pattern of low lake levels, however, from approximately 30,000 or 40,000 to 24,000 B.P. and deep lakes from approximately 24,000 to 12,000 B.P. has been established (Mehring 1977).

There are many variables to consider which affect the existence of any given lake, including evaporation rate, salinity, precipitation, basin contour and shape, temperature, faulting, isostatic adjustments and substrate permeability. Each lake, therefore, has its separate history and distinct attributes and, in order to be understood in detail, must be understood in these terms.

The work of G. I. Smith in the Searles basin (1967a, 1967b, 1968, 1970), R. S. Smith's work in the Panamint Valley (1976), and Davis' work in the China Lake Valley (1976; 1978b) show conclusively that while minor details of water budgets and physiography are unique for each valley, the major episodes of high water, low water, and pedogenesis were comparable throughout the Great Basin (Davis 1978b:3).

Progress has been made in recent years toward establishing a chronology of lake fluctuation in the western Great Basin. Research at Mojave Lake suggests overflow stages prior to 14,500 B.P.: 13,750 to 12,000 B.P. and 11,000 to 9,000 B.P. A smaller lake is dated at 8,500 to 7,500 B.P. (Ore and Warren 1971).

More relevant to the study area is the work of Davis at China Lake. According to Davis:

. . . we only have information (which is not the best) on two penultimate high stands, measured at the Basalt Ridge Site as 2,234 feet MSL. At this point, we have two doubtful dates on tufa. Judging by these, the lake was brimful twice in rapid succession--13,300±150 years BP (UCLA 1911A) and 12,200±120 years BP (UCLA 1911B)--with a recession in between. After this, the climate seems to have warmed and dried: the water level sank, exposing a bay 7.1 m

below the Basalt Ridge, and a soil had time to form at beach elevation by 10,800±310 years BP (GX3446) (1978b:18).

The most well documented lake in the Death Valley system is probably Searles Lake. In his summary of Great Basin lake chronology, Mehringer provides the following discussion:

The Searles Lake chronology . . . reflects a late Wisconsin period of high water levels following smaller lakes correlated with the preceding interstadial (G. Smith 1967a, 1968, fig. 4; Smith, Friedman and Matsuo 1970). Lake history is recorded in the classic subsurface stratigraphy with salts representing shallow lakes and muds representing deep lakes.

. . . The Searles Lake Overburden Mud represents at least one shallow lake stand, in the last 6000 years or so, following a period of desiccation represented by the Upper Salt (Smith 1968). The radiocarbon dates, on a variety of material (G. Smith 1967b, fig. 12), do not permit fine chronological discrimination; however, one wood date of about 3500 B.P. serves as a maximum age for its burial in lake deposits.

Hooke (1972:2093) assumes that lakes in Death Valley fluctuated in phase with Lake Searles and, further, that Panamint Valley most probably overflowed into Death Valley via Wingate Wash between 11,000 and 10,500 B.P. A shallow marsh deposit on the floor of North Panamint Valley is radiocarbon dated at 10,000-10,500 B.P. (Davis, Brott and Weide 1969:15; Mehringer 1967a:172, table 5). These dates place a minimum age on the last major overflow of Lakes Searles and Panamint.

. . . In Death Valley, a 30 foot deep lake is recorded in shore lines and salt deposition (Hunt et al. 1966:48; Hunt and Mabey 1966:82). A minimum age of about 2000 years is based on overlying dunes lacking artifacts older than those characteristic of Death Valley III occupation (Hunt 1960:111) (1977: 118, 123).

Davis feels that there were several intervals of prolonged drying that affected the Death Valley lakes system.

. . . There was rapid emptying of the basins after 10,800 BP. . . This was immediately followed by a return of somewhat moister conditions between 8,000 and 8,500 BP reflected in a rise of Pleistocene Lake Mojave. Between 8,000 and 6,000 BP there was another long stretch of very hot, dry weather. . . . moisture and brackish lakes appeared in repeated cycles between 6,000 and 2,500 years BP (Davis 1978b:7).

Between 2,000 and 2,500 BP another dry interval emptied the water from the valleys. . . . Low, fluctuating and (probably) saline lakelets appeared periodically between 1,500 and 150 years ago. One hundred and fifty to two hundred years ago the southern lakes were high. . . . China Lake was full or nearly so for a very brief time. . . .

Since this recent episode of high water, the southern lake valleys have remained dry except for vestigial lakes and development of transitory ponds and seas of clay after winter rains (Davis 1978b:8).

Within the study area itself, much work remains to be done toward understanding chronology, dynamics, and cultural associations of lakes, not to mention how particular groups adapted and readapted to changing hydrologic regimens.

When full of water, and with associated productive marshes, lake environments were very hospitable to human occupants of the area. It is expected, of course, that any period of time during which water and/or marshy conditions existed, people would have been drawn to these lake basins. Cultural resources will likely occur associated with lake beds and lake features in each basin within the study area.

According to Davis (1978b:3-4), a true picture of the prehistory of these valleys can be reconstructed only after each valley/mountain configuration has received the same long and painstaking investigation as China Lake. The geoarchaeology of each basin must be unraveled, its geochronology worked out, and the climatic sequences determined before it will be known where to predict the presence of archaeological sites and when they should have been in use.

Additional discussion of the relevance of geological sciences and their utility for archaeological and paleoenvironmental studies is provided by Weide and Weide (1977:79-111).

2. Biotic Environment

a. Paleobiotic Reconstruction. Other than work at Little Lake (Mehringner and Sheppard 1978) and in Panamint Valley (Davis et al 1969), little paleobiotic reconstruction has been accomplished within the study area boundaries. Information conveying the paleobiotic environment, however, has been gathered from nearby areas, such as China Lake (Davis 1978a, 1978b), Searles Lake (Leopold 1967; 1970; Roosma 1958), Black Lake (Batchelder 1970a, 1970b), the White Mountains (La Marche 1969, 1973), and Death Valley (Miller 1950).

Paleobiotic studies are of prime importance, both for aiding in the interpretation of past conditions in the physical environment and for suggesting hypotheses concerning past human demography and adaptations. There are many sources of data concerning past biotic environments that are useful to archaeologists, such as plant macrofossils, coprolites, fossil pollen, tree ring chronology and climatology, and paleontological remains.

In the Great Basin, a considerable body of evidence suggests fluctuations in plant distributions between 40,000 and 10,000 B.P. (Martin, Savels and Shutler 1961:115). Dominant plant species once occurring at lower elevations 12,000 to 10,000 years ago now grow at considerably higher elevations (Laudermilk and Munz 1934:34; Mehringner 1967b). This pattern was first discovered through the analysis of well-preserved plant remains associated with cultural material from dry caves and rock shelters such as Gypsum Cave, Nevada.

Paleobiotic evidence, however, does not have to be associated with cultural remains to be of value to archaeologists. A good example is reconstructions of plant distributions based on the study of woodrat nests. According to Mehringner:

The single most important nonarchaeological source of macrofossils is fossil woodrat (Neotoma) middens; they contain abundant and well-preserved plant remains, some of which have been dated to greater than 40,000 B.P. Because of the small home range of the woodrat, one can be reasonably certain that the plants came from the vicinity of the midden (Wells and Berger 1967). In southern Nevada, junipers (Juniperus osteosperma) descended from their present elevational limits by as much as 3000 feet . . . to the Las Vegas Valley (Mehringner 1967a; 183). Throughout the Mojave Desert juniper and pinyon grew

at lower elevations (Leskinen 1970; Mehringer 1967a:191; Van Devender and King 1971; Wells 1969), resulting in connections between presently disjunct woodlands. The pluvial history of higher elevation montane forest is less certain but bristlecone (Pinus longaeva) and limber (P. flexilis) pines and white fir (Abies concolor) also expanded their ranges and grew at much lower elevations (D. Fowler 1972b; Madsen 1972, table 3; Mehringer and Ferguson 1969 . . . (1977:133).

Studies of fossil pollen and peat are increasingly useful for paleobiotic reconstructions. Mehringer notes the potential for establishing a history of spring discharge and marsh resources through the study of change in:

. . . sediments as well as fossil pollen, molluscs and diatoms that furnish data on past salinity and water depth. Salt marsh pollen records of the Death Valley area contain evidence for nearly total desiccation and deflation, as well as higher than present spring discharge and preserved peat deposits. In both Panamint Valley and Ash Meadows, initiation of a major period of peat formation and accompanying dominance of marsh pollen and macrofossils is dated at about 3600 B.P. These deposits are eroded and weathered, probably as a result of significant desiccation (after 2200 B.P.?). Another important episode of marsh growth started about 400 years ago. Yet older evidence for equally significant post-pluvial variation in spring discharge is undated (1977:135, 137).

While general trends in vegetation history based on pollen studies are fairly well known and accepted, details of particular areas during the past 10,000 to 12,000 years are few. There are problems in interpretation, chronological control, ecological site sensitivity, and/or regional differences in post-pluvial climatic and vegetation history (Mehringer 1977:135).

Detailed work in paleobiotic reconstruction, including pollen analysis, at Black Lake in the Adobe Valley is especially relevant for reconstruction of climatic changes occurring to the west of the Eureka Planning Unit.

Paleoenvironmental studies at Black Lake include plant microfossils, fossil molluscs and the geochemistry of sediments, . . . postdating drying of the larger pluvial lake that occupied Adobe Valley and

overflowed southward to the Owens River Batchelder (1970a, b), relying primarily on plant indicators of water depth and lake size, recognizes several important climatic changes. Organic sediments dating from about 11,500 B.P. are thought to indicate conditions considerably dryer and somewhat colder than present. This was followed by a trend toward a deeper lake culminating in an important regional increase in effective moisture about 8500-8000 B.P. Dryer conditions prevailed from 8000 to 4500 B.P. The most xeric interval, about 7000-6000 B.P., is followed by a minor increase in water depth before 5300 B.P. After 2000 B.P. temperature and moisture approached their modern values (Mehringer 1977:138).

Further work especially relevant to the northern portion of the study area, as well as the western Great Basin, has been done in the White Mountain bristlecone pine areas. Studies of this longest living organism are significant for many reasons. According to Mehringer,

Studies of past tree growth and distribution provides the most precise evidence for the chronology and magnitude of climatic change, as well as dating of glacial features (Currey 1965) and geomorphic processes (LaMarche 1968). These studies are unique, in their time depth, to the Great Basin where living bristlecone pines (Bailey 1970) may be older than 4000 years and their wood survives many thousands of years past death of the trees (LaMarche 1969). Using both living trees and wood remnants, Ferguson (1968, 1969, 1970) established a continuous 7484 year chronology and reported yet older remnants. The long bristlecone pine chronology is of prime importance in understanding variation in radiocarbon production (Damon, et al. 1974) (1977:142).

Tree line fluctuations of the last 6000 years are recorded by the remains of dead bristlecone pines . . . up to 450 feet above present tree line (LaMarche 1973; LaMarche and Mooney 1967) and by dated changes in growth form (LaMarche and Mooney 1972, fig. 10). . . . Summer temperatures are important in determining tree line elevation. Thus, former higher tree lines are probably indicative of higher temperatures. During most of the past 6000 years, tree line in the White Mountains has been higher than during the last few hundred (Mehringer 1977:144).

Of relevance to the southern portion of the study area is the work of Mehringer and Sheppard (1978) who obtained core samples from Little Lake and were able to reconstruct its history for the past 5,000 years through analysis of fossil pollen, peat, seeds, molluscs, and sediments. The findings of their study are as follows:

1. From about 5,000 to 3,000 BP the Little Lake Basin was occupied by salt grass meadow, marsh and ponds. The local water table was as much as 13 m below the high water levels of the past few years.
2. After 3,000 BP, the sediments and fossils are interpreted as indicating a shallow lake.
3. Within the lake sediments, brief but significant lowering of the water table is suggested by a return to marsh deposition near 4 m depth. Sediment structure at 2.37 and 0.66 m indicates seasonally dry lake-edge at the coring sites.
4. While Little Lake has been shallower than present there is no clear evidence that it has been much deeper or fresher during the past 5,000 years.

Changing water availability at Little Lake may be a direct reflection of climatic change and provide a chronology of relative effective moisture for the northwestern Mohave Desert. However, local factors, particularly faulting, might also have been responsible for some variation in water availability. Determination of the ultimate cause(s) for the changing water table requires a better understanding of the structural geology and rates of deposition from alluvial fans below Little Lake (Mehringer and Sheppard 1978:165-166).

Studies of plant remains such as peat, pollen, woodrat nests, or bristlecone pines are valuable indicators of climatic conditions and change. Areas where such plant remains exist or are likely to exist are a cultural resource in the sense that their study permits cultural interpretations.

It is also true that animal remains can provide similar kinds of information concerning past climates and climatic change, as well as human adaptation. Archaeological consideration of the paleontological record has led to interpretations that human beings were largely responsible for the extinction of a great variety of megafauna at the end

of the Pleistocene (Martin 1967, 1973). Regardless of the mechanisms by which many species became extinct, these mechanisms are, in one sense, irrelevant. Many animals did, in fact, become extinct and this undoubtedly had an influence on populations who exploited them. Thus, studies of the paleontological record in terms of chronology and associations with cultural remains provide clues to possible episodes of culture change.

Cooperation between archaeologists and paleontologists has been infrequent in the western Great Basin area until recently, probably due to a paleontological lack of interest in the area. Fortsch, a paleontologist who has worked at China Lake, feels that this situation:

. . . doubtless resulted from the fact the valley lies within the basin and range geomorphic province, an area characterized by closed basins and centripetal drainage. Workers probably assumed any specimens present were being ever more deeply buried by sediments derived from the surrounding mountains and indeed, the work of Zbur (1963) indicates up to 6200' of unconsolidated alluvium fills some parts of the valley. If I have properly interpreted the geomorphology and limited topography of the valley floor however, post-Pleistocene deflation has removed in excess of 1 km³ sediment from the valley thereby exposing many fossils (1978:173).

If cautiously extrapolated to basins within the study area, future paleontological studies may reveal the presence of fossil faunas in areas where post-Pleistocene deflation has occurred.

At China Lake, Fortsch identified ". . . 20 recognized genera and 6 groups not yet determined to generic level. Comparison with fossil assemblages from surrounding areas shows it is most like the Rancho La Brea fauna from the 'tar' pits of the Los Angeles Basin" (1978:176).

Davis provides the following reconstruction based on this assemblage for optimum periods varying between 42,000 and 10,000 years B.P.

Dry land surroundings of Pleistocene Lake China are best reconstructed from known habitats and food preferences of the terrestrial mammals. The periodic existence of extensive savannas is demonstrated by the presence of Family EQUIDAE (a large and a small horse; Family CAMELIDAE (a large and a small

camelid); Family BOVIDAE--Bison cf antiquus; and a number of specimens of Mammuthus. The relatively fine tooth plates of these (Columbian?) mammoths indicate grazing preferences rather than the browsing adaptations of mastodons or modern LOXODONTIDAE (Fortsch 1972:86).

Large predators such as Smilodon, the saber-tooth cat, and Canis dirus are informative mainly as they tell us that there were enough large grazers (and carrion) present to invite the attentions of a huge cat and a heavy-duty, hyena-like canid. The presence of coyote, C. latrans, brings into view another side of the environment: this grassland biota doubtless included rabbits, hares and small rodents.

Condition of the grassland must have been excellent at times, providing abundant fodder for large herbivores. As an example, the larger of the two Lake China horses is larger than the same species at Rancho La Brea (Fortsch 1972:76) due, perhaps, to superior feed. Last of all, a single fragment of deer bone (Odocoileus sp) further supports a premise that the surroundings of Lake China were savannas. Deer are forest edge browsers rather than grazers (although they eat some grass when it first sprouts in the spring). Scarcity of deer among our specimens, therefore, indicates a grassy rather than a brushy environment (1978b:20).

In support of this reconstruction are fossils from the Class Aves, which are marsh nesting, tree nesting, shallow water waders, and fish feeders (Davis 1978:20). It would be reasonable to assume that other basins within the study area had similar environments.

Another work of potential interest to archaeologists in the area is the Hubbs and Miller (1948) study of fish distribution and hydrographic history. According to Mehringer,

. . . Their analyses illustrate former connections of Pleistocene lakes, river courses, estimates of times of isolation and most importantly the magnitude of climatic and biological change over a geologically short time. Other studies of fish distributions and fossils provide information on specific paleoenvironments (Smith, Stokes and Horn 1968) and past distributions (Hubbs and Miller 1970; Miller 1965). Data on the paleoecology of aquatic habitats

also come from studies of the ubiquitous molluscan remains (Roscoe 1963; Taylor 1967, 1970) (Mehringer 1977:146).

It must be stated that relatively little paleoenvironmental research has been done within study area boundaries. It is probable, however, that the study area contains considerable amounts of paleoenvironmental information based on analysis of results from nearby regions. Such information is invaluable in assessing the prehistoric record even if the paleoenvironmental evidence is not directly associated with cultural materials. Paleoenvironmental evidence tends to be found in particular localities, including lake bed sediments, active and fossil springs, rock shelters, and dunes.

b. Present Biotic Environment. Archaeologists need to consider present plant distributions and ethnographically recorded uses in order to make inferences concerning Late Prehistoric subsistence. According to Mehringer, however, these considerations:

. . . are not necessarily a key to even the recent past. For example, the importance of pickleweed (Allenrolfea) for the past 10,000 years is well documented (Harper and Alder 1972), but we do not know the post-pluvial geographic history or relative abundances of such important resources as pinyon pine (Pinus monophylla) and mesquite (Prosopis juliflora and P. pubescens) (Steward 1933:241, 1938:20, 80). It may be convenient to assume that these trees, within their present ranges, have long been important to Great Basin inhabitants, but without direct evidence from archaeological excavations or linguistic data (C. Fowler 1972) such assumptions lack verification. It seems likely that both trees have undergone considerable post-pluvial range adjustment (Mehringer 1977:133).

Near the study area, however, an expansion of pine and juniper prior to 12,000 to 10,000 B.P. is suggested from pollen samples at Searles Lake (Leopold 1967, 1970; Roosma 1958).

Archaeologists should be aware that a nonclimatic variable that may have affected present plant distribution is nineteenth century Euro-American land use. Mining activities and towns required fuel, and Euro-Americans undoubtedly used local plants for this purpose. For example, Spears (1892:112) mentions that mesquite and sage had been stripped from an eight-mile stretch of valley near the Argus Mountains.

Thus, analyses made on the basis of present plant occurrence and distribution must be undertaken cautiously.

B. PAST AND CURRENT RESEARCH

In relation to its large size and abundance of cultural resources, the study area has received little cultural resource attention. One reason for this may be the relative inaccessibility of the area and difficulties in logistic support for any type of large or sustained archaeological project. With a few notable exceptions, much of the work that has been done in the study area is little known and unpublished. In many cases, information gathered in earlier days is difficult to locate or gain access to.

As might be expected, little substantial archaeological work has been accomplished until relatively recent times. The most important previous research is discussed in other sections of this report. Valuable ethnographic accounts have been published by Coville (1892), Nelson (1891), and Dutcher (1893). The most substantial ethnographic work done in the study area occurred during an early period due to the efforts of Julian Steward (1929, 1933, 1938, 1939a, 1939b, 1970). His work is valuable for both its ethnographic and archaeological content and will serve as a "baseline" for much of any future work done in the area, simply due to the mass of data he collected.

In 1931, there was one notable attempt to assess the archaeological potential of the Saline Valley by the Clifford Park Baldwin Expedition. The expedition resulted in the photorecording of several sites and artifacts. Some collection was also apparently conducted. The manuscript and photographs are curated at the California Eastern Museum in Independence. Unfortunately, the data collection techniques were uneven, and the information gathered has limited scientific value.

The best known portion of the planning unit is the Little Lake/Coso locality. This locality has been investigated by several archaeologists, including Lanning (1963), Harrington (1949, 1950, 1952, 1953, 1957), McCown (1957, 1964), Farmer (1937), and Riddell (1951, 1956, 1958). The results of these works have provided the most substantial, reliable information for the cultural development of the area. As these works are discussed extensively below, no attempt will be made to summarize them at this time.

Alan Garfinkel has carried out extensive work in the Little Lake locality, including survey, ethnographic and historic research (1976). The resulting report, on file at the Bureau of Land Management office in Bakersfield, California,

constitutes a detailed overview of the specific area. Mr. Garfinkel has recently published the results of his research at this locality (1978, personal communication).

In addition, Timothy Hillebrand completed his dissertation on the archaeology of the "Coso Locality" (1972). While this did not encompass any of the specific area under concern at this time, it is a valuable document on the local archaeology.

In 1965, W. Lewis Tadlock excavated a site in the Waucoba Springs area of the Saline Valley. The open midden site (Iny-157) was an apparent multi-component site. The collection from this excavation is stored at the UCLA Anthropology Museum, and a brief report on the site is on file at the Bureau of Land Management office in Riverside, California.

In the 1930s, the Campbells examined a portion of Inyo County (Campbell 1949; Harrington 1956). Harrington briefly summarizes the archaeological work done up until that time in Inyo County in "Archaeology of Inyo County" (1956).

In 1968, a site was excavated near Deep Springs Valley by Floyd W. Sharrock, Department of Anthropology, University of Montana. Sharrock excavated a rock shelter site in the Lake Mountain area (Blanco Mountain Quadrangle) (Bureau of Land Management 1978). This collection is curated at the University of Nevada, Reno. The results of this excavation are not known to have been published.

Richard Brook has investigated 54 features in upper Saline Valley. The prepared paper discusses arguments in support of the structures as hunting blinds. Brook's conclusion is, "There can be little doubt the rock features of the Upper Warm Springs area are hunting blinds, used both as ambush and observation locations" (1977:12).

An attempt to assess the scientific potential of Panamint Valley was carried out by Robert T. Farrell of the University of California, Berkeley, in 1951. His survey resulted in the recording of six sites and recommendations for further work. The sites are described in little detail, and apparently some surface collections were also made.

Of interest in this report is an interview with Mr. George Carter, a resident of Ballarat. A limited amount of information is given through this interview concerning the Hansen Ranch, Panamint George, and Hungry Bill (see Historic Setting section). Carter provided Farrell with some clues

for finding sites and local lore. In the interview, however, there is a statement by Carter concerning the Hansen Ranch which suggests that Native Americans have had a concern for the Hansen Ranch remains since at least 1951: "If you want to find some burials you should be able to find them up at the Ranch. The Indians come back every so often to see that the graves are not bothered" (Farrell, 1951).

Clement Meighan (1953) and Martin Baumhoff (1953) conducted research in the Panamint Range east of the study area. The sites investigated include the Coville Rock Shelter (Iny-222) and several others in the area. Collections from Iny-103, Iny-222 and Iny-220 (or Iny-161) are curated at the Museum of Anthropology, University of California at Berkeley. Although the sites lie outside the present planning units, they represent one of the few intensely examined regions in this part of the country.

Extensive work has been done in Death Valley, which borders the present study area. Rather than summarize that work at this time, reference is made to Hunt (1960) and Wallace (1977). The latter is an excellent summary of the work completed in the Death Valley region until 1977.

The best known work in the Panamint Planning Unit was carried out by E. L. Davis during the 1960s. Davis excavated in the vicinity of Lake Island and also obtained environmental information at Warm Springs in Panamint Valley. The cultural materials obtained are curated at the UCLA Anthropology Museum, and the results of the excavation were published in 1969 (Davis, Brott and Weide 1969). In addition, work was conducted by Lathrap and Meighan (1951), True, Sterud and Davis (1967), Mehringer (1966), and Davis, Cook and Peterson (1967).

In the 1950s, Clements examined portions of the Panamint Valley (1955). This work resulted in a 1956 publication entitled "Inferences Regarding the Ancient Habitation of Panamint Valley, California." This article provides very little information about the fieldwork undertaken.

In 1951, Richard W. Patch of Cornell University surveyed a portion of the southern Eureka Valley. His work is summarized in American Antiquity (1951:50-52) and discusses an irrigation system in the Eureka Valley.

Robert Bettinger (1973) has had a continuing interest in the area. He is currently engaged in research designed to explicate the occurrence of irrigation and horticulture by prehistoric and protohistoric groups in and near the study area. Bettinger is especially interested in details

concerning the antiquity of irrigation, causal explanations for its inception, the role of food production in the subsistence economy and the impact of irrigation on sociopolitical organization (Bettinger 1978).

A test excavation was completed in 1977 in the Eureka Valley at a location where an irrigation feature was thought to exist. This, however, was determined to not be a cultural feature. According to Dr. Bettinger, irrigation features, terraces, or dams may occur in other areas within the study area. Such features are often situated in localities where flash floods from summer rains bring considerable amounts of water down a canyon. This water can be conveniently diverted for use where canyons open into fans (Bettinger 1978).

There is no statistical relationships known between the location of winter villages and irrigation. Irrigation, however, is often found within a mile of a village site. As archaeological manifestations, irrigation features are difficult to recognize. They often consist of loosely defined alignments of rocks and may appear as trail-like features from the air. Some success has been achieved using aerial photography in locating such features, although known irrigation systems were in one case not detected from the air, and surface examination was required to establish their identity (Bettinger 1978). According to Bettinger, important research questions may be addressed using data recovered from the excavation of such systems, and all efforts should be made to prevent their destruction prior to their study. Presently, Bettinger is preparing a monograph describing the results of his most recent research (Bettinger 1978).

In 1972 Robarcheck undertook an overview of the Saline-Eureka Valley area. This summary describes the information available for this locality prior to the fieldwork undertaken by the Bureau of Land Management.

Currently, Dennis Gallegos, an archaeologist for Westec Services in San Diego, California, has a research interest in the Saline Valley (1978, personal communication). Gallegos is especially interested in the settlement patterns and ethnohistory of the valley, as is Farrell (1977). Ann Peak performed research focused on the Owens Valley located to the west of the Saline Valley.

Stanley Berryman, an archaeologist at Toups Corporation in San Diego, California, has conducted research in the Little Lake area (1978, personal communication). He has tested a site near Little Lake on private property which, according to Mr. Berryman, may hold a potential as great if not greater than the Stahl Site for explicating prehistory of the area.

Malcolm Rogers of the San Diego Museum of Man has also worked in the general region of the present study. Unfortunately, the site forms completed by Rogers were not dated, nor are maps available showing site locations. Copies of the site forms were made available by the San Diego Museum of Man. The general locations of the sites are provided on these forms, but no specific locational information is available.

Mention must be made of Campbell Grant's work on rock art of the Coso Range. While not within the study area, this work (Grant, Baird, and Pringle 1968) does provide an excellent overview of the region's prehistoric rock art.

Rock art in the study area has been formally studied since the 1920s. Perhaps the most comprehensive treatment of rock art relevant to the study area from this early period is the work of Julian Steward (1929). Steward describes a number of rock art sites throughout the Owens Valley vicinity, including sites in Deep Springs Valley (1929:75), the Keeler locality (1929:75-78), and the Little Lake/Coso locality (1929:78-82). Steward also knew of petroglyph sites near Darwin, Millspaugh, and the Saline Valley but did not discuss these in detail. Since Steward's early publication, many others have been interested in the rock art which proliferates throughout the western Great Basin, including Heizer and Baumhoff (1962), Grant, Baird and Pringle (1968), von Werlhof (1965), Rector (1976), Martin (1977), Martineau (1973), Brook, Ritter and Farrell (1978), and Crowley (1979).

There is considerable variability in rock art sites in style, location and, although difficult to date, age. At least four styles have been identified for the area according to Grant, Baird and Pringle:

- Naturalistic Realistic or representational.
- Stylized Realistic subjects, simplified or conventionalized, but still easily recognizable.
- Abstract Having little or no reference to the appearance of objects in nature, often decorative patterns. In relation to rock drawings, the term

abstract is somewhat misleading. There is no doubt that many seemingly abstract symbols, incomprehensible to us, represented actual objects or ideas.

Pit-and-Groove This style in the Coso Range consists of small hemispheric pits from 1 to 2 inches in diameter and from about 1/2 to 1 inch deep, arranged in lines or at random (1968:16).

Rock art in the Coso area has been relatively dated based on the criteria of subject matter, relative patination, and erosion into early, transitional, and late periods. The early period is estimated to begin sometime prior to 1,000 B.C. and continue to approximately 200 B.C., the transitional from 200 B.C. to A.D. 300, and the late from A.D. 300 until the historic period (Grant, Baird and Pringle 1968:58).

Grant, Baird and Pringle describe the subject matter of rock art in the Coso area, which is generally similar throughout the region. They state that the early period includes the following: naturalistic--sheep; stylized--atlatls, sheep heads, and solid-body anthropomorphs; and abstract--miscellaneous curvilinear and rectilinear patterns and pit-and-groove. The transitional period includes: naturalistic--sheep (horns to side and front), dogs, deer, medicine bags, and projectile foreshafts; stylized--atlatls, sheep heads, solid-body anthropomorphs and stick-figures, patterned-body anthropomorphs (simple), hunters with atlatls and hunters with bow; and abstract--shield patterns (simple) and miscellaneous curvilinear and rectilinear patterns. The late period includes: naturalistic--sheep (mainly horns to front), dogs, and deer; stylized--solid-body anthropomorphs, processions of stick-figures, patterned-body anthropomorphs (elaborate), hunters with bow, medicine bags and sheep (horns, front only); and abstract--shield patterns (elaborate) and miscellaneous curvilinear and rectilinear patterns (1968:24).

In the Coso region, Grant, Baird and Pringle found that rock art sites cluster distinctively in certain localities.

The rock drawings are concentrated at four types of localities. Most are at the entrances to gorges containing piled-rock hunting blinds; others are located in conjunction with blinds, on rocky points dominating saddles between watersheds; isolated rocks in the immediate vicinity of springs have engravings, and the rocky crags near Coso and Silver Peaks, have innumerable drawings and many blinds. No drawings were found in canyon areas lacking easy access (Grant, Baird and Pringle 1968:30).

The interpretation of rock art in the study area has been a subject of much debate. Grant, Baird and Pringle (1968:42) believe that much of the rock art is connected with hunting magic; however:

. . . some of them, particularly the early abstract patterns and the Late Period shield-like designs might relate to other matters. In parts of the western states much of the rock art was made in connection with puberty rites, fertility, weather control, and clan identification. There is no ethnographic evidence for the purpose of the drawings in the Coso Range and the only clues lie in the subject matter itself. This subject matter bears witness to an immense preoccupation with bighorn sheep and the hunting of bighorn sheep (Grant, Baird and Pringle 1968:42).

For the Saline Valley, Crowley interprets rock art as multifunctional:

. . . Some petroglyph elements appear related to hunting and possibly fertility magic as well. Some elements may have been related to the pebble mounds, which can be interpreted as ritualistic. The horse and rider element appears to portray an historical event. Pictographs may have been an addition to puberty ceremonies. The cupule rocks probably were related to fertility because of their village association (1979:14).

Recently Brook, Ritter and Farrell (1978) reported an unusual occurrence of rock art associated with the remains of the nineteenth century mining town of Panamint City. The rock art occurs in a series of three rock shelters, which contain numerous pictographs and a few possible petroglyphs. Approximately 210 elements were observed and recorded. The elements were executed in black, yellow, red, white, tan, and gray and represented quadrupeds, big horn sheep, horse or mule riders, anthropomorphs, sunlike symbols, and other

naturalistic and abstract elements. Both native American and EuroAmerican artifacts occur in the rock shelters. The rock art is thought to date after A.D. 1800 and may represent activities of native Americans and/or Anglo miners.

As with other ongoing research concerns, rock art studies can provide important information concerning past lifeways of the area. To date, there has been only limited efforts at using the information gained from these studies as informational units for the study of prehistory and anthropology. Functional analysis is but one useful aspect to which rock art studies can be put. In addition, detection of stylistic variation on a minute level should be possible, thus permitting refinement of much of the understanding of the area's prehistory.

III. CULTURAL RESOURCE NARRATIVE

A. INTRODUCTION

The Darwin, Eureka, Panamint, and Saline Planning Units cover approximately 2,885 square miles. This very large area has been occupied for over 7,000 years and perhaps much longer. During this time, the residents of the area have left a fragile record of their occupancy. This record is manifest in structural remains, trash piles, indications of trails, and other items which at first glance may seem of little value, but in fact reflect the major record of the occupation of this area.

The cultural resources of the region indicate a varied occupancy from the remnants of early man to the complex remains of large mining operations. Each of the groups responsible for these remains came to this sometimes forbidding area either to exploit some component of the environment or for some social or religious reason. Where the general setting provided aboriginal populations with nearly their entire subsistence, the historic occupancy was oriented toward exploitation of mineral resources.

The following detailed discussion presents pertinent available information on the cultural development of the area. It is divided into six major segments including five periods of aboriginal development and one historic period. The components of the aboriginal occupation are delimited on the basis of a series of horizon styles detected through past archaeological investigations. The historic period stresses the mining operations of the area and is, therefore, confined primarily to one type of land use. This is not to say that mining was the only historic activity undertaken in the area, but it was the causal factor for the development of historic land use and was therefore used as the key for presenting the historic development of the area.

One thing which must be stressed is that there are no substantial theoretical differences between the prehistoric period of occupation and the historic. The historic period is often set aside from the aboriginal period, but it, in fact, simply represents the intrusion of another cultural pattern into the area. The existence of extensive written records should in no way limit the use of historic archaeological information in the evaluation of anthropological questions and the study of the processes of culture and society.

Although heuristically applied boundaries provide a necessary frame for the management of large tracts of land,

they have no prehistoric cultural significance. Because of this, it will be necessary to expand the present discussion to include more than just the limited study area. While the specific Darwin, Eureka, Panamint, and Saline Planning Units are important for the management of cultural resources, the base for understanding the significance of those resources involves vantage points diverse in time and space.

As noted above, the study area lies at the western edge of the Great Basin. Because of this, it is also important to evaluate the multitude of developmental explanations provided for this geographical area. In addition, the project area falls within Baumhoff and Heizer's Southern California desert region (1965), and any comprehensive discussion must also address the relationships in this region as a whole.

In approaching a general discussion of the cultural development of the study area, it is first necessary to adopt a framework which will permit a noncontradictory presentation. As there has been only limited archaeological investigation in the western Great Basin area, there has been little opportunity for archaeologists and prehistorians to compile a general overview for the area at large. Because of the lack of such an eclectic construct, investigators as late as 1960 had to prepare their own generalizations. This not only prevented the incorporation of their results into a larger body of information but also made it difficult for others to compare and evaluate similar sets of information.

Perhaps the earliest effort at interregional evaluation which included the study area was done by Malcolm Rogers of the San Diego Museum of Man. His first publication which concerned materials of the far southwest desert was The Stone Art of the San Dieguito Plateau (1929). In this publication, he presents his initial thoughts on the existence of what later became the San Dieguito cultural pattern, called at that time "scraper makers." At the time of this publication, he felt this pattern was of less antiquity than what he termed the "shell midden people," later to be associated under a Milling Stone Period heading (Wallace 1955).

Rogers modified this first presentation and in 1939 proposed a complex scheme, including Malpais, San Dieguito, Playa, Pinto-Gypsum, Amargosa, Yuman, Shoshonean, Pueblo and Paiute (Rogers 1939:77). This has become the cynosure for much of the synthetic work done in the area.

Since Rogers' presentation, there have been several reformulations and different explanations presented: Wallace (1962), Davis, Brott and Weide (1969), Donnan (1964), Hester

(1973), Bettinger and Taylor (1974), and recently, Davis (1978b). This, of course, does not exhaust the constructs proposed for the area, but it does demonstrate that there are a multitude of explanations for what is a single, although large, set of information.

The relationship between several of these reconstructions is presented in Figure 4. Several similarities are apparent from studying this table. First, five basic periods have been described, bracketed by significant cultural horizons; and second, these periods have many labels and little consistency in dates.

Most recently, Warren and Crabtree have compiled a summary of the prehistory of the southwest portion of the Great Basin (Warren and Crabtree 1978). They divide the area into five periods: Lake Mojave, Pinto, Gypsum, Saratoga Springs, and Shoshonean. These periods represent still another set of spatial, temporal, and formal relationships and application of different summary terminology.

Instead of adopting a label for each general cultural era, a series of periods referred to as Period I, Period II, Period III, Period IV, and Period V will be used within this report. Although well founded in the archaeological record, they are completely heuristic devices and make no claim to reflect a cognitive cultural explanation. This five-tiered structure is based on a series of major horizons: the chopper/scrapper horizon, the projectile point horizon, the ceramic horizon, the milling horizon, and the contact horizon. Using these horizons, five periods of occupation can be readily defined, and the archaeological remains described to date can be integrated (Figure 5).

As used in this report, the terms "horizon" and "tradition" were adopted from Willey and Phillips (1958) and Rouse (1972). They are used as integrative devices. Tradition is used in this discussion to represent the persistence of a specific trait over a long period of time; horizon, on the other hand, represents a broad, rapid spread of culture traits. Horizons allow the linking of contemporaneous patterns, and traditions allow the linking of any distinct temporal units (Willey and Phillips 1958:83; Rouse 1972:279).

These concepts should not be confused with that of stage or period, which have both temporal and spatial dimensions and which are segments of a historical sequence in a given area. In this presentation, the horizon and tradition are used to integrate patterns and periods to provide a basis for presentation of the work previously undertaken in this portion of the California deserts.

Present	Late Prehistoric	Shoshonean	Prehistoric Yuman and Shoshonean	Yuman, Shoshonean, Paiute	Klondike	Post Contact
1,000 B.P.	Rose Spring/ Eastgate	Yuman	Amargosan	Amargosan, San Dieguito II San Dieguito III Pinto-Gypsum	Baker	Milling (Archaic)
2,000 B.P.		Amargosan			Cowhorn	
3,000 B.P.	Great	Pinto Basin	Pinto Basin	Playa I, II San Dieguito I	Clyde	Early Milling (Archaic)
4,000 B.P.	Basin					
5,000 B.P.	Archaic					
6,000 B.P.						
7,000 B.P.	Scanty Occupation	?				Terminal (Paleo-Indian)
8,000 B.P.						
9,000 B.P.	Western Pluvial Lakes Tradition	Lake Mojave Playa	Lake Mojave	Malpais		Western Lithic Co-tradition (Paleo-Indian)
10,000 B.P.						
11,000 B.P.	Fluted Projectile Point Tradition	?				Fluting Co-tradition (Paleo-Indian)
12,000 B.P.		Tule Springs				
13,000 B.P.	Pre-Projectile Point					Early Stages (Paleo-Indian)
14,000 B.P.						
15,000 B.P.	(Hester 1973)	(Donnan 1964)	(Wallace 1962)	(Rogers 1939)	(Bettinger 1976)	(Davis 1970)

Figure 4. General regional reconstructions.

B. PERIOD I: CHOPPER/SCRAPER HORIZON

This period is marked at its onset by a proposed chopper/scraper horizon and at its end by the projectile point horizon. It has a variety of labels, including "Lithic" (Willey and Phillips 1955, 1958), "Pre-projectile Point" (Kreiger 1964), "Early Man" (Hanna 1978) and "Paleo-American" (Davis 1978b).

The nature of this period has been of particular recent interest as noted by the establishment of the Friends of the Pleistocene, a group organized for the exchange of ideas on the existence of a Pleistocene human occupation of the New World.

Although a pre-projectile point complex would probably indicate a Pleistocene occupation, such a complex is not a requirement for a Pleistocene occupation. These are often combined, but they are not necessarily the same. Discrediting a pre-projectile point complex does not, however, conjointly eliminate the possibility of a Pleistocene occupation.

In addition, it must be remembered that absence of projectile points is not sufficient to permit inclusion of a pattern within this period. The fact that regularly occurring assemblages can be found which are non-projectile point bearing, yet which postdate proposed projectile point patterns, is evident in Southern California. For example, the Milling Stone Period (Wallace 1955) patterns of coastal Southern California (D. B. Rogers 1929; M. Rogers 1945, Moriarty 1966) lack projectile points but do not predate known projectile point patterns (Kaldenberg 1976; Rogers 1945).

There are many reports on deposits which are potential Period I occupations: Tule Springs (Harrington 1956; Harrington and Simpson 1961; Simpson 1958, 1960), Lake Manix (Simpson 1958), Calico Early Man Site (Simpson, 1960, 1973) and Texas Street/Buchanan Canyon (Carter 1957). Two areas of particular interest because of their proximity to the study area are the materials found in the Death Valley (Clements and Clements 1953; Clements 1954) and those found in the China Lake region (Davis 1974, 1975a, 1975b, 1976, 1977a, 1977b, 1977c, 1977e, 1977f, 1978b).

Through her work at China Lake, Davis has proposed an occupation of the western Great Basin as early as 45,000 years B.P. The tool industry characteristic of this occupation includes choppers, chopping tools, large spokeshaves, stubby broad beaks, long ovate knife/points, cordiform

knife/points, large flaked tools, bone tools, and pounding/grinding rocks (Davis 1978b:28).

The time figure placed on these materials is an estimate based on "... the presence within the sample of a number of distinctive tool kits" (Davis 1978b:31). This early core tradition is based on "... a) degree of weathering, b) morphology of the tools, c) technology and d) choice of material" (Davis 1978b:33).

It is proposed by Davis that weathering represents an age indicator which is used because it:

... allows us to construct a model of Mojave Desert prehistory and New World cultural progressions large enough, and with enough slack, to accommodate a very slow spread of human beings in the Americas and to explain occasional sites with dates earlier than 10,000 years BC. (Davis 1978b:37).

Dr. Davis' explanation represents a position not shared by everyone on the habitation of the New World. Where it has been recognized that there is a possibility for a mid- and late Wisconsin occupation of the New World, most researchers believe that "... little has been proved. Neither the age nor the cultural significance of this complex can be settled here. The answer lies in the ground" (Jennings 1974:81).

Davis summarizes the relationship between those who are searching for the New World roots in the Pleistocene and those who feel they lie in recent times as follows:

In the 20th Century U.S. archaeology has witnessed a deadlock struggle to push backward the antiquity of New World peoples. This continues as a Cold War of Seekers vs. Conservatives. This paper presents to California archaeologists four suggestions for disclosing pre-clovis sequences by seeking new patterns in new ways and new places (Davis 1977d:27).

Clements and Clements (1953) have also reported on a potential Period I occupation in the general vicinity of the study area. They discuss the materials found around Lake Manly in Death Valley and conclude that the Lake Manly site was inhabited at an earlier date than the Lake Mojave, Little Lake and Pinto Basin sites (1953:1189-1204). They feel that the area was occupied during the Tioga substage of the Wisconsin.

Wallace (1977) takes exception to the claim by Clements and Clements (1953) that the Lake Manly materials are the results of human modification.

Some of the chipped stones do call to mind simple tools such as scrapers and choppers. But they lack any consistency of form or workmanship, and so appear to be products of natural forces rather than of human handiwork. Natural agencies for flaking stone are many and varied and can and frequently do produce fairly convincing "tools" (Wallace 1977:111).

Wallace does recognize the materials reported by Hunt (1960:20-61) as reflecting materials of hunters who ". . . came in search of big game" (Wallace 1977:112) and indicates that they entered the region ". . . 9000 or so years ago" (Wallace 1977:112).

As far as specific claims for a Period I occupation within the study area boundaries, little has been done. Claims for this early occupation are limited to the Panamint Valley (Clements 1956; Davis, Brott and Weide 1969). Before a discussion of these claims can specifically be presented, a presentation of another series of potential Period I patterns is necessary.

While the validity of some pre-projectile point assemblages can be attacked by challenging the nature of the production of the "artifacts," some non-projectile point assemblages are the result of human activity. These include Malpais and San Dieguito patterns. These patterns have traditionally been associated with a "Paleo American" occupation of the Southern California deserts. They are clearly the result of human activity and cannot be offhandedly dismissed as nature-facts.

Malcolm Rogers (1939) defines these three groups and arranges them in potential chronological order. The "Malpais Industry" is defined on the basis of three types of material evidence: house sites, large gravel-outlined figures, and artifacts (Rogers 1939:6-21). He indicates that the correlation of these components is ". . . largely based on inductive reasoning" (1939:21) but feels that the Malpais occupation is one of significantly greater antiquity than the Yuman occupation with which he compares it.

Following the Malpais Industry, Rogers proffers the existence of a San Dieguito-Playa Complex. This pattern is characterized by scraper types, knives, choppers, crescentics and potentially stemmed blades (Rogers 1939:28-36).

These patterns were later united within three phases of the San Dieguito pattern: San Dieguito I, II, and III (Rogers 1966). Davis combines these within the "Western Lithic Co-tradition" (Davis, Brott and Weide 1969:13).

There are problems concerning the uniqueness of these assemblages, as well as their temporal placement (Borden 1971). Unambiguous stratigraphic position, association with extinct fauna, and associated absolute dates are extremely rare. One site which is purported to represent the later components of the San Dieguito pattern, San Dieguito III, is the Harris Site in San Diego County. At this site, typical San Dieguito III materials were clearly overlain by a milling stone assemblage with an absolute date of 6,300±200 B.P. (Warren and True 1961; Warren 1966). The association of this San Dieguito III material and much "cruder" San Dieguito I/Malpais materials is unknown.

Recently, E. J. Rosenthal completed a study of typical Malpais materials in the Sierra Pinacate of northern Mexico. Here she attempted to examine the correlation of surface materials in order to evaluate the existence of the Malpais Industry and hopefully assess its antiquity. While her results indicate an association between materials characteristic of a Malpais Industry, absolute assessment of their antiquity was not determined (Rosenthal 1978).

The interest that exists over the question of the first New World occupants makes an understanding of the nature of this period and its interrelation with other patterns and variants of special concern. The recent claims in San Diego County of man in the area circa 100,000 years ago (Smith 1977) emphasizes the extent to which people are willing to go to establish this early period.

In review of the nature of the period and the information available about it, the best that can be said is that little is known and even less is understood. There is insufficient evidence to prove the existence of such an occupation, but insufficient evidence exists to reject it as well. Davis suggests several ways in which this evaluation can be made with increased confidence. These include: "(1) Recognize unfamiliar . . . tool complexes, (2) stay away from caves for awhile and learn the patterns of Pleistocene lakes, . . . (3) Develop the necessary technologies for dating calcic paleosols, [and] (4) Evolve a series of Geologic/Climatic microstudies in the (closely-related) coasts and deserts of southern California" (Davis 1977d:27).

While the interests of Davis are evident, her concern with the nature of the examination of the potential early

occupation of the California deserts is well justified. The attempts to develop "straw man" arguments for early occupations provide no evaluative evidence for objective assessments. Detailed studies are necessary to 1) establish the nature of cultural versus natural breakage of the materials involved, 2) evaluate the effect and rate of deterioration of lithic materials, and 3) search for buried examples of the questionable pattern. Some studies are presently underway. These should be done through scientific extrapolation and not through a hit or miss process.

There has been a substantial amount of logical explication of the two major positions. Difficulties can be pointed out in each, as well as benefits. It is only through generation of testable hypothesis that the controversy can be resolved. This makes the general region of the present study area of particular importance. The record of a long occupation of the area combines with the nature of the substantial ecological changes to make this area of particular potential for the resolution of this problem.

C. PERIOD II: PROJECTILE POINT HORIZON

This period of occupation is marked at its onset by the projectile point horizon and at its termination by the milling stone horizon. It is characterized by a series of distinct projectile point types, including fluted points, Lake Mojave and Silver Lake points and points characteristic of the later phases of the San Dieguito pattern.

Fluted points have often been separated into a separate tradition with its establishment and end occurring prior to the development of other point types. They will be dealt with here in conjunction with other pre-milling point types found in the northern Mojave Desert.

The appearance of fluted points in the southwest represents the earliest absolutely dated pattern in the New World. It also represents the major point of contention between those supporting an early occupation and those believing only in a post-Wisconsin occupation.

Fluted points have been found extensively throughout the western United States (Davis and Shutler 1969), but only in limited quantities in the western Great Basin area, such as around Lake Mojave (Simpson 1947), in the Owens Valley (Davis 1963) and at several other places throughout California (Glennan 1971).

Fluted points are often found with extinct Pleistocene fauna, with several radiocarbon dates indicating a period of origination about 10,000 years ago (Jennings 1974). The fluted points in the Far West have not had the benefit of associated radiocarbon dates, but through stylistic similarities are associated with this early period.

In any event, the occupation of the western Great Basin represented by these few projectile points is extremely limited. Many of the recovered points are unfortunately from surface sites with little situational information, restricting both cultural and temporal placement.

The fluted projectile points represent the basis for an interesting and important problem in understanding the population of the New World. Acceptance of a pre-New World development of fluted points requires the acceptance of a very rapid spread of human populations.

It is a theory developed by Haynes (1964) and Martin (1973) proposing a sudden breakthrough of northern mammoth hunters as a corridor opened between the Laurentide and Cordilleran glaciers about 12000

years BP. Clovis spearmen advanced along a widening front at the rate of 100 miles a year, and bursting upon an unsophisticated megafauna, decimating proboscideans, camels, and horses, sweeping two continents and arriving at the tip of South America within 1,000 years (Davis 1978b:39).

Although the scope of this paper does not permit an attempt at analysis or even proposal of a solution to this problem, it is within the general vicinity of the study area that the problem is best approached, for it is in the deserts of California that a potential pre-fluted projectile point occupation occurred. Further, it is Davis' position that the fluted projectile point may have developed in this vicinity only to spread later to the areas of its greatest appearance further east.

In 1977 Bettinger published the results of a sample survey of Long Valley Caldera, Mono County, California. In this report, projectile points are used as "market artifacts" in defining four periods: Little Lake period, Newberry period, Haiwee period, and Marana period. Of particular interest here is Bettinger's position that:

Indeed, if there is a Clovis occupation within the Long Valley Caldera--and this is far from certain-- its patterns of resource exploitation would appear to conform more closely to the Little Lake settlement-subsistence system than to the Big Game Hunter model traditionally postulated for these groups (Bettinger 1977a).

Comparison of the entire fluted point assemblages and the assemblages purported to be earlier manifestations of areal occupation is the only way to adequately evaluate this problem. If all tests fail to reveal a pre-fluted point tradition, a rapid population of the New World, such as described above, must be accepted. It is only by disproving such a period of occupation that a later influx of people can be accepted with any degree of confidence.

Other patterns which must be discussed within this period of prehistoric development are the Lake Mojave/Silver Lake pattern, the San Dieguito III pattern, and the Panamint Basalt Industry.

The Lake Mojave/Silver Lake pattern was initially defined by work done on the shores of Lake Mojave by Campbell et al. (1937). This lake lies along the Mojave River at the southern end of Death Valley. The site is characterized by ". . . numerous side and turtle backed scrapers, retouched

flakes, large knives, mostly broken, leaf-shaped projectile points, drills, and the projectile point which we have styled the Silver Lake Type . . ." (Campbell et al. 1937:33). The assemblage is thought to be characteristic of hunters who ". . . must have lived a life much like that of the buffalo-hunting tribes of the Great Plains" (Amsden 1937:90).

Of particular current interest is the Lake Mojave and Silver Lake projectile points (Adams 1938; Barbieri 1937). The typical Lake Mojave point has a long tapering stem with a slight shoulder just below the center of its vertical axis (Amsden 1937:80) (Figure 6). It is diamond shaped and is closely associated with the Silver Lake style (Campbell 1936) which has a more definite shoulder and a less tapered stem (Figure 7).

The importance of these point types stems from their relative age. The apparent lack of milling equipment and the estimated date of at least 15,000 B.P. (Antevs 1937:48) make these artifacts some of the earliest materials proposed for the New World.

Admittedly, the dates of these materials have repeatedly been called into question (Brainerd 1953; Meighan 1965; Warren and De Costa 1964; Woodward and Woodward 1966; Heizer 1965; Heizer and Baumhoff 1970). While some of the questions raised about the study area's antiquity have yet to be resolved, the Lake Mojave-type sites are generally accepted as having some antiquity. Radiocarbon dates for fossil shell range between 6,500 and 13,500 years B.P. and provide an apparent age for the associated archaeological deposits.

Lake Mojave/Silver Lake materials have been identified within the study area (Davis, Brott and Weide 1969). The Panamint Basalt Industry is a variant of the Western Lithic Co-tradition and was identified at sites at the northern end of the Panamint Valley.

The Western Lithic Co-tradition was developed with information gained in the northern portion of the Panamint Valley. The "Panamint Basalt Industry" is one representation of this co-tradition.

It would seem, then, that the industry belongs mainly in the Paleo-Indian Stage of a Paleo-Desert Tradition of life, but use of the basalt quarries continued into the Archaic Period. The Paleo-Indian material probably represents a Panamint Variant of the Lake Mohave Pattern (Davis et al. 1969:19).



Figure 6. This figure illustrates the general shape and size of Lake Mojave projectile point. Scale mark equals one centimeter.

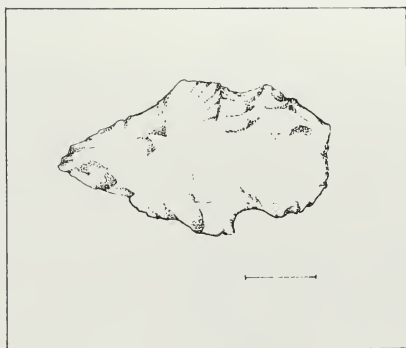


Figure 7. This figure illustrates the general shape and size of Silver Lake type of projectile point. Scale mark equals one centimeter.

Factors which are characteristic of this Panamint complex, and of the Western Lithic Co-tradition at large, include:

- 1) Weak-shouldered, long-stemmed point/knives
- 2) Blades scarce
- 3) Side-struck flakes common
- 4) Extensive production of macroflakes (massive, and more than 12 cm. long)
- 5) Amorphous cores
- 6) Large end-scrapers, with rounded cutting edges
- 7) Spokeshaves (notched scrapers)
- 8) Crescentic implements (Tadlock 1966:666)
- 9) High domed planes
- 10) Step flaking
- 11) Pressure retouch of scrapers, some denticulation
- 12) Point/knives made on flakes, knife/points made on ovate blanks
- 13) Emphasis on ovate bifaces of all sizes, proportions and degrees of finish: a "Biface Series"
- 14) Choppers and chopping-tools

Additional traits:

- 15) Seed milling absent
- 16) Frequent proximity to sources of water now dry or reduced (Davis 1969 et al.:22).

While the dates of this pattern are not firmly established (Tuohy 1971), association of cultural materials and lake stands provide possible dates of 10,020±120 B.P. (UCLA 989) and 10,520±100 B.P. (UCLA 990) for the Panamint remains (Davis 1969:19). While there is a distinct possibility that earlier materials will be discovered in the future, these appear to be the earliest absolute dates yet obtained for the study area.

The fact that the Panamint Basalt Industry marks the earliest potential introduction of projectile points into the region mandates its placement at the interface of Period I and Period II. While the more distinctive point types of the Western Lithic Co-tradition occur within the San Dieguito portion of the construct, Davis extrapolates to the tradition as a whole.

The third Period II pattern which has significance for the present study area is that characteristic of the San Dieguito assemblages, specifically San Dieguito III. The San Dieguito patterns, San Dieguito I, San Dieguito II and San

Dieguito III, represent a separate reconstruction for the California deserts and the Far Southwest, and as such introduce some difficulties to this presentation. As was mentioned earlier, some of the San Dieguito materials have been associated with Period I occupations of the area. Projectile points appeared in the third phase but are not present in San Dieguito I or San Dieguito II. It is suggested, however, that the points developed out of the bifaces typical of San Dieguito II assemblages, but with associations being made primarily on horizontal rather than vertical stratigraphy (Rogers 1966:61).

Rogers (1939, 1966) apparently associated San Dieguito II and San Dieguito III more closely than he did San Dieguito I with either of these latter two phases. Because of this and because of the information presented in the 1966 publication, the San Dieguito II and III patterns will be dealt with concurrently here. Tools which characterize the San Dieguito II and III association include cores, hammers, bifaces, chopping tools, graters, planes, scrapers, knife points, and crescentics. In addition, five projectile point types have been included within this pattern: the ovoid point, the leaf-shaped point, the leaf-shaped bi-point, the Lake Mojave point, and the Silver Lake point (Rogers 1966).

These patterns have been placed together within what Bedwell termed the "Western Pluvial Lakes Tradition" (Bedwell 1970). This tradition has been defined as including

. . . lacustrine-oriented sites of the early time span between ca. 9000-6000 B.C. Lithic traits consist of Lake Mohave, Haskett (and "Haskett-like") Cougar Mountain, and related lanceolate points, lanceolate points with concave bases . . . probably also fluted points, long stemmed points similar to Lind Coulee, crescents . . . and possibly, core-blade and burin technologies (Hester 1973).

The concept of a lakeshore adaptation makes the inclusion of some of the patterns, specifically components of the San Dieguito, difficult. It does, however, reflect an association which appears to hold for many of the assemblages. Unfortunately, placement of materials along past lake lines does not permit the assumption of contemporaneity as the setting is a dynamic one, with lakes rising and falling in a complex process.

The representation of these patterns within the study area is quite limited. Hunt's work in Death Valley has permitted the assessment of early projectile point patterns

within the Death Valley I phase (Hunt 1960). Excavations at Rose Spring and Little Lake both recovered Lake Mojave specimens, but only in limited quantity.

The possibility that Davis' material from the northern Panamint Valley is a Period II occupation exists, but additional work is necessary to tie the Panamint Basalt Industry to Lake Mojave and San Dieguito.

With the occurrence of pre-milling projectile point complexes in the northern Mojave Desert, there is no reason to expect their absence from the study area. The lack of evidence for their existence must be assigned to the fact that little in-depth investigation of the area has been achieved to date.

D. PERIOD III: MILLING HORIZON

This stage is marked at its initiation by the milling stone horizon and at its termination by the ceramic horizon. It has been dealt with as the Great Basin Archaic (Hester 1973; Shutler 1961, 1968) and the Early Milling and Milling Archaic (Davis 1970). It encompasses a wide variety of assemblage characteristics, the most important of which are projectile point style horizons.

The term "archaic" has been rejected for use in this report for several reasons. The term has been used many times in a variety of ways to refer to a very general period of prehistory (Ritchie 1932; Webb and De Jarnette 1942; Willey and Phillips 1955, 1958). It has specifically been applied to the Great Basin and Southern California in equal quantity by Davis (1968), Hester (1973), Irwin-Williams (1968), Shutler (1961, 1968), and Meighan (1959). The multiplicity of uses, however, has tended to muddle its meaning and thus limit the ability of the term to serve as a valuable tool for communication about local prehistory.

The confusion over the concept of archaic is apparent in that Hester (1973) uses it to refer to a period from about 1,800 B.P. until approximately 6,000 B.P.; while Shutler refers to its Great Basin manifestation as possibly extending from 10,000 B.P. until 1550 A.D. (Shutler 1968:24). Finally, Davis uses the concept to refer to all aboriginal occupation of the Far Southwest after termination of the "Paleo American" period, including Early Milling Archaic, Milling Archaic, Ceramic Archaic, and Post Ceramic Archaic (Davis 1968).

Rather than employ the term archaic and attempt to clarify its use, the present discussion will be based on the concepts which permit its definition. The general use of the concept in the western Great Basin references the milling horizon. Hester's use of the Great Basin Archaic terminates with the ceramic horizon and the desert side notched projectile point horizon. For this discussion's purposes, therefore, these key integrative occurrences will be used for presentation of the myriad of constructs for local development.

Another concept receiving regular use for Period III occupation of the California deserts is the "Desert Culture" (Jennings 1964, 1974; Jennings and Norbeck 1955). Jennings uses the concept of "Desert culture tradition" to refer to a portion of the "Western Archaic" encompassing the Great Basin, the Intermontane area, a portion of the Colorado Plateau, coastal California, and portions of Arizona, Mexico, Texas, and the Plains (Jennings 1974:154-155).

Dates for the milling horizon vary. Hester places the date between 6,950 and 7,950 B.P. (Hester 1973:125). Shutler suggests evidence exists for a date of 9,500 B.P. for the "Lakeshore Ecology Phase" and temporally equates this with the Desert Phase or Desert culture (Shutler 1968:24-25). Similar dates have been obtained from Period III sites in Southern California (Kaldenberg 1976; Warren 1967). Wallace suggests that a gap occurred between Period II and Period III occupations and proposes that the milling horizon occurred between 4,950 and 4,450 B.P. (Wallace 1962:175; Aikens 1976). Hester (1973) supports the concept of an occupation hiatus, but places it prior to 5,950 B.P. Bettinger and Taylor (1974) feel that little evidence exists for such a gap. They provide a relatively short time frame for all occupation, beginning sometime prior to 8,000 B.P., with the milling horizon occurring around 6,000 B.P.

The potential of an occupational hiatus between Period II and Period III is largely conditional upon terminus dates for the earlier period. Lack of stratigraphic control on most Period II patterns greatly limits any confidence placed in Period II dates. Because of this, there is little to be gained in attempting to solve this problem based simply on the existing literature. The possible correlation of post-Pleistocene climatic changes and the archaeological record is only one key to a potential solution.

Another means for evaluating the potential of an occupational hiatus between Period II and Period III habitation is through evaluation of a buried Period II site. While subsurface Period III sites are numerous, stratigraphic integrity of Period II deposits are rare.

If there was an occupational hiatus, evaluation of a gap in the occupation of the western Great Basin will be based on a series of factors. It will be necessary to establish a firm termination date for Period II assemblages. While there are some potentially reliable dates for the milling horizon, little information is available on the occupational period which apparently preceded it. Without this information, acceptance of such a gap is impossible.

A series of patterns have been defined for Period III, including the Pinto-Gypsum complex (Rogers 1939), the Little Lake period (Bettinger and Taylor 1974; Harrington 1957), Death Valley II (Hunt 1960), Early and Middle Rose Spring (Lanning 1963) and a variety of milling archaic patterns and variants.

It is within this period that enough information is available to permit intraperiod differentiation. While the previous periods lacked both detailed assemblages and situational information necessary for such a discussion, the existence of stratified sites and stylistic artifacts permits greater refinement.

The Pinto point was originally defined by Amsden (1935) through work done at the Pinto Basin Site (Campbell and Campbell 1935:33-51) (Figure 8). These points had been recognized by Rogers in 1929 and were categorized by him into five types (Rogers 1939): a point with a concave base and slight shoulders, a broad stemmed point with weak shoulders, a point with notched sides and base, a point with a straight base and notched sides, and a small, slender leaf-shaped point.

Pinto points were reclassified by Harrington in 1957 through his work at Little Lake (1957). Harrington's types include points with sloping shoulders, square shoulders, one shoulder, barbed shoulders, and no shoulders (Harrington 1957:51-53).

While this report is not overly concerned with the subtypes of the Pinto points, it is important to note that apparent similarities exist between these points and those found at Gypsum Cave in Nevada. This similarity led Rogers to combine the Pinto pattern and the Gypsum pattern into a Pinto-Gypsum Complex (1939). This association extends the possible geographical expanse of this early Period III occupation.

Pinto points have been identified throughout the Southwest. They have been recorded around Tule Lake in the San Joaquin Valley, near the Nevada/Utah line, in Arizona, and in southeastern California (Harrington 1957; Haury 1950; Rogers 1939; Sayles and Antevs 1941).

The Pinto pattern is of importance to this study because of the identification of a Pinto pattern site in the southwest portion of the study area. The Little Lake site was excavated by Harrington in the 1950s (Harrington 1950, 1957). The result of this investigation was the description of a large site with nearly 500 Pinto-type points. When viewed in conjunction with the results of the Rose Spring site to the north, an excellent picture of the Period III and Period IV development of the area is achieved.

The impact of the sites at Rose Spring and Little Lake cannot be underplayed. The long stratigraphic record of



Figure 8. This figure illustrates the general shape and size of Pinto type of projectile point. Scale mark equals one centimeter.

the Rose Spring site combined with the stylistic variation in point types makes it of extreme importance in understanding local prehistory (Clewlow, Heizer and Berger 1970). Using the information from this site, Bettinger and Taylor have outlined five periods of occupation for interior Southern California: the Mojave, the Little Lake, the Newberry, the Haiwee, and the Marana (Bettinger and Taylor 1974). The point types characteristic of these periods and the comparison of this scheme with that provided by Hester (1973) is presented in Figure 9. It is evident from this chart that while labels differ, the time frames outlined correspond closely.

Whether the labels applied by Bettinger and Taylor are selected or those in more general use, a traceable change in projectile point styles appears: the Pinto/Little Lake series, the Elko and Gypsum Cave series, the Rose Spring and Eastgate series, and the Cottonwood and Desert Side Notched points.

Pinto points, the Little Lake pattern, have also been identified in the Panamint Valley. Lack of their location in other portions of the study area can easily be seen as a lack of investigation of these areas, rather than a reflection of their absence. In any event, the Little Lake series represents the first well-documented occupation of the area.

Using Lanning's scheme for regional development (Figure 10), the Early Rose Spring period next appears (Lanning 1963; O'Connell 1967). This is defined by the appearance of Elko series projectile points and Gypsum Cave points.

The Elko series was first defined by Heizer and Baumhoff in 1961. There are two major types: a corner notched and an eared point (Figure 11). A side notched point and a contracting stem point have also been proposed (Clewlow 1967; Thomas 1971). Bettinger and Taylor state that Smith et al. (1957) report the occurrence of Elko Eared and Elko Corner Notched points with Gypsum Cave points in Newberry Cave (Bettinger and Taylor 1974:18). The significance of the relationship between Elko series points and Gypsum points is unknown, but the similarity of their appearance is evident (Harrington 1933; Wormington 1957). Association of the types would have the effect of expanding the cultural territory of the group creating these specimens.

The Rose Spring series are smaller than the Elko points and range from convex- to concave-sided implements (Figure 12). The bases are straight or convex. These points have been divided into six separate types: the Rose Spring

Bettinger and Taylor (1974)

Hester (1973)

600 B.P.	Marana: Cottonwood Series and Desert Side Notched points	Late Cottonwood and Early Cottonwood: Cottonwood Triangular points
1,300 B.P.	Haiwee: Rose Spring Series and Eastgate Expanding Stem points	Late Rose Spring: Cottonwood Triangular, Rose Spring Corner Notched and Eastgate Expanding points
1,400 B.P.		Middle Rose Spring: Elko Series and Gypsum Cave points
2,500 B.P.	-----	-----
3,200 B.P.	Newberry: Elko Series and Gypsum Cave points	Early Rose Spring: Elko Series, Gypsum Cave and Humboldt Concave Base A points
3,500 B.P.	-----	-----
5,000 B.P.	-----	-----
6,000 B.P.	Little Lake: Little Lake Series and Pinto Basin Series points	Little Lake: Pinto and Lake Mojave (?) points
	Mojave: Silver Lake and Lake Mojave points	Hypothetical: II. Lake Mojave and I. Lanceolate points

Figure 9. Comparison of the occupational periods and point types of Bettinger and Taylor (1974) and Hester (1973).

	Cottonwood	PERIOD IV
1,000 B.P.	Late Rose Spring	
2,000 B.P.	Middle Rose Spring	
3,000 B.P.	Early Rose Spring	PERIOD III
4,000 B.P.	Little Lake	
5,000 B.P.		
6,000 B.P.	(Owens Lake II)	
7,000 B.P.		PERIOD II
8,000 B.P.		
9,000 B.P.	(Owens Lake I)	

Figure 10. This figure illustrates the developmental scheme proposed for the Owens Valley (Lanning 1963:278).

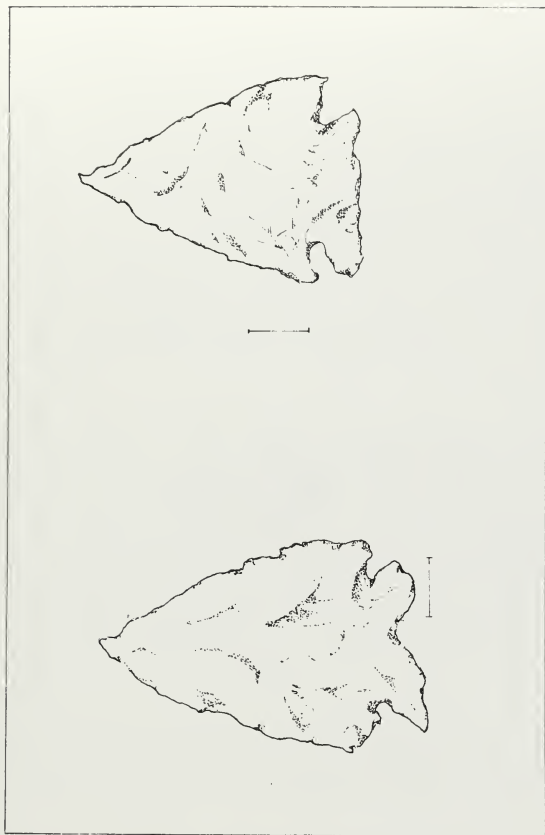


Figure 11. This figure illustrates the general shape and size of Elko Corner Notched and Elko Eared types of projectile points. Scale mark equals one centimeter.

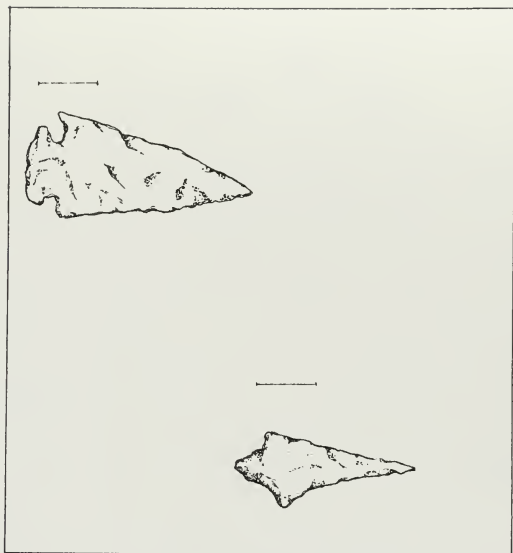


Figure 12. This figure illustrates the general shape and size of Rose Spring Contracting Stem and Rose Spring Side Notched types of projectile points. Scale mark equals one centimeter.

Side Notched, the Rose Spring Corner Notched, the Rose Spring Contracting Stem, an aberrant form with a rounded stem, an aberrant single shouldered form, and a general unclassified category (Lanning 1963:252).

Any discussion of the termination of Period III must deal with the potential for a pre-ceramic Yuman or Shoshonean complex. Donnan identifies what he terms a "Non-ceramic Yuman occupation" which is characterized in this period as consisting of the same artifacts as the later ceramic tradition pattern but without the ceramics (Donnan 1964:11). Rogers proposed this possibility in 1945 by associating the remains of the early ceramic-bearing Yuman patterns with both the Amargosan and the La Jolla patterns which preceded it.

Evidence for a pre-ceramic phase of the ethnographically known groups of the area has little supportive evidence. Donnan believes that the results of the Rustler's Rockshelter and Southcott Cave excavations ". . . seem to fit the description of Rogers' non-ceramic Yuman assemblage" (Donnan 1964:11).

A non-ceramic Yuman and Shoshone horizon has been proffered for the San Diego coast as well (Ezell 1974; Moriarty 1966), but in each case, little supportive evidence exists. The lack of evidence supporting a pre-ceramic Late Prehistoric occupation does not, of course, negate its existence. As will be discussed below, the relationship of the potential language groups with archaeological evidence may indicate a fairly continuous occupation for interior Southern California. In this case, a pre-ceramic component would accompany any ceramic assemblage. Present evidence is scarce, however, for the actual development and use of ceramics in the Far Southwest.

Another pattern of particular interest is the Amargosa Industry, defined by Rogers (1939:61-69) as occurring in the north-central part of the Mojave Desert. He separates the pattern into two phases, Amargosa I and Amargosa II.

Amargosa I sites are located in three general areas: the centers of playas, playa margins, and sandy silt elevations above water holes. All Amargosa II materials are located in sandy terrains in the vicinity of springs, water holes, or playas where water can be readily obtained (Rogers 1939:61).

Wallace describes the two phases of the patterns as follows:

Only a few details concerning the Phase I assemblage are known. Five classes of artifacts are ascribed to it with the most noticeable feature being broad, corner-notched dart tips with squared bases, not unlike those in use during Basketmaker times in the Southwest. Material objects other than points comprise blades, drills, flake scrapers, and slate pendants. Presumably absent are seed grinding implements of any sort. . . . Rather more is known of the younger Amargosa stage. Its distinctive characteristic in the beginning consists of dart points with long slender blades and corner notches. Later these give way to arrowheads demonstrating that the bow and arrow superseded the dart and throwing board sometime during Phase II. . . . Other artifacts which continue on without appreciable change in shape from Phase I times include knives, drills, flake scrapers, and slate pendants. Handstones and milling stones are definitely present (1962:176).

A point of key importance at this time is the existence of milling equipment in the Amargosa assemblage. The fact that Rogers did not associate milling with the Phase I variant and did with Phase II suggests the placement of this pattern at the interface of Period II and Period III. The possibility that the differences observed between Phase I and Phase II result from functional rather than temporal variance is not addressed in detail. While the definition of the variants also incorporates the introduction of the bow and arrow, it is still possible that the variation is a result of nontemporal factors.

Amargosa materials have been reported from Owens Valley (Riddell and Riddell 1956) and near Little Lake at Fossil Falls (Harrington 1957:193). It is possible that materials characteristic of this assemblage are located in the Death Valley region, as Hunt and Wallace suggest (Hunt 1960; Wallace 1958).

The concept of the Amargosa Industry has received little attention in the literature. It is discussed here because of its definition in the nearby Mojave Desert. Its significance to the prehistory of the study area is, however, questionable. It is felt that the general framework developed through work at Little Lake, China Lake, Panamint Valley, and Rose Springs will provide the necessary basis for evaluating the variation presently recognized in the local archaeological record. This foundation can be used through other archaeological studies, such as those at Warm Springs, Coville Rock Shelter, and the Cottonwood site, to further refine the understanding of the area.

E. PERIOD IV: CERAMIC HORIZON

The fourth period under consideration begins with the ceramic horizon and continues until Euro-American contact. It is characterized by a variety of additions to the assemblage, including ceramics, Cottonwood and Desert Side Notched projectile points, and the use of the mortar and pestle. It is this period that is most usually associated with historically recorded occupants of the area, linguistic and ethnographic concerns being often applied to this period.

This period has been referred to as the Late Prehistoric (Hester 1973; Wallace 1955), the Prehistoric Yuman Shoshonean (Wallace 1962), Yuman and Shoshonean Horizon (Donnan 1964) and the Pottery Archaic (Davis 1978a, 1978b). When dealing with this period of prehistory, it must be emphasized that while there are obvious correlations between this construct and the cultural events with which it deals, there is not a direct correlation. The use of the ceramic horizon as a time organizational tool does not require the assumption of two distinct cultural groups. Different assemblage characteristics cannot necessarily be equated with different cultural systems. The introduction of ceramics does represent a significant change in the material assemblage of the western Great Basin occupants but does not require a new group. This is stressed at this time because of the difficulties arising from a potential "pre-ceramic Yuman or Shoshonean" occupation of the area. Such a period has been suggested by Rogers (1945) and Donnan (1963) and cannot be totally refuted here. As discussed above, it is possible that the Cottonwood/Desert Side Notched horizon preceded the ceramic horizon or that the Rose Spring/Eastgate point series represents an early pre-ceramic Yuman pattern, but little supportive evidence exists.

Dates for the ceramic horizon have varied according to different authors but center around 1,000 B.P. The various dates include 950 B.P. (Hester 1973; Wallace 1977), 1,050 B.P. (Rogers 1945), 1,100 B.P. (Bull 1978), 1,150 B.P. (Donnan 1964), 1,950 B.P. (Rogers 1939), and 2,950 B.P. (Davis 1970). Lanning (1963:281) suggests a date of 650 B.P. for the onset of the early Cottonwood pattern and thus the appearance of ceramics in the area. Meighan feels that ". . . there was no pottery whatever in the region before about 1700 A.D." (Meighan 1953:189). This circa 250 B.P. date for the ceramic horizon at the edge of the Saline Valley represents the most recent proposed date for the introduction of ceramics in the area. The conclusion is based, however, on the assumption that the two sherds found at the rockshelter represent an early ceramic occupation; the possibility of

sampling error, functional variance, or other explanations for the lack of discovered ceramics is not adequately addressed.

The termination of Period IV occupation of the area, however, is more easily addressed. The appearance of European occupation in Southern California occurred in the late eighteenth century. Although Europeans and Americans did not visit the area until the middle nineteenth century, the impacts of the new cultural pattern were felt through established trade systems. The ethnographic knowledge of the area, however, did not begin until the early visitation to the area by Euro-Americans in the 1840s and 1850s.

Projectile points of this period are dominated by the Cottonwood series (Lanning 1963) and the Desert Side Notched series (Baumhoff and Byrne 1959) (Figure 13). Bettinger and Taylor place the appearance of the Desert Side Notched points at approximately 750 to 850 B.P. and the Cottonwood points at circa 650 B.P. (1974:20). These points occur throughout portions of the Great Basin and Southern California (Clewlow 1967; True 1966, 1970). The appearance of these point types creates some interesting possibilities for interpretation of the development of the area. While the dates on these point types are quite recent, their basal dates do overlap, to some extent, with the Rose Spring/Eastgate points of the Owens Valley (Lanning 1963). While the point distributions indicate a more recent period of use for Cottonwood and Desert Side Notched points, it is equally apparent that their uses overlap (Table 1).

This, of course, suggests some sort of continuity between Rose Spring points and the later Period IV points. The presence of Period IV points, Marana period, with the general absence of Haiwee period points, Rose Spring/Eastgate, in the Colorado Desert area and western Southern California further complicates the picture.

There are several possibilities for this distribution. If the Cottonwood and Desert Side Notched points are culturally related to the Rose Spring points and if the lack of a Rose Spring series is maintained for the Colorado Desert and western Southern California, it is possible that the Owens Valley area marks the developmental center of the series. As will be discussed below, this can be coordinated with a proposed explanation for the linguistic development of the area.

Several possibilities can be suggested for the development and dispersion of the Cottonwood and Desert Side

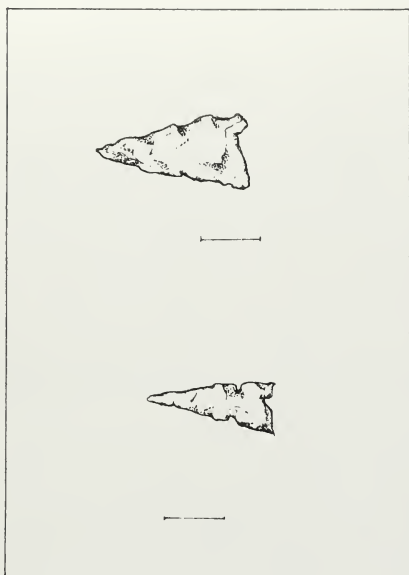


Figure 13. This figure illustrates the general shape and size of Desert Side Notched and Cottonwood Triangular types of projectile points. Scale mark equals one centimeter.

TABLE 1
DEPTH DISTRIBUTION OF PROJECTILE POINT TYPES
AT Iny-372¹

Type	Depth								Total
	0-12 (in.)	12-24 (in.)	24-36 (in.)	36-48 (in.)	48-60 (in.)	60-72 (in.)	72-84 (in.)		
Humboldt Concave Base	--	--	--	--	--	--	2		2
Little Lake Series	--	--	--	--	--	2	5		7
Large Triangular	--	--	--	--	1	3	1		5
Elko Series	--	--	1	1	2	4	3		11
Gypsum Cave	1	--	--	--	2	--	1		4
Silver Lake	1	--	--	--	--	--	--		1
Rose Spring Series:									
Side Notched	7	9	4	2	--	1	--		23
Corner Notched	9	14	17	3	1	3	--		47
Contracting Stem	5	5	8	--	--	--	--		18
Aberrant forms	1	1	4	--	--	--	--		6
Unclassified	1	1	2	--	--	--	--		4
Cottonwood Triangular	19	6	4	1	--	--	--		30
Eastgate Expanding Stem	--	--	2	--	--	--	--		2
Desert Side Notched	5	3	1	--	--	--	--		9
TOTAL	<u>49</u>	<u>39</u>	<u>43</u>	<u>7</u>	<u>6</u>	<u>13</u>	<u>12</u>		<u>169</u>

¹Source: Lanning (1963:254).

Notched points. The overlap of these series with Rose Spring/Eastgate at Iny-317 indicates that either the former point types were introduced into the area or developed in the area. Both of these possibilities have interesting implications. The potential for the adoption of new point types in the area would indicate the development of a new contact. While Cottonwood and Desert Side Notched points can be found throughout the Southwest, Rose Spring/Eastgate points have only a limited range. If contact had existed between the creators of these point types for an extended period, some trait flow would be expected in both directions. For this reason, it would be expected that the contact between the two groups was rather sudden. In addition, it may be possible to suggest some potential intersocial relationships between the two groups to account for the decidedly one-sided exchange.

If the point types developed in the area, the lack of Rose Spring/Eastgate points would be a result of differential temporal expansion and contact of occupants of the desert west. Again, if the spread of the artifacts were migration born, a rapid expanse of population must be considered. In addition, the development of substantially different intersocial relationships would have to occur.

In order to evaluate the nature of cultural development, the information base must be expanded. As previously noted, the similarities of the Period IV occupation of the area with the ethnographically recorded occupation have resulted in an extrapolation from the ethnographic present to Period IV archaeological patterns. While this has its difficulties, certain types of ethnographic information can be employed in the evaluation of the archaeological record. Perhaps the most valuable of these is the linguistic structure of the area.

The use of linguistic evidence for prehistory is more tenuous than the more substantial cultural material record, but it can provide important insight into cultural development. The result of linguistic analysis for the prehistory of an area must be viewed critically. If, however, the archaeological record and the linguistic evidence both reflect actual activities, the reconstruction proposed by one field should be substantiated by the other.

It seems apparent that when an area undergoes an intensive linguistic change (as from one stock to another), it may also undergo a corresponding change in the material remains left by the people involved. The degree to which the linguistic record is mirrored by the material remains is dependent upon several factors: first, the nature and extent

of the linguistic change; and second, the relationship between the two groups prior to the actual change. If two groups are in extended contact, their nonlinguistic elements can be assimilated while their language may remain relatively distinct (Bright and Bright 1965).

These warnings are a caution not to assume that because there are distinct language groups, there are also distinct cultural elements. It does not, however, preclude the possibility that there may be unique languages as well as unique assemblages. What cannot be assumed is a causal relationship between the two.

One other precaution must be expressed when assessing the applicability of linguistic evidence to a discussion of an archaeologically developed prehistory. The dating of past linguistic activity rests on the assumption that language changes at a relatively constant rate. That is, a specific degree of difference between languages takes a certain amount of time to establish. The quantification of this rate of change is known as glottochronology and has several recognized limitations (Hymes 1960). Although the application of absolute frequencies to linguistic change might be incorrect, the concept of a relatively constant rate of change is still a valuable tool for the assessment of prehistory.

The linguistic picture for the study area is a diverse one. Of importance to this area are three language stocks: Hokan, Uto-Aztecan, and Penutian.

1. Hokan. The Hokan stock is one of the most diverse of the American Indian language stocks, both linguistically and geographically. It ranges from the Pacific Northwest to as far south as Nicaragua. The great variation of the stock has been taken as an indication of extreme antiquity (Taylor 1961:74). Taylor feels that the time depth of the Hokan stock is great enough to make it potentially the first language group in California. This position is supported by Miller:

. . . because of the broken distribution around the edges of the area, it seems likely that the distribution was once continuous, but was interrupted by Penutian and Uto-Aztecan arrivals (1964:87).

There are three Hokan families that are of importance to this study: Yuman, Chumash, and Washo. The Yuman family extends from the Colorado River Valley across the southern portion of California and northern Mexico to the Pacific Ocean. The Chumash is limited to a portion of the

coastal region of Southern California, and the Washo surrounds Lake Tahoe.

There are presently no Hokan-speaking groups in the study area under discussion, but the relationship of the Hokan languages to the Uto-Aztec and Penutian languages has great significance to understanding the development of the area.

a. Yuman. The Yuman family consists of closely related languages spread over a 120,000-square-mile segment of the Southwest. It extends from the Grand Canyon on the north to the Valley of the Trinity on the south and from the Mescal Mountains of Arizona on the east to the Pacific Ocean on the west (Wares 1968:9).

The Yuman languages were originally combined as one language family by J. W. Powell (1891:136-138). Today, this classification includes ten languages: Walapai, Yavapai, Havasupai, Mojave, Yuman, Cocopa, Maricopa, Diegueno, Paipai, and Kiliwa (Langdon 1974:16).

Yuman was not immediately recognized as a Hokan language. When the first attempts to genetically relate the language groups which Powell defined were undertaken, Yuman was omitted for being only slightly Californian in nature (Dixon and Kroeber 1903). It was not until 1913, when Harrington suggested a genetic relationship between Yuman and Chumashan languages and the subsequent inclusion of Chumash and Salinan within the Hokan stock (Dixon and Kroeber 1919; Sapir 1917), that the Yuman languages were identified as Hokan.

The languages which make up the Yuman family exhibit great similarity, as demonstrated by examination of comparative vocabularies (Wares 1968). This similarity is indicative of a relatively recent expansion, which has been dated at "probably less than two thousand years ago" (Miller 1964:90). Further, Miller (1964) feels that Proto-Yuman could easily have occupied a much smaller territory than the present-day descendants.

Howard Law (1961) believes that the Proto-Yuman speakers are native to a desert area similar to their present location, which is primarily in the lower Colorado River Valley. This would seem to indicate that the Yuman languages expanded from the desert, the Colorado River Valley, about 2,000 years ago.

b. Chumash. The Chumash languages are situated on a coastal area of Southern California from San Luis Obispo County on the north to Ventura County on the south and from the Pacific Ocean inland up to 60 or 75 miles at the broadest point. Powell (1891) unites six languages within the Chumash family: Ventureno, Barbareno, Inseno, Purisimeno, Obispeno, and Island. Dixon and Kroeber (1903) group Chumash and Salinin into a "Southwestern group." This group was later labeled "Iskoman" and set up in relation to another new stock, the Hokan. Dixon and Kroeber later reassessed their position and proposed that Iskoman was, in fact, a part of Hokan (1903). Unlike their linguistic cousins to the south, the Yumans, the Chumash vocabulary is relatively maritime in orientation (Henshaw 1955), suggesting extensive association with the sea.

c. Washo. The Washo family consists of a single language, Washo. Its territory straddles the California and Nevada border and surrounds Lake Tahoe (Langdon 1974:16). Sapir (1921) includes Washo within the Hokan stock.

2. Penutian. The Penutian language stock is situated in the central portion of California and consists of five main languages: Wintun, Maidu, Miwok, Yokut, and Costanoan (Kroeber 1925). Its central position is of extreme importance to the reconstruction of prehistoric linguistic activity. Taylor (1961:75) proposes that the entrance of the Penutians resulted in the breaking up of the "Basin-California Hokan-speaking continuity." Hopkins (1965:56-58) agrees that it was the intrusion of the Penutians that resulted in the disruption and subsequent peripheral positioning of the Hokan language families. Hopkins places the initiation of this intrusion at about 10,000 years ago, at the onset of the Altithermal.

3. Uto-Aztecan. Situated between Chumash, Yuman, and Washo speakers are languages of the Uto-Aztecan language stock. This stock is spread throughout western North America and encompasses several distinct families. The linguistic distance--time depth--between these families is much less than among the Hokan stock, with linguists dating the initial expansion of the Uto-Aztecan at around 3,000 B.P. (Goss 1968).

Eight language families have been identified for this stock; four major families have been identified for the northern aspect of the Uto-Aztecan linguistic stock: Numic, Tubatulabalic, Hopic, and Luisenic. A variety of dates have been proposed for the separation of these families.

Goss dates the separation of the Luisenic from the main body of Uto-Aztecan at about 2,500 B.P. He proposes an Arizona-Sonora border origin for the Uto-Aztecan, with the initial breakup of this group beginning about 5,000 years ago. Goss hypothesizes the separation of the ancestors of Tubatulabal, Numic, Luisenic, and Hopic from the main group and their migration northward at approximately 4,000 years ago. He feels that the separation of ancestral groups of the Luisenic and Hopic from the Tubatulabal and Numic occurred around 3,000 years ago, which was immediately followed by the separation of Hopic and Luisenic groups (Goss 1968:17).

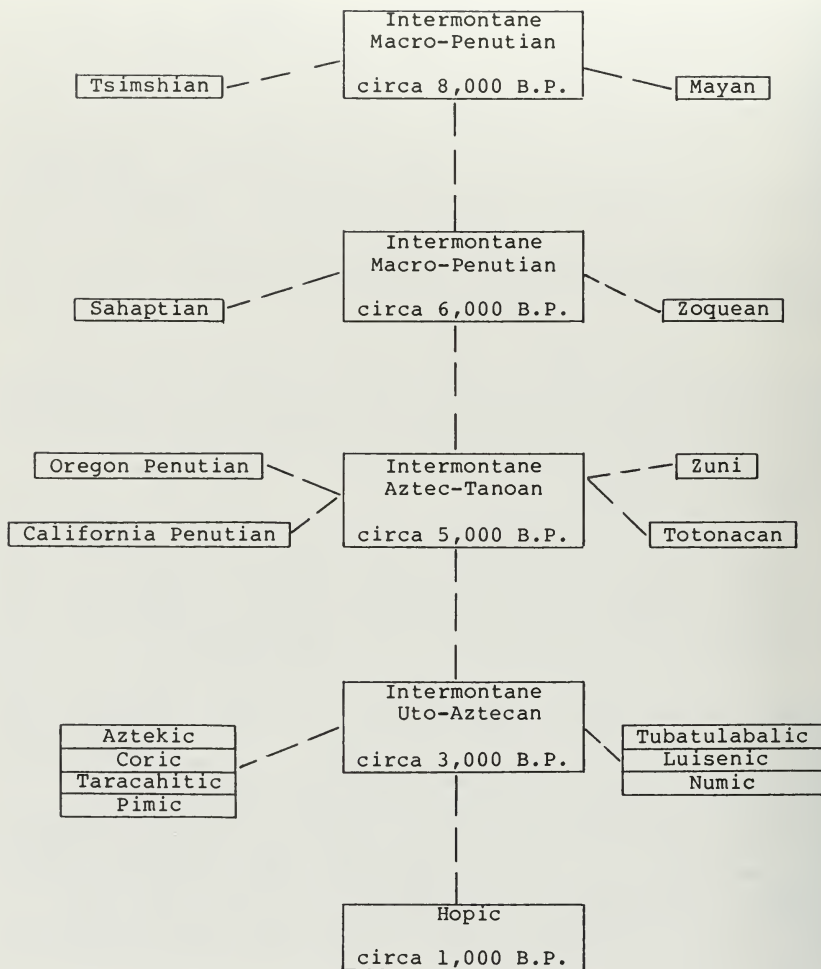
Lamb (1958) also suggests that the initial breakup of the Uto-Aztecan languages occurred 5,000 years ago somewhere around the Arizona-Sonora border.

More recently, Goss has reevaluated his position and now believes that ". . . there is no evidence that anyone but ancestral Uto-Aztecan have held the major portion of the Great Basin, Colorado Plateau, Central Rockies and Southern Sierra Nevada since original settlement" (Goss 1978). In his 1977 article, Goss critically evaluates the generally accepted Lamb model.

[The Lamb] model quickly became dogma and a large group of linguists and anthropologists (Gunnerson 1962; Hopkins 1965; Miller 1964; Goss 1968; Fowler 1972; and Fowler, Madsen and Hattori 1973), including myself, began shuffling data to fit this model and rejecting that which did not fit (Goss 1977:60).

In light of this "blind acceptance," Goss proposes an alternative explanation. This model is based around the development of an Intermontane Macro-Penutian dialect in the Great Basin (Figure 14) and accounts for the development of the various languages within the present locational framework. In this presentation, Goss suggests that Yuman speakers have occupied the same general territory for the past 10,000 years, as have the Washo speakers. This would be supportive of Law's suggestion (1961) that the Yuman languages have developed in association with the Colorado River for an extended period of time. It would also permit the potential Southern California Hokan group tentatively proposed by Langdon (1974).

What becomes of key importance for understanding the prehistory of the Saline, Darwin, Eureka, and Panamint Planning Units is the potential for a point of origin along the Arizona-Sonora border. The explanation presented by Goss (1977) would not stress this area but places the point of



Present Language Configuration

Figure 14. Illustration of the language developmental relationship proposed by Goss (1977) for the Great Basin.

origin in the Intermontane region of the Great Basin. Acceptance of Goss' explanation would entail continued linguistic development within the Great Basin and not permit the assessment of any of the archaeological horizons discussed above in accordance with a major linguistic change. The Lamb explanation does provide for a substantial cultural change in the study area with the divergence and intrusion of the Numic family approximately 4,000 years ago.

In either explanation, the linguistic continuity of the present study area seems assured for minimally the past 1,000 years, and the potential divergence of the Numic, Tubatulabalic, Hopic, and Luisenic approximately 3,000 to 4,000 years ago. The latter date could potentially correspond to the appearance of the Late Prehistoric Period identified on the coast of Southern California (Bull 1977; Madsen 1975; Wallace 1955). This would then precede the expansion of the Yuman-speaking populations from the Colorado Plateau.

The placement of Uto-Aztec speaking groups between the Washo, Chumash (Southern California Hokan), and the Yuman families would aid in explaining the great apparent difference in these language groups.

Direct implications for the work done in the study area are numerous. Perhaps the most interesting is the potential for a development point of the Cottonwood and perhaps the Desert Side Notched projectile points. Such a northern Mojave position of development would explain the relative position of Rose Spring points and Period IV points. In addition, it would suggest that Cottonwood points were developed by Uto-Aztec populations and were subsequently adopted by Yuman groups.

There are several potential testable hypotheses for this explanation. If the explanation provided by Goss is correct and if the development is reflected in the archaeological record, several things would be expected to occur. First, it would be expected that the Uto-Aztec populations expanded from the Great Basin prior to the expansion of the Yuman speakers. This would result in a potentially detectable series of traits. One would expect the representatives of the Hopic pattern to have older dates than sites of the Luisenic pattern. Older Period IV dates should exist in the interior of Southern California than on the coast. Additionally, there should be older dates in northern San Diego County, Orange County, southern Los Angeles County, and Riverside County than there are in northern Mexico, southern San Diego County, and Imperial County for Late Prehistoric sites.

Furthermore, given Goss' explanation, no major occupational hiatus would be expected for the general desert areas. While it would be quite possible that microenvironmental factors would influence the occupation of a single area, the region as a whole should have consistent occupancy.

The explanation provided by Lamb can also be evaluated archaeologically. If the Numics arrived in the Death Valley area approximately 4,000 years ago and developed from there, a major shift in the archaeological record of the area would be expected to be detectable, either a marked change in the patterns reflected or in the lack of materials prior to the proposed intrusion date. Using the Lamb explanation, it would be possible to have a major occupational hiatus, but this would most likely occur prior to 4,000 B.P.

Needless to say, this report is not able to fully evaluate the archaeological reliability of either of these basic propositions. The archaeological record might not reflect either explanation when one may in fact be correct. The archaeological record does, however, present some clues.

An occupational hiatus has been proposed for the western Great Basin immediately preceding 4,000 B.C. (5,950 B.P. (Hester 1973:128). As was discussed above, there is little support for such a gap. This stems, for a large part, from the lack of information available concerning this period of prehistory. The appearance of Pinto Basin materials around 6,000 B.P. could possibly reflect a Numic appearance in the area, but substantially earlier than that proposed by Lamb.

The association of Rose Spring points and later Cottonwood points in this area and the lack of the earlier series in the Colorado Desert or coastal Southern California would support the Goss explanation.

While neither explanation is presented on a geographically refined area small enough to permit evaluation of specific changes within the study area, the implications drawn for the Great Basin and Southern California areas at large have substantial impacts for the Panamint, Saline, Eureka, and Darwin Planning Units. The nature of the relationship between the Mono speakers of northern and central Owens Valley and the Koso of the Panamint Valley, Saline Valley, and southern Owens Valley may, with additional study, have application to the prehistory of the region.

The nature of the association between both of the languages and Tubatulabal further to the west could have substantial ramifications. Lamb (1958:98) feels that Monachi-Paviotso and Panamint Shoshone were more closely related than either was to Kawaiisu-Ute, the languages to the south. Furthermore, he claims that Kawaiisu-Ute shared certain features with Tubatulabal which are not found in the other two language groups.

Goss takes exception to this position, questioning the evidence on which Lamb's conclusions are based, stating:

Lamb doesn't tell us what the certain structural features of resemblance between Yutish and Tubatulabal are. I do not know what they are, although I have spent some time comparing the Ute and Tubatulabal materials since 1961. There is a direct counter argument for his statement that Monachi-Paviotso and Panamint-Shoshone are closer to each other than either is to Kawaiisu-Ute. Freeze and Iannucci (1974) have recently produced a comparative study which indicates that Panamint-Shoshone and Kawaiisu-Ute are closer to one another than either is to Mono-Paviotso (Goss 1977).

The relationships between these languages are one element of evidence for understanding the prehistoric development of the area which must be evaluated in any future research done. The importance of linguistic affiliation to archaeological interpretation is clear both in the terminology used, "Non-ceramic Yuman," Yuman Shoshonean Horizon, and in the ultimately derived explanations. Explication of this relationship should be paramount in any discussion, rather than assumed.

Consideration of the introduction and spread of Cottonwood and Desert Side Notched points and the expansion of linguistic families can be augmented by a third component of the cultural record. The ceramic tradition is the element that characterizes this stage. Its introduction and distribution can provide additional information about the movements of populations and the nature of sociocultural relationships of the late occupants of the area.

The ceramics of the study area are dominated by Owens Valley Brown Ware. This type was originally defined by Riddell (1951) in his report on a Paiute village site in Owens Valley. This type is distinguished from Tizon Brown Ware which has been identified in the south. May (1977)

includes the ceramics of the study area within a category labeled Panamint Brown and associates this type within a ceramic series termed the Mojave Series. He describes them as ". . . typically medium to thick walled vessels with medium to coarse crushed sands of feldspar and quartz. Carbon streaking is common (May 1977:16).

Little is known about the ceramics of the study area. The dates for the ceramic horizon have been summarized above. Spread of the "crude" ware series which occurs through Southern California has received little documentation because of the limited number of absolute dates and the minimal attention the ceramic types have received.

In Southern California, it is proposed that production of ceramics developed from the Colorado River region outward. This would mean that ceramics were introduced into the study area from the south at a relatively late date. Restriction of ceramics to the upper three levels, and therefore to the upper two levels at the Rose Springs site, suggests a later introduction of Owens Valley Brown Ware than the appearance of Cottonwood and Desert Side Notched points. Evaluation of the distribution of locally made ceramics in the study area may aid in evaluating the complex lines of cultural influence between the Owens Valley region and the desert Southwest. May's work on these ceramic types may provide some of the information necessary to evaluate this problem. At the present time, only the presence and absence of ceramics can be used as an integrative device.

F. PERIOD V: ETHNOGRAPHY

1. Introduction. Knowledge of ethnographically recorded Native American use of the land is helpful in identifying the likely location of cultural resources and, once located, aids in their interpretation. Archaeologists often derive models for interpreting the past from ethnographic sources; however, ethnographic analogy is only one approach to interpreting the past and cannot be used uncritically. This is especially true within the study area because there have been dramatic changes in both human adaptations and environments through time. The fact that such change has occurred is well documented for the region surrounding the study area and has been discussed most recently by Davis (1978b). It is therefore considered inappropriate to rely too heavily on models derived from the study of more recent hunting and gathering peoples, such as the Koso, and apply them to people who lived in the study area thousands of years ago when quite different environments existed. As a general rule, the applicability of ethnographic analogy decreases with an increase in time. Nonetheless, a review of the ethnography is in order because through such study insights may be derived regarding late prehistoric adaptations and the significance certain places have for living Native American peoples.

It is difficult to provide any specific date for the end of the late prehistoric and beginning of the historic period in the study area. The Walker party visited nearby Owens Valley for the first time in 1834, and during the period of the 1840s to 1860s, sporadic Euro-American-Native American contacts occurred with the influx of explorers and the later 49er and immigrant parties. Bettinger (1975a:203) does not feel that such contacts in Owens Valley had crucial impacts on Native Americans in the area. These people had already had access and exposure to Euro-American products through the trans-Sierra trade with groups to the west. Bettinger (1975:203) places the beginning of the historic period with the sustained presence of Euro-Americans in Owens Valley, around 1860. This occurred when cattle were first brought into the valley in numbers and the first Euro-American settlements were established. These factors combined to irreversibly change Native American economic and social patterns and made Euro-American goods widely available to Native Americans (Bettinger 1975:203).

Reliable written accounts concerning Native American lifeways in the area are not abundant for the late nineteenth century, and ethnographic recording of Native American lifeways in the area did not really begin until the 1890s.

Fortunately, the western Great Basin has received considerable attention, and a substantial body of literature exists relating to the ethnography of the study area. A good part of this literature, however, relates primarily to people in the Owens Valley to the west of the study area and to people of Death Valley east of the study area. Nonetheless, important observations of Native American lifeways within the study area have been made by a number of authors prior to the turn of the twentieth century, such as Coville (1892), Dutcher (1893), and Nelson (1891). Kroeber's handbook (1925) provides a brief synthesis of information existing at that time relating to the study area. The most important and comprehensive ethnographic work directly related to the study area was done by Julian Steward in the 1920s and 1930s (Steward 1933, 1936, 1938). His work has resulted in a series of publications with detailed information about lifeways throughout the western Great Basin. Steward's 1938 publication, Basin-Plateau Aboriginal Sociopolitical Groups, remains a landmark study and is the foundation upon which many later works have been built (Thomas 1973). A review of the history of ethnography in the Great Basin as a whole is provided by Baumhoff (1958). One of the best recent reviews of the history of Great Basin ethnography is in Fowler (1977), Ethnography and Great Basin Prehistory. This review discusses the many sources of ethnographic information of pertinence to the study area and relates its usefulness to archaeology. The study area is therefore not unknown ethnographically.

2. Peoples of the Western Great Basin. Several Native American groups have been identified and described in the western Great Basin. Divisions between groups have been made using both geographic and linguistic criteria.

Kroeber (1925) uses the term Shoshonean for the western Great Basin people, based on language affiliation. Shoshonean is, in turn, a subdivision of Uto-Aztecan, speakers of which extend over a broad area from Montana to Panama. Kroeber divides Shoshonean speakers into four branches. The most widely distributed branch is Plateau, the branch characteristic of the study area. The other branches occurring in California and the western United States are Kern River, Southern California, and Pueblo. Kroeber further subdivides branches into divisions and groups. Table 2 depicts Kroeber's classification scheme. Of the seven groups, three (Eastern Mono, Koso (Panamint), and Kawaiisu) are known to have inhabited, or are currently inhabiting, the study area.

Following Kroeber's initial work, the linguistic boundaries of various groups have been altered to reflect additional knowledge. Figure 15 depicts the spatial distribution of groups in the vicinity of the study area.

Figure 15. This figure indicates the relative position of the three Uto-Aztecan language groups in the project area.



TABLE 2
SHOSHONEAN BRANCHES, DIVISIONS,
AND GROUPS IN CALIFORNIA¹

Branch	Division	Group
	Mono-Bannock	Northern Paiute Eastern Mono Western Mono
I. Plateau	Shoshoni-Comanche	Koso (Panamint)
	Ute-Chemehuevi	Chemehuevi Kawaiisu
II. Kern River		Tubatulabal

¹Taken from Kroeber (1925:577).

a. Paiute. The group inhabiting and/or exploiting the northern and western portions of the study area are called "Eastern Mono" by Kroeber. Their territory is described as the Owens Valley and Mono Lake region. Kroeber, however, expresses some uncertainty concerning terminology or territorial boundaries, as reflected in the quotations below.

The exact southward limits of the Mono have not been recorded, it appears. The line between them and the Koso, the next group beyond, has been drawn between Independence and Owens Lake; but it is possible that the shores of this sheet should have been assigned rather to the Mono (Kroeber 1925:586).

Eastward and northward the Mono extend indefinitely across the diagonal line that gives the State of Nevada its characteristic contour. There appears to be no consequential change of dialect and no great modification of custom. On Owens River and around Mono Lake the people are sometimes called Mono and sometimes Paiute; in western Nevada they are only Paiutes; as the center of that State is approached, the Shoshoni name Paviotso begins to be applicable. To the Paiute of Pyramid Lake they are all, together with the bands far in Oregon, one people (Kroeber 1925:586).

To the northwest, toward the Washo, the Mono boundary is formed by the watershed between Carson and Walker Rivers (Kroeber 1925:586).

In this report, the term Paiute is used as a synonym for Eastern Mono.

b. Koso or Shoshone. Kroeber distinguishes a different group inhabiting and exploiting portions of the central and southern study area. He terms this group Koso, although there are a number of other names which have been applied, including Kosho, Panamint, Shikaviyam, Sikaium, Shikaich, Kaich, Kwuts, Ssoni, and Shoshone. Steward uses the term Shoshone to refer to the same group as Kroeber's Koso. Except where quotes are involved, the term Shoshone will be used in this report.

According to Kroeber, the Shoshone inhabited a territory larger than that of any other California Native American group. Kroeber considers the boundaries of this territory as uncertain but provides the following discussion.

To the west the crest of the Sierra has been assumed as the limit of the Koso toward the Tubatulabal. On the north were the eastern Mono of Owens River. Owens Lake, it seems, should go with the stream that it receives; and perhaps Koso territory only began east or south of the sheet; but the available data make the inhabitants of its shores "Shoshones" and not "Paiutes."

It is only known that at least four successive ranges, with the intervening valleys, were the portion of this people--the Coso, Argus, Panamint, and Funeral Mountains, with Coso, Panamint, and Death Valleys. Thirty years ago they actually lived at four spots in this area--on Cottonwood Creek, in the northwestern arm of Death Valley; south of Bennett Mills on the eastern side of the Panamint Mountains, in another canyon leading into Death Valley; near Hot Springs, at the mouth of Hall Creek into Panamint Valley; and northwest from these locations, on the west side of Saline Valley, near Hunter Creek at the foot of the Inyo Mountains (Kroeber 1925:590).

c. Kawaiisu. According to Kroeber, this group lived primarily in the Tehachapi Mountains, Tehachapi Pass, Walker Basin, and probably some southern affluents of the Kern River that were possibly in Kawaiisu possession. Kroeber further states that they also owned the eastern drier slope of the mountains, and perhaps some of the desert beyond (1925:602), but the limits of their distribution are conjectural. It is known, however, that Kawaiisu inhabited the southern portions of Panamint Valley (Steward 1938).

Another group, the Tubatulabal, may have had some territorial claims in the vicinity of Little Lake. If so, the Little Lake locality was not their primary area of occupation, for the Tubatulabal inhabited the Kern River area and the mountains south and west of the study area.

It is, of course, likely that at various times in the past other groups visited, exploited, or inhabited portions of the study area, but their presence was not ethnographically recorded. In addition, written records prior to the late nineteenth century are often inaccurate or incomplete. When discussing boundaries, they should not be considered as being precise lines, as those that surround the territories of states. Rather, Native Americans in the study area moved frequently within a territory around which flexible zones existed where other groups might be encountered. Thus, two or more groups might have been inhabiting and exploiting the same general geographic area and resource.

In summary, three linguistically distinct groups have been identified as inhabiting and exploiting the study area: Paiute, Shoshone, and Kawaiisu (see Figure 15).

The Paiute territory included the Owens Valley, Deep Springs Valley, Fish Lake Valley, Eureka Valley, and the White and Inyo mountains.

Shoshone occupied the Saline Valley, the northern portion of the Panamint Valley and associated mountains, the southern portion of the Eureka Valley, and northern Death Valley. They also occupied the southern Inyo Mountains, the Coso Mountains, an area south of Owens Lake, and the eastern slope of the Sierra Nevada south of Paiute territory.

The Kawaiisu inhabited the southern portion of Panamint Valley and associated mountains, as well as territory beyond the study area to the south, east, and west.

3. Population Size. The most characteristic aspect of the three groups known to have exploited the study area is their limited population size. Steward (1938) derives population estimates from a number of sources, including Kroeber (1925) and census data from the late nineteenth century. Steward believes that population density for the western Great Basin was approximately one person to 15.6 square miles (1938:48), a figure first arrived at by Kroeber. There would, of course, be local variation in this figure dependent upon local environmental conditions. Areas that were well watered, such as Owens Valley and higher elevations west of Owens Valley which trapped precipitation, would have had a

greater population density. Figures for population density at contact are conjectural, and data from early observations and census data are subject to error. It is generally assumed that at contact population density was higher than at later times. Subsequent figures are assumed to reflect acculturation, death and disease, dislocation, and other stress factors resulting from contact with Euro-American populations.

For various geographic localities in and near the study area, Steward (1938) provides the figures presented in Table 3. For the Panamint Valley, Coville states that the population ". . . did not greatly exceed 25 individuals" (1892:352). Nelson believes that less than 100 lived in the Saline and Panamint valleys combined (1891:373). There are no ethnographic accounts of habitation of the Eureka Valley, although the valley is known to have been exploited ethnographically. The Deep Springs Paiute, and likely other groups as well, made trips into the Eureka Valley to collect *Oryzopsis* seeds. According to Steward, "Eureka Valley is almost devoid of water and seems to have had few if any permanent residents, but abundant seeds attracted Paiute and Shoshone from neighboring valleys" (1938:59).

4. Native American Lifeways. People in and near the study area essentially had an extractive rather than a food-producing economy, with the possible exception of the Owens Valley where irrigation was practiced (Treganza 1956). Dependence upon natural food resources influenced human land use and movement.

Several plant and animal species occurred in such great quantities in certain localities during short periods that, even when they were not taken cooperatively, they drew large numbers of families to such localities. Outstanding among such species are pine nuts, which were often a major factor in the location of winter villages (Steward 1938:232).

While there was considerable variation in the exploitation pattern of people both during the same year and from year to year, a general pattern was followed; therefore, at least a generalized seasonal round can be described.

For the most part, people spent the winter in a settlement located near a valley bottom by streams issuing from nearby mountains or from a spring. Winters were relatively mild on the valley floor when compared with the cold conditions at higher elevations. During the winter, people subsisted on stored food, such as pine nuts and seeds, supplemented with whatever small game could be procured. The

TABLE 3
 POPULATION ESTIMATES
 FOR PORTIONS OF THE STUDY AREA¹

<u>Location</u>	<u>Population</u>	<u>Area</u> <u>(square miles)</u>	<u>Square Miles</u> <u>per Person</u>	<u>Date</u> <u>of Census</u>
Owens Valley	1,000	2,125	2.1	1860
Deep Springs Valley	23	250	10.7	1870
Fish Lake Valley	100	990	9.9	1870
Saline Valley	65	1,080	16.6	1870
Death Valley	42	1,260	30.0	1870

¹Taken from Steward (1938:48).

amount of stored food was, of course, dependent upon the success of gathering and the amount of yield the previous year.

The most permanent association of families was at winter encampments. These were sites where certain families habitually remained during the months when vegetable foods could not be had. Necessary conditions for such sites were accessibility to stored seeds, especially pine nuts, water, sufficient wood for house building and fuel, and absence of extremely low winter temperatures. These conditions were most often fulfilled in the mouths of canyons or within the pine nut-juniper belt in the mountains, though sometimes broad valleys near fishing streams were chosen. Encampments tended to cluster with respect to mountain masses rather than valleys. But whether they were scattered at intervals of several hundred yards to a mile along streams, were situated at springs on mountain sides, or were clustered in dense colonies depended upon the quantity of foods which could be gathered and stored within convenient distance of each camp. In some places families had to camp alone; elsewhere as many as 15 or 20 could congregate in a true village (Steward 1938:232).

During February through April, stored foods tended to become exhausted and hunger was most pronounced. At this point, people began leaving the winter villages to gather the first vegetable food available and to hunt antelope and rabbits. Later in the spring (May), some went to Owens Lake to gather fly larvae, an abundant and nutritious food resource. By late spring and early summer, a variety of seeds began ripening in various areas, primarily the higher elevations surrounding a valley and the mountains. In one sense, exploitation of the seeds at higher elevations was advantageous since it permitted people to avoid the excessive heat of the valley floor characteristic of summer. Often, in both summer and fall, people from different adjacent valleys foraged in the same mountain area separating the valleys, although each gathered the seeds independently.

In most areas in and near the study area, seed exploitation required a considerable amount of travel, and information concerning the location of prolific gathering areas was sought from other families encountered. In Owens Valley, less traveling was required due to its favorable environment and successful irrigation. In early fall, people prepared for the pine nut harvest, one of the most important subsistence crops in the region. Following the harvest, most people returned to the valley floors where festivals occurred

involving relatively large numbers of people who participated in dancing, gambling, and rabbit drives.

Except in the Owens Valley, each family pursued subsistence activities independently for most of the year, but often wintered in the same village year after year. This was, however, not always the case. In the course of a normal year, a family ranged over a certain minimum area, the limits of which were dependent upon a number of factors, including the location and abundance of essential food that year and the distance possible to travel on foot with an entire family. Inhabitants of neighboring winter villages tended to forage in the same general terrain but also tended to most heavily exploit the area nearest their own village. Limitation on the food supply and poor transportation methods, before introduction of the horse, inhibited all the inhabitants of a given area from living in a single large settlement.

The greatest degree of complexity achieved by an ethnographically known group in the vicinity of the study area was to the east in Owens Valley. Within recent years, Native American agricultural practices carried out in Owens Valley have been recognized as a potential source of knowledge concerning the origins of agriculture. A recent detailed discussion of Paiute agriculture and irrigation may be found in Lawton, Wilke, DeDecker and Mason (1976). According to this publication:

The Paiute of Owens Valley had by early historic time progressed to a substantial extent along the path toward large-scale food production. They are perhaps the best instance in North America of a group that developed its own system of vegiculture--a system carried over to include irrigation of a variety of seed-bearing plants as well. The Owens Valley Paiute thus offer a better example of agricultural origins than any presently known archaeological cultures that already had domesticated crop plants (1976:43).

Owens Valley is the most well watered and richest of the large western Great Basin valleys in this area. The floor of Owens Valley lies at approximately 4,000 feet above Mean Sea Level and is approximately 100 miles long and 20 miles wide. It is bounded sharply on the west by the Sierra Nevada, some peaks of which, including Mt. Whitney, reach 14,000 feet or more. The steep mountain wall created by the Sierra is almost matched to the east by the Inyo Mountains and more northerly White Mountains, with peaks of up to

10,000 feet above Mean Sea Level. It is the Sierra Nevada, however, which is the most important factor in the environment of Owens Valley. The Sierra traps considerable moisture from storms from the west and north, and this moisture is preserved in the form of snow, lakes, and glaciers. These feed water into the Owens Valley as a series of streams which course eastward, resulting in a lush biotic environment compared to those environments further east beyond the Inyo and White mountains.

In the proximity of Owens Valley, both plant and animal resources were relatively abundant prior to environmental changes related to modern land uses. Large game animals, such as deer and mountain sheep, were available in the mountains, and in the valleys, antelope could be found. The valleys also held small game, such as rabbits, which were important. The Owens River held two varieties of fish which were a minor food source. A variety of plant foods were available as well. Edible seeds and roots were found in the foothills and valley floor, the growth of which were stimulated in places through the use of irrigation. To the west, acorns were available in the mountains, and to the east, extensive pine nut groves existed in the Inyo and White mountains. Pine nut groves located in the higher elevations throughout the study area were especially important as a food resource.

The combined diversity, reliability, and relative abundance of food resources in the Owens Valley permitted Paiute bands to form permanent villages with ownership of land, direction by chiefs, and some tendency toward matrilineal organization (Steward 1938:50-52). This contrasted with the situation faced by peoples to the east and south who had a less fertile subsistence base and faced a greater amount of travel in obtaining it.

The nature of the environment in Owens Valley permitted the Paiute to gather those items necessary for essential subsistence needs from an area within 20 miles of their villages. The territories exploited were roughly a long narrow triangle extending across Owens Valley from the crests of the Sierra Nevada to the summit of the White and Inyo mountains. Within that territory, a wide variety of resources occurred due to the differential elevation of different life zones.

The territories and settlements were primarily related to the streams emanating from the Sierra. Villages were situated on each feeder stream along the lower edge of alluvial fans which spread out from the mouth of each canyon.

These localities were favorably disposed for access to water and centrally located in relation to the resource base. Archaeological evidence also suggests that habitation occurred along the valley bottom. Settlements are mapped by Steward (1938), depicting settlement patterns (Figure 16)

Although a variety of plant food was exploited in Owens Valley, various seeds and nuts were most important. Near settlements, irrigation was practiced to aid in the productivity of seed plants, thus playing an important role in achieving an additional food supply. According to Steward (1938), a family could harvest seed crops from anywhere on irrigated land. In the southern portion of the Owens Valley, irrigation was the responsibility of the chief, and he either built the irrigation system himself or enlisted the aid of others.

Besides irrigated seed crops, pine nuts gathered from groves in the White and Inyo mountains were especially important.

When gathering [plant] foods, group endeavor might bring the pleasure of companionship, but it did not increase the per capita harvest. In fact, because few plants other than the pine nut grew in dense and extensive patches, it usually decreased the harvest. As food shortage was always a real danger it was necessary that families harvest alone or in the company of not more than one or two other families. A woman harvested exclusively for her own family. The only collective activity connected with plant foods was irrigation in Owens Valley and occasional sowing of wild seeds in central Nevada (Steward 1938:231).

Trips to pine nut groves were made in the fall. The trip was planned and announced by the band chief several days before the trip, and the entire band participated in the harvest. When the pine nut groves were reached, each family went to its own plot to accomplish the harvest. When the harvest was completed, some pine nuts were carried back to the settlement below and others were cached and recovered later as needed. Occasionally, if the harvest was especially productive, people might remain in the mountains for part of the winter.

For the most part, the Owens Valley Paiute collected food from within their own territory. An exception occurred when people were asked to participate in a communal hunt elsewhere or were asked to gather vegetable foods in another group's territory.



Figure 16. This map, taken from Steward (1938), illustrates settlement patterns, villages, and subsistence areas of the Death Valley and Owens Valley regions.

A number of animals were hunted both communally and independently.

Hunting was the complement to harvesting. Game provided not only essential foods but skins for clothing and materials for certain implements. Most hunting was also on a family basis. Small species, such as rodents and insects, were taken by both men and women. Large game was usually taken by men, while women gathered plant foods. A hunter was obligated, however, to share large game with other members of the village. Thus a family was able to provide most of its wants without assistance. But in time of dire need other families came to its aid if possible.

But the family was not always the maximum economic unit in hunting. When taking buffalo, antelope, rabbits, deer, mountain sheep, and, under certain conditions, water fowl, fish, and even insects, collective effort increased manyfold what an individual hunter could have procured. The duration of such hunts and the profitable number of participants depended upon special conditions in each case. Among the Western Shoshoni and many of their neighbors game was so scarce that these hunts usually lasted only 1 to 2 weeks and never more than 6 weeks. Participants rarely numbered more than two dozen families (Steward 1938:231).

In Owens Valley, communal rabbit hunts were especially successful on the flat portion of the valley along the river. In carrying out a rabbit hunt, a large group of people was needed and considerable planning was necessary. The majority of the people would beat the brush, driving rabbits ahead of them into long nets. Once trapped, the rabbits were killed by net attendants. One to three nets were used, each of which was supervised by its owner. In the southern part of the Owens Valley, the band chief was responsible for planning and ensuring that the hunt was a success. Communal rabbit hunts ordinarily occurred in association with the pine nut harvest in the fall.

Communal hunts for both deer and antelope were also under the direction of the village chief. The method for taking antelope was similar to that of taking rabbits. According to Steward:

The antelope hunt director announced the hunt several days in advance. Antelope were driven by 8

or 10 men, perhaps aided by fire, into a corral built of posts spaced about 20 feet apart and covered with brush. The corral had a wide opening but no wings. As the animals milled around inside, archers stationed between the posts shot them (1938:82).

When hunting deer, the older men hid along game trails and shot the deer driven toward them by younger men.

Mountain sheep were also hunted communally. Dogs were used to help drive the animals onto cliffs where they were an easy target for armed hunters. In cases of communal hunting, the meat was generally shared by all. Large game obtained by a solitary hunter was also shared by members of the band.

In the southern portion of Owens Valley, hunting territory was not band owned. Men customarily hunted near their own settlements but were permitted to hunt anywhere they chose. In the Fish Springs area, individuals were permitted to hunt anywhere; however, communal hunting by outside groups was not acceptable unless they participated with the ownership group.

Each village or cluster of villages represented a band. The band was unified and interdependent, marked by cooperation of its members in a number of activities, such as rabbit and antelope drives, and participation in festivals and other ceremonies. Owens Valley groups had more or less well defined seed gathering areas including irrigated plots. Different bands might occasionally participate in joint ventures, such as communal hunts, but united for this purpose only temporarily.

Relationships between bands were generally non-antagonistic, and there is little evidence of warfare among themselves or with their neighbors. Limited disputes might occur, but these were not ordinarily solved through killing or organized fighting. Disputes that did occur, either among people within a band or between bands, often focused on ownership and use of resources, such as a seed plot or pine nut grove or cache. Fights might occur, as well as feuds, but seldom were there any serious injuries. Magic might be used to inhibit trespassing by others onto owned resource areas. On the other hand, owners might and did invite other persons to harvest food on their plots, even people from other bands.

. . . warfare was virtually unknown. Shoshoni never fought one another except in family feuds which somewhat disrupted group unit. Upon rare occasions

Shoshoni fought their Paiute neighbors, but no organization was entailed (Steward 1938:238).

In the fall, bands participated in festivals after the pine nut harvest was completed. The sponsoring group sent out invitations by runner and acceptance of the invitation was optional. Fall festivals involved interband visiting with dancing, gambling, and rabbit drives being the major activities.

Festivals were made possible in most of the western area by the temporarily increased food supply produced by rabbit drives, pine nut trips, antelope hunts, or other communal economic affairs. The essential motivation of festivals, however, was non-economic. People desired social intercourse with friends and relatives rarely seen during the remainder of the year. They wished to dance and gamble, and, in some localities, to hold religious observances. Some of these activities, like the dances, were developed in the area. Others, like the games, were probably introduced from neighboring areas at a remote time (Steward 1938:237).

When one band decided to have a festival, people came from miles around, and there was an effort made to avoid scheduling a festival to conflict with a date set by another village. Larger settlements often alternated in sponsoring a festival.

The size of groups united by festivals rarely exceeded that produced by communal economic undertakings. In the Western Shoshoni area festivals could be held only at times of communal hunts or when many families were gathering pine nuts or other species at a certain locality. They merely provided an additional motive for assembling together. Owens Valley bands seemingly held special gatherings for festivals. In providing an extra occasion for band activity, festivals enhanced band solidarity. But, as neighboring bands were often invited, temporary organization greater than the band was sometimes achieved (Steward 1938:237).

Fall was also the time customary for an annual mourning ceremony. This ceremony was intended to commemorate deceased relatives and end the year of mourning, during which relatives of the deceased were required to observe taboos on the eating of meat and grease, washing, and participating in festivals. The commemoration was carried out by ceremonially

burning articles saved for the occasion, along with some new articles obtained specially for the ceremony. Each ceremony was led and organized by the band chief, and people from neighboring villages and bands frequently attended.

Another institution important to male members of the band was usage of the communal sweathouse. Many activities, both sacred and secular, focused around the sweat-house. While sweating, men would pray, and when finished dive into a nearby pool of water. On other occasions, the sweathouse functioned as a place to gamble, a clubhouse, and a dormitory.

The permanent sweathouses throughout the Owens Valley indicate that a relatively stable subsistence situation existed. In less productive areas where settlement was less permanent, individuals built smaller sweathouses which were used only for sweating.

There was no organized religion among people in the study area in the sense of a priest holding a full-time, definite office. There were, however, shamans or doctors, such as antelope shamans who took part in communal antelope hunts, but this person did not function in a full-time capacity (Steward 1955:114).

The relationship between human beings and supernatural power was considered largely a matter of individual rather than group concern. The exception to this was the circle or round dance which, according to some groups, promoted general welfare. A shaman, however, was not a necessity in order to have group ceremonies (Steward 1955:114).

It was recognized that shamans had the ability to cure sickness and had knowledge beyond the ordinary person. When curing took place, the event might attract a number of people because they liked to watch the shaman's singing, trance, dancing, and laying on of hands and they enjoyed visiting other families. A group, however, was not required to effect a cure (Steward 1955:114). Shamans were influential because their special knowledge and curing abilities gave them prestige. On the other hand, there was also an element of fear because a shaman might also be capable of practicing black magic. A shaman still had no specific authority (Steward 1955:114).

The position of band chief was one of some importance as it carried with it a number of responsibilities. These responsibilities included the establishment and maintenance of irrigation systems, leadership in festivals,

hunts and ceremonies, and planning and executing the fall trip to the mountains for pine nuts. The chief was also responsible for establishment and maintenance of the sweat-house, for inviting other bands to participate in group activities, and for serving as a host.

Small villages, whether or not comprised of related families, had no formal chiefs.

Many larger villages, however, had a single headman. His title, degwani or dagwani, means "talker" and truly designates his most important function. "Chief" usually connotes extensive authority and perhaps should not be applied to these men, though it has been used in this paper. The headman was usually experienced though not necessarily old. Infirmary disqualified him. His task was principally to keep informed about the ripening of plant foods in different localities, to impart his information to the villagers, and, if all the families traveled to the same pine-nut area, to manage the trip and help arrange where each was to harvest. As a "talker," he gave long orations, telling of his information and giving directions to families who cared to cooperate. His authority, however, was not absolute. Any family was at liberty to pursue an independent course at any time (Steward 1938:247).

The chief might be succeeded by his son, provided he had leadership qualities, persuasiveness, intelligence, and wisdom. If the chief was instead succeeded by his brother, another male member of his family, or a nonrelative, popular support was necessary for the new chief to function successfully. Chiefs had no formal assistants or retainers. Rather, he led with the assent of the people on a cooperative basis.

The importance of kinship in village control decreased in proportion to the village size. When single kin groups did not comprise the majority of the population they ceased to dominate the village. The leaders of communal festivals and hunts served without regard to family ties (Steward 1938:239).

Organization superseding the village was only temporary among Western Shoshoni. It involved specific communal endeavors of limited duration and specialized leadership which pertained only to such endeavors. Several of these activities were economic. Rabbit drives brought the members of

several adjoining villages to a certain place where they drove under the direction of a skilled rabbit hunter. Antelope drives similarly entailed joint effort, but the leader acquired authority by the accident of having received a vision for the power of antelope shamanism. Festivals, held either at places of abundant foods or at prominent villages, usually required the leadership of a dance specialist. During such communal affairs the headmen of the villages participating usually lent their influence to that of the special director by "talking" from time to time. These talks were harangues, exhorting the people to behave, have a good time, prepare food for feasts, etc. In some instances a village headman was also antelope shaman, dance director, or rabbit-drive leader. But his special authority was restricted to the communal activity and ceased at its conclusion (Steward 1938:247).

Concepts regarding ownership of property varied between different groups. It has been seen that Owens Valley groups owned seed areas and pine nut groves. This contrasts with groups to the east and south within the study area.

All natural resources, with the sole exception of privately owned eagle nests, were free to anyone. This was not communal ownership; it was not ownership at all, because no group whatever claimed natural resources. Water, seed, and hunting areas, mineral and salt deposits, etc., were freely utilized by anyone. But once work had been done upon the products of natural resources they became the property of the person or family doing the work. Willow groves could be used by anyone, but baskets made of willows belonged to their makers. Wild seeds could be gathered by anyone, but once harvested, they belonged strictly to the family doing the task, even though they might be shared with other families (Steward 1938:253).

In areas east of Owens Valley where environments were less well watered and food resources more scarce, exclusive ownership of resource areas would have worked to the detriment of everyone. Owing to the erratic annual and local occurrence of foods, the arbitrary exclusion of territorially delimited groups of families from utilization of other territories would have caused starvation and death. With few exceptions, the habitat of most families always provided such uncertain subsistence that the territorial interpenetration of families living in different localities was necessary to the survival of all (Steward 1955:108).

The Owens Valley Paiute family was bilateral, tracing descent through both the mother's and father's side. Although in the Owens Valley there was frequent interaction at the band level, the family was the most stable socioeconomic unit. This pattern prevailed throughout the western Great Basin and is attributed by Steward to ecological factors and the requirements of subsistence.

Among Western Shoshoni and probably Southern Paiute the family was necessarily the economic unit. This family was bilateral rather than patrilineal or matrilineal, first, because an extended family would frequently have been too large to live together; second, because the uncertainties of food and consequently of residence made association with persons other than those of the immediate household uncertain. Under the existing ecology it was physically impossible for groups larger than the village to remain in association during the winter. Though these villages often comprise related families, frequent change of residence prevented this always being so. There was consequently no localized lineage, nor condition for clan development. Social features dependent upon large and prosperous populations were also prevented, e.g., clubs, rank based upon wealth, slavery, and others. Likewise, political organization was minimal. There were no bands.

The Owens Valley Paiute, though culturally and economically similar to Western Shoshoni, lived in an unusually fertile environment and therefore had a dense population which was clustered in large villages. Restricted subsistence areas coupled with habitual cooperation of certain villages permitted the development of land-owning bands with a variety of political controls (Steward 1938:236).

The sexual division of labor was well defined. Except for pine nut gathering, women were responsible for seed gathering and men for hunting. Food collecting and hunting were most often done in units no larger than the family.

The biological family, that is, parents and children, constituted the household. Among Western Shoshoni the household was very nearly a self-sufficient economic unit and as such an independent social and political unit. With the exception of large game, all foods belonged exclusively to the households of the persons acquiring them. Food-gathering

activities were conducted largely by independent households under the leadership of the household head (Steward 1938:239).

The household was often enlarged by the inclusion of relatives, especially grandparents, who had no households of their own. It was also temporarily enlarged by the addition of the spouse of one or more of its children. Up to a year of matrilocal residence as bride service was common and, in any event, a young married couple usually remained with one family or the other until they had children or their own house. A household might also be augmented by polygyny or polyandry (Steward 1938:240).

Marriage between what were considered consanguine relatives was forbidden, and Steward notes recent cases where first cousin marriages had occurred, which were especially disapproved. The levirate and sororate were practiced, and in order to avoid participating in these, a payment was required. Widowed spouses observed the taboos mentioned earlier and were supposed to refrain from having affairs for a year. This was enforced through the fear that the parents-in-law of the deceased spouse might institute witchcraft.

In the Owens Valley, there were occurrences of infant betrothal reflecting a desire to ally families. Special kinship terms were used to recognize the relationship-to-be between prospective parents-in-law.

But, though the household was the most stable social and economic unit, some factors tended to disrupt it and others to enlarge it or to extend obligations beyond it. The main disruptive factors were divorce, which occurred easily and frequently, and wife abduction. These, however, merely realigned households (Steward 1938:239).

In the southern part of the Owens Valley there was a preference for matrilocal residence. This tended to convert villages into female lineages, which approximated, but actually failed to be, exogamous matrilineal bands. Steward believes this tendency was related to irrigation and female ownership of seed plots, which were also inherited matrilineally. At Fish Springs and Big Pine, however, seed plots were owned by men and inherited patrilineally with wives harvesting on their husbands' plots.

There were also responsibilities if not strict obligations to persons outside the household.

Whether a village were large or small, several related families usually lived in the proximity of one another. These were usually the households of parents, their married children, brothers and sisters and their spouses, and other close relatives who, in some localities, were further related through cross-cousin and pseudo cross-cousin marriage. These related families traveled together and camped near one another. Though not obligatory, food was freely shared with them. The male members of these households assisted one another in abducting a wife or in defending a wife against abduction and rendered mutual assistance in other ways (Steward 1938:240).

There were, of course, variations from the generalizations made so far regarding Native American lifeways in the study area, dependent upon various factors. First, there was considerable environmental variation from region to region. Second, there were both extracultural and intracultural variations from area to area and from group to group. Therefore, each of the areas within the planning units will be discussed in further detail.

a. Deep Springs Valley. The inhabitants in this valley were Paiute, who shared many elements of their culture with the people in Owens Valley to the west. Population, however, was very low, with Steward (1938) noting that 23 people lived in the valley approximately 50 years before his work. Although there was cooperation among the people of the valley, there was also considerable travel and visiting between Deep Springs Valley and Fish Lake Valley. In addition, there was intermarriage between these and adjoining valleys.

Deep Springs Valley life was similar to Owens Valley as there were fall rabbit drives, a sweathouse, mourning ceremony and festivals, and similar subsistence techniques. Deep Springs Valley differs from Owens Valley in that there was a lack of local band ownership of hunting and seed areas. Also, at the time Steward was working, no irrigation was being practiced in Deep Springs Valley, and the chieftainship interlocked somewhat with that of neighboring Fish Lake Valley.

Deep Springs Valley, although not as well watered as Owens Valley, had a similar environment and similar array of food resources. Seeds and pine nuts were available in the White Mountains to the east, and various seeds were available throughout the valleys and foothills. People ordinarily exploited an area of about 250 square miles, although trips were made to both the Eureka Valley and Fish

Lake Valley when crops were plentiful there. A variety of large game was also available--deer in the White Mountains, antelope in the valley, and mountain sheep in the mountains to the east. Ducks were hunted in the sloughs east of Deep Springs Lake.

The two major sources of fresh water were a stream flowing into the valley from Wyman Canyon and springs which occurred on the southern end of Deep Springs Lake. As might be expected, habitation occurred near water. Steward made a number of observations concerning the location of important sites within and around the valley.

Archaeological remains indicate that the largest and most frequented winter village [18] [see Figure 16] was on the eastern side of Deep Springs Lake, where a number of excellent springs provide abundant water Habitations were generally in the open, though a cave or rock shelter in the vicinity was also used. Sometimes . . . families wintered near a cave at the mouth of Wyman Canyon at the northern end of the valley, site 19. For several miles south of Wyman Canyon, on the western side of the valley and near Wyman Creek, there are many rock shelters formed by huge boulders where fragments of pottery and basketry and flints indicate encampments, site 20. When pine nuts were plentiful people wintered in the lower portion of the juniper belt near the cached nuts, a favorite place being in the hills near Roberts Ranch in Wyman Canyon, site 21. House remains have been found in the White Mountains near and above timber line (about 10,000 feet) but it is not known whether these were winter or summer dwellings. It is scarcely conceivable that people could have withstood the intense cold or traveled through the deep snow that prevailed in winter at this altitude (Steward 1938:58).

Steward also notes that a favorite camp seems to have been in a small valley southeast of Deep Springs Ranch. Another camp was at Deer Creek (probably Bear Creek on the U.S.G.S. maps), used especially for deer hunting. Antelope Springs was the base camp for antelope hunts (Steward 1938:60).

b. Fish Lake Valley. Physiographically, most of this valley is situated in Nevada outside the study area boundaries. The southern portion, however, lies within the Eureka Planning Unit. The valley was inhabited by Paiutes with lifeways similar to those in Owens Valley but especially

similar to Deep Springs Valley. Like the Deep Springs area, the Fish Lake Valley contained less water than Owens Valley.

Fish Lake Valley is bounded on the west by the White Mountains, which separate it from Owens Valley. These mountains are relatively high and therefore capture moisture which passes over the Sierra. Thus, there is sufficient moisture available to encourage plant growth and an environment favorable to subsistence. Access to Fish Lake Valley is, however, difficult. The other sides of Fish Lake Valley are surrounded by relatively low arid ranges, except in the vicinity of Lida, Nevada. In this locality, part of the Silver Peak Range rises into the juniper-pinon belt, thus providing a subsistence base for people in the vicinity. For the most part, the valley floor is arid, lies at approximately 5,000 feet above Mean Sea Level, and is dominated by a growth of xerophytic plants not especially amenable to exploitation. The Fish Lake Valley area as a whole comprises approximately 990 square miles.

An informant told Steward that in about 1870, there were 100 people distributed among eight villages, each having from one to four camps or families (1938:62). Furthermore, Steward notes that:

There was a total of 16 such camps, averaging 6.2 persons each. Six of the villages were located on streams, not far from where they issued from the White Mountains. Two were at springs in the mountains at the eastern end of the valley. The villages were more or less permanent, being occupied throughout the year, except when, during summer and fall, trips were made for seeds and pine nuts (1938:62).

Steward also records that in contrast to the situation in Owens Valley, allegiance to a village was relatively less permanent. Families changed residence so often and traveled so widely that relatives were scattered over several valleys, and even small villages might contain unrelated families.

c. Saline Valley. The Saline Valley lies in the central portion of the study area. It is a deep valley floor at 1,100 feet above Mean Sea Level, sharply bounded on the west by the Inyo Range, which rises above 10,000 feet. Biologically as well as topographically, the Saline Valley has many contrasts. Steward describes the area as a district of about 1,080 square miles within which life zones vary from Lower Sonoran to Hudsonian. Steward refers to the ecological diversity as remarkable and feels that within the

comparatively small Saline Valley, people maintained a secure if not abundant existence without having to exploit an inconveniently large area (1938:77).

Steward discusses the Saline Valley area in terms of a "district" with three subdivisions: the Saline Valley (District A), the Saline Range at the north end of the valley (District B), and the mountains to the east separating the Saline Valley from Death Valley and Panamint Valley (District C).

The Saline Valley subdivision within the Saline district contained one village. The village was situated at approximately 1,200 feet above Mean Sea Level at the mouth of Hunter's Canyon. The area surrounding the village is a barren, infertile expanse of valley where a stream maintains some mesquite and other exploitable plants (Steward 1938:77). According to Steward, people at this locality exploited the surrounding mountains, especially the Inyo Range to the west where big game and pine nut stands occurred.

Steward notes some inconsistency concerning the ownership or lack of ownership of pine nut areas. One informant claimed that pine nut areas which were situated on the Saline Valley side of the Inyo Mountains near Wacoba Mountain were family owned in a similar fashion to the custom of Owens Valley people. Another informant said that pine nut areas were not owned in this manner.

In any case, Saline Valley families traveled to the same well defined areas each year, and the entire family "inherited" a particular area. In the years when the pine nut yield was especially good, a family's area produced more pine nuts than could possibly be harvested by that family in the brief period between when the nuts ripened and when they fell from the trees. At such times, non-Saline Valley people in all likelihood freely gathered nuts in these areas. The Saline Valley people might also have gathered pine nuts in other areas, such as the Hunter Mountain area or even the Coso Mountain area. The winter cold influenced most people to move to winter villages at lower elevations.

When compared with plant resources, game was of secondary importance to subsistence and hunting required a considerable time expenditure. Deer were hunted in the Inyo Range and antelope in the ranges to the north and in the Saline Valley itself. No evidence exists that hunting areas were owned. It is interesting to note that a series of stone hunting blinds occur in the Warm Springs area of the Saline Valley--these may be related to the taking of sheep (cf. Brook 1977).

A variety of other resources besides pine nuts and big game were also exploited and for the most part did not involve extensive travel from the village. Rats, mice, chuckwallas, rabbits, and birds were available throughout the area. A stand of mesquite was available in the vicinity of the Saline dunes near the village, and a variety of seed could be gathered in various parts of the valley and adjacent mountains. Occasionally, trips were made to Owens Lake to gather larvae or to hunt ducks.

The Saline Valley playa has an abundance of high-quality salt. The people gathered this salt to trade for various goods and for shell money from the Owens Valley people. In turn, the Owens Valley people traded salt across the Sierra Nevada. The dynamics of this salt trade is presently under investigation by Bettinger (1978).

In consonance with the pattern in other areas, rabbit drives were held in the fall in conjunction with festivals. Sometimes individuals also attended festivals elsewhere.

One of Steward's informants told him that the Hunter's Canyon camp or village, as he remembered it about 1870 or 1880, was composed of five families or camps whose heads were: 1) Caesar, the chief; 2) Caesar's father, who had been chief before him; 3) Wakin; 4) Tom Hunter, the other chief; and 5) Patu'ku. If the average family consisted of six persons, as in Fish Lake Valley, the total population was not over 30 people. Another informant said he thought that this village had a communal sweathouse, like those in Owens Valley.

The second subdivision of the Saline district is situated between Saline and Eureka Valleys, where low mountains were suitable for winter dwellings. The principal, and perhaps sole, camp was probably at Waucoba Spring (36) (see Figure 16) on the eastern slope of Waucoba Mountain at about 5,600 feet above Mean Sea Level. There may have been another camp at Lead Canyon Spring.

People in this area gathered most foods locally. Pinon nuts and deer occurred in the Inyo Mountains to the west. They obtained seeds, antelope, and rabbits from the low hills around them and also gathered some seeds in Eureka Valley to the north and in Saline Valley. Like the Hunter Canyon group, they obtained pine nuts and hunted deer in the Inyo Mountains.

Just to the north of this group lies Eureka Valley. Eureka Valley is practically waterless and supported

no permanent residents. It did, however, have substantial quantities of sand-grass seed and another unidentified food plant. Water was obtained from a well near the sand dunes in the southern end of the valley. It is doubtful, however, whether short visits by small parties could account for the vast archaeological site which stretches for several miles along the northern foot of the dunes on the edge of the playa. The site has untold quantities of chert and obsidian chips but relatively few tools other than some spherical stone mortars of the type commonly used by the Shoshone for grinding mesquite. Steward (1938) notes that no mesquite grew in the valley. An extended search produced no pottery--only one sherd was observed by RECON at this site in March 1978. Pottery is usually present at Shoshone and Paiute sites in this region. The mortars are more characteristic of Shoshone than of Paiute.

Recently, the Eureka dune area has been examined by Clough (1976). A report describing sites located and recorded in the dune area is on file at the Bureau of Land Management, Desert Planning Staff, Riverside, California.

The mountains separating Saline, Death, and Panamint valleys encompass the third subdivision. There were two known villages in this subdivision, one at Goldbelt Spring (37) at about 5,000 feet above Mean Sea Level and the other at the springs in Cottonwood Canyon (38) at about 3,800 feet.

People in this subdivision exploited pine nuts, various seeds, rabbits and mountain sheep in their own territory. When locally available seeds were unusually abundant, visitors came from Saline Valley and sometimes from Surveyor's Well to gather the seeds near Cottonwood Canyon. One informant thought that rabbit drives were held independently of those of the Saline Valley group; another thought that Saline Valley people always visited this subdivision for rabbit drives.

For festivals, the people either went to Saline Valley or Saline Valley people visited them, but simultaneous festivals were not held. Caesar and Tom Hunter directed festivals at both places.

Nelson (1891) discusses both the Cottonwood Canyon group and the Hunter Canyon group. He notes that most of the people lived at the Hunter Canyon locality. In describing the Hunter Canyon settlement, Nelson notes, "Their houses are both square and dome-shaped and made of wattled straw or brush laid over a framework" (1891).

d. Panamint Valley. North of Ballarat, Panamint Valley was predominantly Koso with some mixture of Kawaiisu. South of Ballarat, it was largely Kawaiisu. This valley lies at a relatively low elevation (1,000 to 1,500 feet above Mean Sea Level) and is very arid with virtually no water, except within the valley where winter villages could have been located, perhaps near ephemeral lakes. The Panamint Range to the east and Argus Range to the west do, however, have many springs and streams which were frequented between spring and fall by people from neighboring valleys but had few winter residents.

According to Steward (1938), the principal and probably only village within the northern part of the valley was at Warm Springs. This site lies near the valley floor at an elevation of 1,100 feet. Another site mentioned by Steward was Wildrose Springs located at about 4,500 feet in the Panamint Range, about eight miles north of Warm Springs.

According to Steward, subsistence activities could be carried out largely within a short distance from the villages. While the valley floor was relatively devoid of important foods, some mesquite grew at Warm Springs and Indian Ranch. The Panamint Range, however, surpassed 11,000 feet and has a diversity of environmental niches where seeds, pine nuts, and mountain sheep could be obtained. Occasionally, people in the Panamint Valley went to the Argus Range near Maturango Peak to collect chia or to the Koso Mountains for sand bunch seed. Dutcher (1893) records that people from the Panamint Valley gathered pine nuts in the mountains between the Saline and Panamint valleys.

Steward did not believe that any large-scale community activities were held in the Panamint Valley--people went to the Saline Valley or Death Valley for festivals.

e. Little Lake and Coso Mountain Region. Steward includes approximately 1,000 square miles in this area. The environment encompasses the Upper Sonoran and Transitional life zones of the Koso Mountains and the eastern escarpment of the Sierra Nevada, where precipitation is relatively more abundant than in areas further east. Steward identifies four major villages in this area, marked 16, 39, 40 and 41 on his settlement pattern map. Most of the information gathered by Steward for this area was from the inhabitants of a village near Coso Hot Springs.

According to Steward's informants, the residents of this area spent the winter in pit houses, hunting rabbits and eating stored seed. In April, some people

traveled 12 miles to Haiwee Springs to gather greens. By June, people often went to Cold Springs to hunt rabbits. Others might participate in antelope hunts. Favorable environments for antelope were the areas south of Owens Lake and the northern end of the Saline Valley.

In midsummer, some families might go to the Saline Valley or Death Valley to gather mesquite, while others might gather a variety of seeds in the Coso Mountains.

During September or October, people went to the Coso Mountains for pine nuts. If the pine nut crop here was poor, they might go to the Panamint Range. In the fall, people might hunt ducks near Owens Lake and, of course, participate in rabbit hunts. The people traveled considerable distances to attend a rabbit hunt. For example, rabbit hunts held near Olancho might attract people from Keeler 25 miles away or from the Saline Valley about 50 miles away.

There was no absolute fixed routine either in where people went to gather food or in the food people might be eating at a particular time. According to Steward,

Mountain sheep might be hunted by individuals in the Koso Mountains or the Sierra Nevada and deer in the Sierra Nevada. Fish were taken in Rose Valley and, with poison, in Little Lake. Larvae were procured in Owens Lake. Caterpillars . . . could be had on the ground around Koso Springs, Little Lake, and elsewhere. Other animals eaten were bear, badger, chuckwalla, gopher, mice, rats, doves, eagles, hawks, crows, snakes, mountain lions, wildcats, but not coyotes, wolves, frogs, magpies, or grasshoppers. To vary the vegetable diet, acorns might be procured from the eastern foot of the Sierra Nevada (1938:83).

f. Coso Hot Springs. Although Coso Hot Springs is not within the study area, it is surrounded by the study area on three sides and is important in the belief systems of Native Americans in the area. The most recent comprehensive study of Coso Hot Springs was undertaken by Theodoratus and Smith-Madsen (1977).

The springs are located approximately four miles east of the Sugarloaf Mountain obsidian source and situated in a fault zone where active volcanism has been a characteristic of the surrounding area within Quaternary times.

The springs consist of a number of steam vents, bubbling ponds, and mud holes of various sizes and colors (Theodoratus and Smith-Madsen 1977). These springs have been used by both Native American and non-Indians for more than 100 years, and archaeological evidence in the area suggests prehistoric use as well.

In describing the area around the springs, Theodoratus and Smith-Madsen note a variety of features, attesting to prehistoric and historic significance of the springs.

West of the springs area are the remains of Sanders Resort which consists of both wooden and rock structures. To the south of the springs is a large mineralized mud pond. North of the springs, along the base of the foothills lie other fumaroles and the remains of Schobers resort with one rock building remaining. Scattered throughout the area west of the springs and west of Sanders Resort, are numerous historic and prehistoric features, which include ten historic graves and two prehistoric rock rings. Obsidian lithic material is concentrated in a large area west of the springs. Immediately east of the springs are the remains of Adams Resort which consists of one rock [building] and one wooden building (1977:5-6).

While the springs are located in territory customarily exploited by the Koso, it is well documented that other Native American groups utilized it as well and that the area was open for the use of anyone.

Fall festivals were recorded by Steward at Coso Hot Springs which drew many Northern Paiute, as well as Shoshone, Saline Valley people, and people from northern Death Valley (1938:75).

Theodoratus and Smith-Madsen have additional ethnographic accounts of use of Coso Hot Springs.

"Whoever knew about it, went." "All kinds of Indians came." Several consultants mentioned having heard several different languages spoken while there. Specific mentions were made of other Shoshone from Death Valley, Darwin, and other places; of Paiute (Owens Valley); and of people coming from the Kernville area, Mohave and Ely, Nevada. Until the turn of the century mostly Indians went, but on occasion there were a few Mexicans and Whites as well. The

Indian people who came stayed varying lengths of time from a few days to several months. They came individually, as families, or in other groups. One consultant, whose family went faithfully each year (sometimes several times a year), remarked that once there, the people at the springs were in "unison." It was "like one big family," with people acting as a group, camping, bathing, steaming--this "built strength spiritually" (1977:21).

Also according to Theodoratus and Smith-Madsen:

The existence of Coso is founded in Paiute and Shoshone history and is important for spiritual reasons. To these people, the waters of Coso are "alive" and to partake in them gives one a feeling of well-being, both spiritually and medicinally. Coso, like the rest of nature, was a gift; it was put there for a purpose. The waters and mud of Coso are living manifestations of these spirits who have spiritual and medicinal healing powers. If treated properly the springs and mud can cure the body and the mind. The Paiute and Shoshone believe that Coso is a gift from "Nature" for use as a cure, and that it is proper to talk and give blessings to it before it is utilized (or before one participates with it) (1977:17).

5. Ethnography and Cultural Resources. Ethnographic knowledge of the study area will be of particular value in predicting where late prehistoric, protohistoric, and historic Native American sites occur. From examination of the ethnographic record, it is possible to abstract several important variables relating to site location, including occurrence of fresh water, occurrence and accessibility of exploitable plants and animals, and topographic variability.

For example, substantial winter village sites would be expected to occur around the margins of the larger mountain ranges which are high enough to capture moisture not already captured by the Sierra Nevada. Ranges which have a sufficiently high elevation and contain enough water to support a juniper-pinon belt will have villages at their bases. It may also be expected that winter villages will be located near the mouths of major canyons that open to broad fans descending to the basin beyond. Such canyons provide water, in the absence of springs, and the canyons themselves provide access routes to higher elevations where pine nuts might be cached. Those canyons which provide the greatest amount of

flowing water will likely also be the ones most favorable for the establishment of irrigation systems.

Sites other than winter villages will probably occur in a number of different localities. Resource extraction camps should be located near stands of concentrated and edible plant resources, such as mesquite, sand grass, or piñon stands. Springs will be the loci of a variety of sites, from winter villages to hunting areas with stone hunting blinds. Locations where lithic material useful for tool manufacture occurs, such as the basalt in the north end of Panamint Valley and obsidian outcrops at Sugarloaf Mountain, will likely have evidence of aboriginal exploitation.

Ethnographic knowledge may also contribute to interpretations of cultural resources. Bettinger (1975a, 1977b) identifies two sites in the Inyo Mountains as piñon zone winter camps. He is able to estimate the number of occupants at the camp and to infer the functions of tools on the sites based on information in Steward's 1933 ethnography of the Owens Valley Paiute. He does, however, find inconsistencies in the size and construction of the structural remains actually present and winter camp structures as described by Steward's informants.

Knowledge gathered from ethnographic sources may also aid in the identification of cultural resources that have contemporary heritage significance to Native Americans in the area. An example of such is Theodoratus and Smith-Madsen's (1977) work with Native American consultants to document the importance of Coso Hot Springs (Theodoratus and Smith-Madsen 1977). Currently, additional ethnographic research concerning the Coso Hot Springs locality is being undertaken by Iroquois Research Associates for the China Lake Naval Weapons Center (Tilly Barling 1978).

The applicability of the ethnographic record to the archaeological record will, of course, decrease as older sites are encountered dependent upon environmental and cultural differences that occurred in the past. It is reasonably certain, however, that for interpretations of late prehistoric resources, ethnographic analogy will remain an especially useful tool.

Consideration of the ethnographic record is not a cure-all for reaching an understanding of the past. Wobst (1978:303) warns that if the goal is to build a truly anthropological theory capable of predicting behavior, whether archaeological or ethnographic, theory has to be liberated from the biases imposed upon it by the ethnographic record.

According to Wobst (1978:307), if the only source of data on human behavior were observation, little would be known about its variability. Fortunately, there are means of data acquisition that do not require presence at the time the behavior is transacted. The material precedents and products of behavior (archaeological and ethno-archaeological mode) can be observed, and verbal information can be acquired about behavior (ethnographic mode). These modes of data collection make it possible to overcome the constraints on the field of vision and to deal with human behavior in all of its temporal and spatial expressions.

G. HISTORICAL SETTING¹

1. Introduction. The region west of Death Valley and east of Owens Valley has not had strong appeal for permanent Euro-American settlement. Low population density has traditionally characterized the region. The leading authority on Inyo County maintains that the remote desert areas of the region attracted both white and red renegade populations (Chalfant 1922:15). The fact that Indians have lived in the area for hundreds of years only served to convince early white observers of the lowly condition of the Indian population as Euro-Americans had no appreciation of Native American adaptations. The extreme temperature range, lack of consistent water supply, and the rugged terrain have often discouraged even the most robust Euro-American settlers. One nineteenth century writer found that the water and soil conditions in Death Valley compared favorably with those found in the Panamint Valley (Harcourt 1898:488). Despite the semantic dread attached to the Death Valley region, however, the Panamint desert area's living conditions are even more severe. E. I. Edwards (1969), one of the foremost experts on the California desert lands, uses the geographical statistics of Telescope Peak to illustrate the extremes of reliefs in the area. According to Edwards (1940:5), Telescope Peak, which reaches to 11,000 feet at its tip, drops sharply to 280 feet below Mean Sea Level on the desert floor. Telescope Peak is also called White Mountain since one of the early 49er pioneers to the area, William Manly, first viewed the peak covered with snow (Edwards 1940:21). The Panamint desert area was so bleak and stark as to provide little relief to settlers struggling out of Death Valley. Figure 17 illustrates historic settlements and features discussed in the following text.

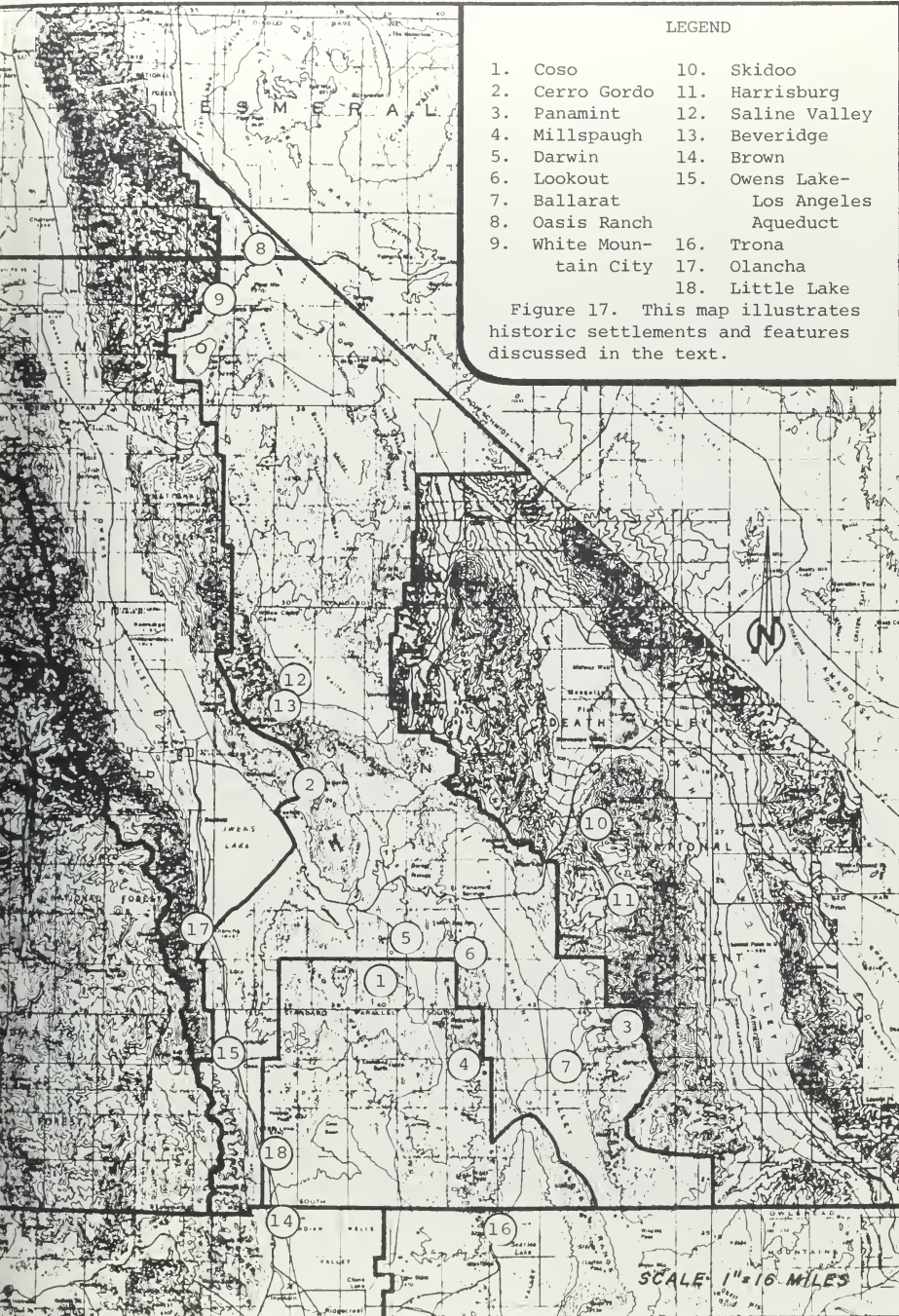
2. Early Exploration. The reputation of the Panamint region was not enhanced by the tragic circumstances which surrounded attempted passage through the area by 49er gold seekers. The so-called Death Valley parties associated with the winter tragedy of 1849 belonged to the Sand Walking Company heading to California under the direction of Captain Hunt. The name Sand Walking is an apt corruption of the original name for the San Joaquin Company, but in literature dealing with the group, the name Sand Walking Company is always used (Wheat 1939a). The dispute which eventually led to the deaths of a number of emigrants in the company had to do with the proper route to be followed through California to the gold fields. Hunt's original plan was to lead the group through the southern San Bernardino route. But Captain Smith, who had attached himself to the Sand Walking Company en route to California, urged Hunt to abandon his original

¹Prepared by Ronald J. Quinn

LEGEND

- | | |
|------------------------|--------------------------------|
| 1. Coso | 10. Skidoo |
| 2. Cerro Gordo | 11. Harrisburg |
| 3. Panamint | 12. Saline Valley |
| 4. Millspaugh | 13. Beveridge |
| 5. Darwin | 14. Brown |
| 6. Lookout | 15. Owens Lake-
Los Angeles |
| 7. Ballarat | Aqueduct |
| 8. Oasis Ranch | 16. Trona |
| 9. White Mountain City | 17. Olancha |
| | 18. Little Lake |

Figure 17. This map illustrates historic settlements and features discussed in the text.



plan and take a shortcut through Death Valley. Smith argued that this direct route would save the travelers weeks of time and perhaps as many as 500 miles in actual distance (Edwards 1940:12). Hunt maintained the direct route west was unsafe, almost suicidal, but agreed to lead the entire group by Smith's route if the group unanimously chose this. A debate over the proposed routes ensued. Eager to arrive at the gold fields and apprehensive about the winter weather, a majority of the company opted for the shortcut. Hunt refused to lead the group, feeling he had a moral obligation to remain with those who preferred the southern route. Despite strong admonitions from Hunt, a majority of the group abandoned Hunt and embarked upon the direct route (Edwards 1940:13).

Enthusiasm for the direct western route was short-lived. A majority of the direct route group collectively decided to return to Hunt and follow the southern route. Those committed to the direct route comprised the Death Valley parties. The four most important parties were the Jayhawker Party, the Georgia-Mississippi Party, the Brier Party, and the Manly-Arcane Party. It still remains unclear which of the parties successfully survived the dangerous trek through this rugged territory. Chalfant, for example, believes that Captain Smith made it through the area, but Edwards suggests that Smith probably died. In this dispute, Edwards had access to the Stover manuscript but Chalfant did not (Edwards 1940:17-18). Stover is an important source because he had been a companion of Smith in Death Valley. Two survivors, Pinney and Savage, reported that nine of their companions died in the Slate Range. The skeletons of these men were found ten years later (Edwards 1940:22). Pinney and Savage left the group of 11 to avoid the possibility of cannibalism which had been discussed by the group. The two men made their way through Inyo County to Owens Lake (Koenig 1967; Lee 1963).

Edwards maintains that of all the groups of the old Sand Walking Company, the Jayhawker Party had the most advantages (Edwards 1940:25). The men in the party were young and well equipped, and they had not encountered the difficulties of other parties in Death Valley. The group, however, found it impossible to move their equipment through the rugged landscape. They left their wagons at Furnace Creek (Ellenbecker 1938:42) and began to face serious trouble on the western slopes of the Panamint Range and in the desert of the Panamint Valley. Like others who had opted for the direct western route, they had underestimated the geography of the area. The Jayhawkers are reputed to have scratched their initials, names, and date upon a boulder somewhere in what is now called Jayhawker Canyon. This boulder, found in 1936, is considered to substantiate their route through the canyon (Putnam 1946:72). Moving slowly through the Panamint

Range, they soon faced shortages of food and water. The confused party was spotted by George Hansen, more popularly known as "Inyo George" (Ellenbecker 1938:42). Remarkably, some survivors of all parties made it to Owens Valley. The Jayhawker Party emerged out of Panamint Valley through the Slate Mountains to Searles Lake Valley. This party was able to reach the northern end of the Slate Mountains which connected with the Argus Mountains (Long 1950:139). What made the 49ers' problems even more difficult was that they almost always ignored Indian trails, which would have directed them to water (Long 1950:183). As a result, a number of pioneers wandered in frustration, searching for water and a passable route west. Actually, those who managed to survive the trek through Death Valley and Panamint Valley in the winter of 1849-50 were more often simply lucky. The Manly Party, for example, found their escape route through Redlands Canyon in the southern part of the Panamint Range (Palmer 1948:61).

3. Mining Operations. Mormon travelers passed through Inyo County during the 1850s. The Mormon route to San Bernardino encompassed the southeastern tip of Inyo County (Chalfant 1922:70). The Mormons were also interested in the mineral wealth of the area, and in 1854 Mormon prospectors discovered gold in the desert 25 miles south of Resting Springs (Chalfant 1922:70). The Mormons called this discovery the Amargosa mines (Palmer 1952:5). Two years later more gold was found in the vicinity of the Amargosa River (Palmer 1952:5). In 1858, Mormons discovered silver in the Panamint Range (Ray 1966:29). Since there was no immediate water source, some of the ore was refined at Anvil Springs. This location, according to Palmer (1948:7), is 20 miles south of Telescope Peak, Township 23 South, Range 45 East, Mount Diablo Meridian. The spring was supposedly given the unusual name anvil because an old wagon tire was found in the area (Palmer 1948:7). The mining operations here, however, were short-lived since the expense involved proved prohibitive. Mexican miners followed the Mormons into this area, but the result of their efforts remains obscure (Ray 1966:29; Belden 1963; Chalfant 1950).

Prospectors continued to explore the west side of the Panamint Range in 1860 and 1861. William Alvord was the most famous of these searchers (Wolle 1953:137). Alvord was an unlikely prospector; he was 60 years of age and a native of New York with no experience in mining (Weight 1953:48). Yet with a little food and water, a pick, and a shotgun, he separated from his party and wandered for two weeks alone in the Panamint Range. Presuming Alvord dead, his companions established a new camp. But Alvord found his party and delivered the exciting news that he had discovered gold. Neither Alvord nor any of his companions, however, was able

to relocate the ledge which contained the precious gold (Weight 1953:48; Brewer 1963).

a. Coso. The most important discovery of 1860 was made by Dr. Darwin French. The French party included, among others, Dennis Searles and James Hitchens, whose names, along with French himself, would be permanently identified with the geography of the county. In March of 1860, the party discovered silver at old Coso in southern Inyo County. Coso is a Paiute word meaning fire (Steward 1938). Paiute and Shoshone Indians used the thermal springs of the area for medicinal reasons (DeDecker 1966:37). The discovery of silver at Coso came as something of an accident as the party was actually searching for the Gunsight Mine. No one has ever found the Gunsight Mine, and the origins of the rumors and legends associated with it remain obscure. L. Burr Belgen speculates that the rumor may have come from a young unidentified Mississippi man who was a member of the Mississippi Georgia Party, which crossed Death Valley in 1849.

After the discovery at Coso, the French Party continued northward. On the journey, the party named Darwin Canyon, which is located near a wash (later called Darwin Wash) which ran through the Argus Range and entered the north end of Panamint Valley (Township 19 South, Range 40 East, Mount Diablo Meridian) (Palmer 1948:21). The party also named Darwin Falls, which was located 50 feet above the canyon floor. In May of 1860, the French Party decided to return to Coso.

Word of the discovery of silver at Coso spread quickly. M. H. Farley followed French into the area and made 90 separate claims (Chalfant 1922:81). Farley was so excited by his discoveries that he renamed the area Silver Mountain (Chalfant 1922:81). By July 1860, there were perhaps 82 miners in the area belonging either to the Coso Mining Company or the Coso Gold and Silver Mining Company (DeDecker 1966:37). The Coso Mining Company was founded by a group from Oroville, California. They elected William McIntyre president and began their venture with \$78,000 in capital stock (Chalfant 1922:82). Members of the French Party founded the Coso Gold and Silver Mining Company and chose James Hitchens as president (Chalfant 1922:82). In 1862 a trail was constructed leading northeast from Little Lake to the mines at Coso (Warren and Roske 1978:33-35).

In October 1860, a party led by Dr. S. G. George set out in search of the Gunsight Mine (Spears 1892:22). The group included W. T. Henderson, a future sheriff of Inyo County (Chalfant 1922:82). The group encountered Indians who taught them the meaning of many

Indian names, and it was this group that learned that the Indian meaning for "inyo" is "the dwelling place of a great spirit" (Chalfant 1922:83). Henderson named the highest tip of the Panamint Range Telescope Peak (Chalfant 1922:83). The group formed the Telescope Mining Company. They never found the Gunsight Mine but did discover a mine of antimony which they called Christmas Gift (Spears 1892:22). Early in 1861, the Rough and Ready Mining Company was formed, and later in the year, mining began in the Slate Range east of Coso (DeDecker 1966:37-38). Dennis and John Searles showed the most interest in the mining potential of the Slate Range. Gold fever brought the Searles brothers to California from New York in 1849 (Wynn 1963:25). Dennis Searles had been a member of the French desert party, and while traveling with the French Party, he heard rumors of gold and silver in the Slate Range (Wynn 1963:25). After the Searles brothers had investigated random ledges in the Slate Range, they were encouraged enough to invest their money in machinery and lumber for the construction of a mill (Wynn 1963:26). Although investors recognized the rich deposits of borates in the Slate Range region, few shared the enthusiasm of the Searles for the silver and gold potential of the area. The Searles brought gold samples from the region to encourage investors, but the brothers were never able to raise enough capital to make the mill successful. By early 1864, the Searles were forced to abandon their joint venture (Wynn 1963:27).

Success in mining fluctuated greatly, and promoters overestimated the money-making possibilities of mining in the Coso area (DeDecker 1966:37-38). Perhaps the most important long-range effect of the mining operations at Coso was the fact that it was responsible for increasing the population of Inyo County. In response to the mining at Coso, assorted farmers and cattlemen made their way into Inyo County, especially the Owens Valley, to provide food for the miners. Often these ventures proved to be more profitable than the mining. When mining in the Coso region ended, travelers still came to the area to use the thermal springs (DeDecker 1966:39). Although sulfur mining proved unprofitable in the Coso region during World War I, cinnabar and mercury were mined successfully during the late 1930s (DeDecker 1966:39).

Mining operations were also responsible for the Indian-white hostilities which characterized the early 1860s in Inyo County. While most of the fighting took place in the Owens Valley, the increased white population in the Owens Valley was lured there by the mining operations at Coso. By March of 1863, Henderson was forced to close down his mining operations in southeastern Inyo County because of

Indian troubles, and sporadic fighting broke out between the Henderson-led miners and the Indians in the Panamint mountains in the spring of 1863 (Chalfant 1922:159). Henderson suffered tremendous financial losses as a result of the Indian conflicts since it was expensive to move machinery into the area. Henderson estimated his losses at a quarter of a million dollars and sought compensation from the federal government, but Chalfant suggests Henderson may have attempted to hold the Indians responsible for a venture which had never been profitable (1922:160). Additionally, Henderson held the Indians responsible for a fire which destroyed the Searles mill in the Slate Range, even though he admits there is no direct evidence linking the Indians to the fire (Chalfant 1922:160). In the midst of all these conflicts, the Nevada legislature attempted to extend its border to the Sierra Nevada, but the proposal received a negative response in California (Chalfant 1922:211).

b. Cerro Gordo. In 1865, Pablo Flores and two Mexican companions discovered silver at Cerro Gordo, the name given to a mining district in the Inyo Range, east of Keeler. (Palmer 1948:15). For the next two years, Mexican miners worked the area, using small adobe furnaces to process the ore (Reid 1908:273). It was a small operation since the Mexican miners lacked the capital for large-scale exploration; these miners also did not have an adequate supply of water, food, or clothing (Mecurio 1870:3). Sometime during the early summer of 1866, Flores and his two companions were attacked by Indians. The Indians eventually killed two of the three Mexican captives, and they released Flores only after he promised them he would not return to the area. Flores did return, however, in the fall of 1866 with 40 other miners, and together this group established the mines of Ignacio, San Francisco, and San Felipe (Mecurio 1870:3).

Later in 1867 one of the Mexican miners from Cerro Gordo traveled to Virginia City, Nevada, and showed examples of the ore to silver-hungry miners (Nadeau 1965:188). Thus began the Cerro Gordo silver boom. The news of Cerro Gordo mining possibilities spread throughout the State of California. One of the first to take advantage of the wealth of Cerro Gordo was a mining engineer from San Francisco, Mortimer T. Belshaw (DeDecker 1966:57). Belshaw joined forces with Abner B. Elder, whom he had worked with in silver mines in Mexico (DeDecker 1966:57). The men brought examples of the ore to San Francisco in order to obtain the necessary monetary support. Belshaw worked quickly to obtain a financial monopoly in the area. He built a smelter, constructed a toll road and channeled water from a nearby spring

(Nadeau 1965:188). Together with Victor Beaudry, a Cerro Gordo storeowner, Belshaw established the Union Mine (Nadeau 1965:188). After only one year's preparation, Belshaw and Beaudry had put together the most productive silver mine in the United States (Nadeau 1965:188).

While Belshaw and Beaudry possessed the necessary business sense and the ruthlessness to squeeze out the opposition, the real key to their success was their ability to overcome the serious logistical problems of the area. The pair hired the services of a mule team freighter, Remi Nadeau. Almost without interruption, his mule teams hauled the 85-pound metal bars out of Cerro Gordo (Nadeau 1965:188). Belshaw and Beaudry turned Cerro Gordo, which had begun in 1865 as a minor operation run by a few Mexican miners, into a major mining venture with international significance. The destination of the wagons leaving Cerro Gordo was San Pedro, and from San Pedro the ore was transported by ship to San Francisco (Nadeau 1965:188). These wagons had a significant impact upon the development of the City of Los Angeles. The wagons stopped in Los Angeles on the return trips and food was purchased to support the livestock and men in the mining camps. In fact, a large percentage of the items needed to sustain life in the Cerro Gordo came through Los Angeles, including almost all the machinery used in the camps (Phillips 1966:69).

As early as August 1870, the leading newspaper of the county, the Inyo Independent, argued that the costs of wagon road travel were prohibitive (August 8, 1870, p. 2). According to statistics compiled by the newspaper, it was estimated that miners in the county paid in excess of \$36,000 a month to transport their goods to San Francisco. Comparing those figures with the rates charged by the Central Pacific Railroad, the Inyo Independent calculated that miners would save \$10,000 a month by substituting railroad transportation for wagon train transportation (August 8, 1870, p. 2). The savings in transportation costs could be used to finance further mining developments in the Cerro Gordo area. The newspaper proposed that a wagon road be constructed from the mining area to a railroad connection at Visalia (August 8, 1870, p. 2). Railroad transportation would reduce the isolation of the area and make it possible for prospective capitalists to see firsthand the lucrative mining possibilities of the Cerro Gordo area.

Although Beaudry and Belshaw had the most successful mining operation in Cerro Gordo, they never achieved a monopoly over all the mines. Mexican miners never completely abandoned the area. Twenty-five miles to the

north, an English company established the Eclipse Mine (Inyo Independent, October 17, 1870, p. 2). Thirty miles north of the Eclipse Mine is the Deep Springs Valley District, which contained valuable supplies of gold, silver, and lead as well as an abundance of wood, water, and grass (Inyo Independent, October 17, 1870, p. 2). One problem that plagued the entire district from Cerro Gordo to Deep Springs Valley was the shortage of capital. A moneyless miner, writing under the pseudonym Vidette in the Inyo Independent, pleaded with his readers to invest their money in local mines. Vidette encouraged potential investors to come to Cerro Gordo and see for themselves the splendid potential of the region. Vidette claimed the area had too many miners and too little money, and he discouraged amateur miners, suggesting the best way to make money was to entrust it into the hands of professional miners (Vidette 1870).

Vidette failed, however, to inform his readers of the risks involved in small mining ventures. For the amateur investor, it was difficult to distinguish between a legitimate and illegitimate mining operation. Mining camps, however small, attracted large numbers who intended to make their money off the folly of others. These men lessened the reputation of miners in general, even though the legitimate miners were the individuals most often exploited. In addition, miners from the Cerro Gordo area often went to Lone Pine to seek relief from their labors. Many of them became the victims of saloon violence (Swythian 1871). They were also frequently relieved of their money by confidence men who came into the area from as far as Los Angeles with a multiplicity of schemes to defraud miners. One enterprising Los Angeles man, Joe Wilson, came to Cerro Gordo promising to take a load of goods to Los Angeles and make a return trip with food products. Wilson simply left with the miners' goods and money and never returned to Cerro Gordo (Swythian 1871; Johnston 1936:8-10).

Housing shortages added to the discomfort of those attempting to make Cerro Gordo a permanent home. In another of the periodic articles on Cerro Gordo appearing in the Inyo Independent, Owens Valley mill men were urged to begin operations in Cerro Gordo and alleviate the lumber shortage in the region (April 8, 1871, p. 2).

In a period of three years, Cerro Gordo had become a full-fledged mining town. By the end of 1871, the town had daily stagecoach service. In the following year ore was carried across Owens Lake by steamboat (Nadeau 1965:192). Like other mining towns in the West, Cerro Gordo had a varied population. For example, Chinese laborers were brought in to

construct roads. By 1873, the town was large enough to provide several varieties of hotel accommodations.

Cerro Gordo had all the problems of the western mining boom towns with prostitution, violence, high prices and a persistent shortage of housing facilities. The most severe problem facing the residents of Cerro Gordo was the lack of an adequate water supply. Belshaw attempted to overcome this problem by erecting a pipeline which eventually brought 1,300 gallons of water daily into the area (DeDecker 1966:62). The pipeline was not sufficiently protected against the severe weather conditions of the area, however, and was frequently out of operation, causing serious problems both for businessmen and domestic users. Furnaces had to be shut down, and consumers were forced to purchase water brought in by pack animals for ten cents per gallon (DeDecker 1966:62). Water was both scarce and expensive until 1874 when another miner, Stephen Boushey, established the Cerro Gordo Water and Mining Company. Succeeding where Belshaw had failed, Boushey built another pipeline bringing water from Miller Springs, ten miles north of Cerro Gordo (DeDecker 1966:62). Boushey built the pipeline deep enough below surface to protect it from weather damage (DeDecker 1966:63).

The most serious challenge to the Belshaw-Beaudry dynasty in Cerro Gordo was the Owens Lake Company. Conflict began when James Brady, owner of the Owens Lake Company, attempted to purchase the San Felipe Mine which held a conflicting claim to Belshaw and Beaudry's Union Mine (Nadeau 1965:192). The San Felipe Mine, however, was heavily mortgaged and had a variety of indebtedness. The parties acquiring the San Felipe Mine attempted to assume these debts, but Belshaw and Beaudry still refused to recognize the claim. At this point, the Owens Lake Company decided to have the matter settled in the courts. The lawsuit dragged on for years, and the Owens Lake Company finally accepted a small share in the Union Mine in 1875 (Nadeau 1965:193). By this late date, however, the Cerro Gordo mining enterprise was beginning to fade.

Despite the creation of the Cerro Gordo Freighting Company in 1873, transportation problems continued to plague the Cerro Gordo Mining District. With the financial assistance of Belshaw and Beaudry, Nadeau increased his stock of mules to 80 teams (Nadeau 1965:192). These teams, containing 18 mules apiece, consistently made the trek between Cerro Gordo and Los Angeles. Each team was capable of making eight round trips per year (*Inyo Independent*, April 6, 1872, p. 4). The cost of this transportation was high--\$50.00 per ton to transport products from Cerro Gordo to Los

Angeles. Since the northern trip from Los Angeles to Cerro Gordo was uphill, the mules could not carry as much equipment, and the cost almost doubled for the return trip (Inyo Independent, April 6, 1872, p. 4). The cost of transporting goods from Los Angeles to Cerro Gordo was a severe drain on the capital of the miners, and the transportation service was not always reliable. For example, wagons often overturned on the dangerous trip. The biggest drawback for the miners, however, was neither the cost nor the risk of accident--time cost the miners more money than any other single factor, and despite the best efforts of Nadeau's Cerro Gordo Freighting Company, bullion could never be transported out of the Cerro Gordo area quickly enough.

In 1876, a year after Belshaw had settled his differences with the rival Owens Lake Company, he stopped the furnaces at Cerro Gordo (Nadeau 1965:193). In the following year, fire all but destroyed his operation, and in 1878, all furnaces were closed down (DeDecker 1966:65). In October 1879, a mule team carried the last shipment of bullion out of Cerro Gordo (Nadeau 1965:193).

California State mineralogist W. A. Goodyear visited Cerro Gordo in July 1888. He found approximately 40 men eking out a living in the area as best they could (Likes and Day 1975:54). Archie Farrington began reconstruction of the Union Mine in September 1889, but this venture proved a failure, and the Union Mine closed all operations in February 1892 (Likes and Day 1975:55). Depressed silver prices further discouraged any plans for reviving the Cerro Gordo mines. In the early 1900s, only one man retained faith in Cerro Gordo, Thomas Boland. When he died in 1904, it seemed to signal the end of silver mining in the region (Likes and Day 1975:57).

In 1905, the Great Western Ore Reduction Company acquired the rights to the Cerro Gordo mines. The company constructed a steam traction engine which transported ore from Cerro Gordo to the smelter at Keeler (Likes and Day 1975:60). Like so many preceding ventures, this too proved unprofitable. In November 1907, the Great Western Ore and Reduction Company sold its mining rights at Cerro Gordo to the Four Metals Company (Likes and Day 1975:60). In an attempt to overcome inefficient transportation which had limited profits from the Cerro Gordo mines in the past, the Four Metals Company constructed an aerial tramway connecting Cerro Gordo and Keeler (Likes and Day 1975:60). After initial success with the tramway operation, the Four Metals Company ran into financial problems by the spring of 1910, because the company had overestimated the amount of silver

still available in the Cerro Gordo mines (Likes and Day 1975:64).

In 1911, Gordon and Associates purchased a lease from the Four Metals Company. Gordon was interested in the zinc potential of the Union Mine, and in 1914 he purchased the mine from the Four Metals Company and reorganized the entire enterprise under the title of the Cerro Gordo Mines Company (Likes and Day 1975:64). Because Gordon had sufficient capital, he made a success of the operation and built a new aerial tramway which turned around mining operations in the area. Between September 1915 and February 1916, Gordon recorded a profit of \$40,260. The Southern Sierra Power Company provided electrical power to Cerro Gordo in January 1916 (Likes and Day 1975:70). Clearly Gordon had more success at Cerro Gordo than any mining operation since Belshaw.

Another Cerro Gordo depression hit in 1923, however, and the Gordon operation closed its doors in that year (Likes and Day 1975:72). In June 1929, the American Smelting and Refining Company purchased the lease rights to the Cerro Gordo mines (Likes and Day 1975:72). American Smelting and Refining Company operated the mines through 1933. Between 1933 and 1960 assorted companies and individuals toyed with ideas of reworking the mines, but prospective investors refused to take financial risks in the region. In 1960, the Southern Pacific Railroad closed service from Laws to Keeler (Likes and Day 1975:83). Remnants of the old American Hotel and Beaudry's smelter, store, and house still remain at Cerro Gordo. The Union Mine still contains machinery and equipment from the boom days, and ruins of the old Ignacio Mine can still be seen half a mile south of Cerro Gordo (Likes and Day 1975:84-85.).

There are no accurate population statistics for the area, and the worth of the ore produced at Cerro Gordo is also subject to dispute. One student of the area estimates that the population of Cerro Gordo may have exceeded 3,000 in the peak years of the early 1870s (Reid 1908:273). An article in the Inyo Independent valued the silver production of the Cerro Gordo area by the spring of 1872 to be \$2,500 daily (April 6, 1872, p. 4). DeDecker cites the figure of 15 million dollars as the worth of Cerro Gordo silver, lead, and zinc and holds that no other area in California was as productive (DeDecker 1966:65). The DeDecker figure is impressive when compared with statistics of Norman and Stewart, who estimate the value of metallic and nonmetallic mineral production of all of Inyo County since 1880 at 138 million dollars (1951:18).

Cerro Gordo also gave birth to the town of Keeler on the northeastern ledge of Owens Lake. Originally it was the place where residents of Cerro Gordo received their spring water. Julius M. Keeler, an agent for D. N. Hawley, began construction of a mill at the town site of Keeler in March 1880. After completion of the mill in March 1881, as much as 450 pounds of bullion were processed there (Likes and Day 1975:51).

The Carson and Colorado Railroad opened service to Keeler on August 1, 1883 (Myrick 1963:xiv). After the railroad was established, perhaps as many as 7,500 people lived in Keeler (Krautter 1959:4). The town of Keeler did not die with the fading fortunes of Cerro Gordo. The creation of the Inyo Marble Works five miles north of Keeler in the late 1880s sustained the town (Myrick 1963:179).

c. Panamint. Panamint, also called Panamint City, is located at the head of Surprise Canyon directly south of Telescope Peak in the Panamint Range (Palmer 1948:55). The beginnings of Panamint were directly related to the discovery of silver at Surprise Canyon by three prospectors, W. L. Kennedy, Robert L. Stewart, and Richard C. Jacobs. The exact date of the discovery is a subject of dispute. Wolle dates the discovery as December 1872 (1953:137); Nadeau, January 1873 (1965:197); and Chalfant, April 1873 (1922:249). The positive aspect of the discovery was the extreme value of the ore, which ranged from \$300 to \$3,000 per ton (Nadeau 1965:197). The challenge of the discovery was the remote area of Surprise Canyon at an elevation of 6,600 feet above Mean Sea Level and 200 miles from the coast. Vast sums of capital were required to make this silver discovery a practical business venture. In 1873, E. P. Raines attempted to finance a camp in the area but had no success because potential investors were reluctant to put up capital without samples of ore from Panamint (Chalfant 1922:249). But in December 1873, the first samples of ore from the Panamint area arrived in Los Angeles and were put on display at the Clarendon Hotel (Wolle 1953:138).

As early as 1873, a crude trail extended from Little Lake across the Coso and Argus ranges to Surprise Canyon (Warren and Roske 1978:37). In the spring of 1874, the Los Angeles Chamber of Commerce agreed to finance a wagon road into the Panamint Valley (Nadeau 1965:197). One of the early investors in the Panamint Mining Company, Richard C. Jacobs, supervised the construction of the road (Warren and Roske 1978:38). Essentially, Los Angeles, a small, dusty town of 10,000 people, was envious of wealthy, booming San Francisco. San Francisco's flourishing economy and

prosperity had developed largely due to mineral wealth from the gold rush times and was continuing to enjoy stimulation from the wealth associated with the rich silver deposits to the east, especially the mines in the Virginia City, Nevada, area. The citizens of Los Angeles hoped that the mines of Panamint would become, as their promoters promised, "better than the Comstock" and likewise stimulate their own economy (Putnam 1946:197).

The major investors in the Panamint claims were two United States senators from Nevada, John Percival Jones and William Morris Stewart (Wolle 1953:138). Both men had made enormous profits on the Comstock. Chalfant estimates that these two men invested in excess of two million dollars in the Panamint mines (1922:258). Stewart was a lawyer and Jones was a former mine superintendent, and both men had gained reputations as shrewd businessmen for outsmarting the California banking interests in the Nevada mines (Nadeau 1965:197). The two organized the Surprise Valley Mill and Water Company (Wolle 1953:138). The interest of Jones and Stewart in the mines also attracted other investors (Peterson 1978).

By March 1874, 125 men had struggled into the Panamint region, and by November the number of men in Panamint had risen to 1,000 (Chalfant 1922:258). The first issue of the Panamint News on November 26, 1874, urged more prospective miners to the area, and the paper tried to convince prospective investors not to be intimidated by Stewart and Jones (November 26, 1874, p. 2; Muir 1950:5-44).

Unfortunately, Panamint attracted more than honest miners. There was not even a road leading into Panamint in the early days of the town, and since it was so remote, it made a perfect hideout for outlaws (Wolle 1953:138). Panamint also became a haven for stagecoach robbers who robbed the coaches of their express boxes and the passengers of their valuables (Brown 1908:261). For the most part, the original owners of the Panamint mines were outlaws. In his memoirs, Senator Stewart freely admitted that he purchased his original mines from outlaws (Brown 1908:262). When representatives of the Wells Fargo Company heard of Stewart's dealings with outlaws, they threatened to challenge the legality of the purchases, claiming the men owed Wells Fargo for past robberies. In turn, Stewart paid Wells Fargo \$12,000 in damages (Chalfant 1922:258). Two of the men that Stewart dealt with directly, John Small and John McDonald, had known Stewart during his Nevada mining days. Small and McDonald had robbed stages in Nevada and had hidden themselves in the Panamint region. Both men trusted Stewart and

remained in Panamint even after they had sold their mining interests (Nadeau 1965:198-202).

Street violence was also a serious problem in Panamint. A professional gambler, Jim Bruce, was probably Panamint's most notorious gunman and was responsible for the deaths of at least two men. One man accosted Bruce in a whorehouse and was shot to death by the gambler. The other death involved a man named McKinley, an employee of Stewart. The two men were involved in a duel outside the Bank of Panamint; Bruce was also injured in the shooting argument, but McKinley died three days after the incident (Nadeau 1965:198-200). Bruce was arrested and examined by the justice of the peace, but the charges were later dropped on the grounds that Bruce had acted in self-defense (Chalfant 1922:261). Ned Reddy, owner of the Independent Saloon, also brought to Panamint a reputation of violence. Reddy had killed two men in Owens Valley, but as in the case of Bruce, the deaths were judged to be self-defense (Nadeau 1965:198-199). Dave Neagle, a gunfighter from Nevada, came to Panamint as a bodyguard for Justice Stephen Field (Nadeau 1965:199). Saloons were often the centers of violence in mining towns, not only because they served as the only source of recreation for the miners, but also because the saloon keepers themselves were often disreputable businessmen. It required very little capital to open a saloon, and when saloons were damaged by violence, others would open overnight to take their place.

The scapegoats of violence in Panamint were the Chinese. Since the silver in Panamint was located in such awkward places, Chinese workers were hired to build roads to the mines (Wilson 1937:158). Perhaps as many as 200 Chinese laborers accepted jobs in Panamint. For safety purposes and to minimize expenses, Chinese workers lived in very close groups. The Chinese worked for very low wages, and whites accused them of lowering wages for everyone. As high prices for housing and food exacerbated the problem, Chinese workers were frequently victims of random violence. Finally, the hostility against the Chinese workers grew so intense that the largest employer in Panamint, the Surprise Valley Mill and Water Company, agreed to fire all their Chinese employees (Cragen 1975:156).

In the winter of 1874-1875, Panamint was in a full boom stage. By January, 600 silver claims had been filed, and lots on Main Street in Panamint were selling for as high as \$3,000 (Wilson 1937:160). In Panamint, which was built into a hill, the main street stretched 1,000 feet from top to bottom (Wolle 1953:139). The city was built within several months, with 50 buildings going up in a matter of

weeks. By the summer of 1875, there were six general stores and 12 saloons operating in Panamint (Nadeau 1965:199-200). The most elaborate structure in Panamint was Dave Neagle's Oriental Saloon. He invested \$10,000 in fixtures alone and built a black walnut bar for his customers. He also provided card rooms in the saloon with bulletproof walls (Wolle 1953: 138). By the summer of 1875, the population of Panamint had risen to 5,000 and was prosperous enough to support a bank, a meat market, and a local brewery (Nadeau 1965:199-200).

The high cost of living plagued the residents of Panamint. Eggs sold for \$2.00 per dozen, hay for \$200.00 per ton, and lumber for \$250.00 per thousand feet (Nadeau 1965: 199-200). Transportation costs accounted for much of the high prices in Panamint.

The road from Independence to Panamint, running south by way of Little Lake and Indian Wells, curving east to the Panamint Valley, and then taking a northward route to Surprise Canyon, took four days one way and was quite inadequate (Cragen 1975:150). This mode of transportation was clearly unacceptable to the residents of Independence, located in Owens Valley. Prosperity of Owens Valley in this era was directly related to the mining camps of Cerro Gordo, Panamint, and Darwin; and residents feared that due to the slow traffic between Panamint and Independence, none of the bullion from the Panamint mines would travel through Owens Valley (Cragen 1975:150). In order to rectify this situation, residents of Independence and Lone Pine petitioned the Inyo County Board of Supervisors to build a road from Owens Valley to Panamint. The board responded positively to the appeal and awarded the contract for the road to John Shepherd of George's Creek (Cragen 1975:150).

Completion of the road from Independence to Panamint was a partial success. The road sped up the flow of goods and people between the two locations. For example, Rothschild and Company of Independence became one of the major suppliers of lumber, liquor, and food to residents of Surprise Canyon (Cragen 1975:173). Miners flocked into the land office at Independence to file their claims and to spend their money in the towns of Independence and Lone Pine (Cragen 1975:155). When three leading residents of Independence, V. A. Gregg, Al Wapelforst and John B. White, made a fact-finding trip to Panamint, they reported to the Board of Supervisors that Owens Valley dwellers would benefit from the prosperity of Panamint. Owens Valley ranchers made extra money by using their teams and wagons to haul goods to Panamint (Cragen 1975:156).

The road, however, did not completely solve the transportation problems of the region. Demand continued to outdistance supply, and the new road did not significantly lower consumer prices in Panamint. In fact, when some visitors found how expensive it was to live in Panamint, they left the town the day they had arrived (Cragen 1975:153). The one-way fare from Independence to Panamint on the new stage was \$25.00. Besides the high fare, it was often impossible to obtain reservations on the stage, which left every other day for Panamint (Cragen 1975:155). At the peak period of Panamint's boom, as many as 700 people a day crowded into the city (Cragen 1975:156).

By the middle of 1875, most citizens of Owens Valley and Panamint realized that only railroad service could solve the transportation problems of the area. Wagon service between Panamint and Owens Valley and Panamint and San Bernardino was too slow and could never deliver the tonnage necessary. The San Bernardino-Panamint Road was also known as Meyerstein's Road. Meyerstein was a merchant from San Bernardino who was one of the first men to provide supplies for the miners in the Panamint area (Warren and Roske 1978: 29-31). Most of the investment made in Panamint in 1875 was based on the presumption that rails would soon connect the city with the rest of California. Southern Pacific engineers expressed interest in a railroad, but Mr. J. U. Crawford of the Independent Railroad was the first to break ground for a proposed Los Angeles-Independence route on January 9, 1875 (Cragen 1975:157). Besides a railroad, prospects for a telegraph line between Panamint and Bakersfield were also discussed. Investors hoped that if the railroad could link Cerro Gordo, Panamint and Darwin, as much as 1,500 tons of ore could be hauled out of Inyo County mines per day (Cragen 1975:157).

One of the foremost proponents of the new Los Angeles Independence Railroad was the Panamint News. The newspaper was especially impressed with Crawford, who supposedly had connections with famous eastern financier Jay Gould. The newspaper was also excited by Crawford's intention to connect the Los Angeles Independence Railroad with the Union Pacific. Senator Jones was the major source of support behind Crawford's project. In New York, Jones purchased 78 box, platform, and gondola cars from the New York, Boston and Montreal Railroad Company. Jones also ordered expensive locomotives and passenger cars for the proposed new line (Panamint News, May 18, 1875, p. 8). What everyone misjudged was the time it would take to build this proposed railroad, but Jones and Steward inspired confidence in investors. The railroad would hopefully end the tedious process of moulding

750-pound balls of silver and slowly transporting them down the mountain (Brown 1908:264).

On July 24, 1876, a disastrous flash flood washed through Panamint, destroying the town in one day. Rains began early in the morning and continued throughout early afternoon, with tons of water flowing through the main street. Some survivors estimated that the waves reached 50 feet high. Frightened residents ran up the mountain or attempted to form human chains to escape the onrush of water. Huge boulders and parts of trees hurled down the main street of Panamint, severely damaging or completely destroying every building in the town. Fifteen people were killed in the flood. A few miners remained in the area after the flood but refused to live in the town again (Wolle 1953:139-141). The last company mines shut down in May 1877 (Nadeau 1965:202). In 1925, an attempt to tunnel under old mines proved unsuccessful (Wolle 1953:141). In Panamint itself, there are a few remnants of the nineteenth century boom period, including the foundation of the city's largest mill, parts of walls from destroyed buildings, old cellars, and a few graves in Sour Dough Canyon (Wolle 1953:141). Panamint was the most colorful of the late nineteenth century mining towns within or near the study area. Much of the lore and legends surrounding the rise and fall of Panamint has been preserved by Wilson in Silver Stampede (1937).

A branch of the Panamint road passes through Indian George's ranch to the highway, and the highway leads to Wildrose Station, half the distance between Ballarat and Skidoo. This station was the site of an important freight stop during the 1906 boom in Skidoo (Weight 1960:9). A Civilian Conservation Corps camp was opened in the same area during the 1930s, and George and Anne Pipkin operated the station at Wildrose during the 1940s and early 1950s (Weight 1960:9).

Hungry Bill's Ranch is an area of special importance in the history of Panamint City and the Panamint Valley. The ranch is sometimes referred to as Indian George's Ranch (Weight 1960:9). During the decade of the 1870s, this ranch, located near the head of Johnson Canyon north of Six Springs Canyon on the east side of the Panamint Range, served as a source of fresh produce for miners in Panamint (Kirk 1953:16). The ranch was first made productive by Swiss immigrants who settled the land during the mining boom in Panamint (Kirk 1953:16). But the land is more properly associated with the Indian, George Hansen. Hansen is also known as "Inyo George" or "Indian George" (Ellenbecker 1938:42). Hansen was one of the first Indians to spot whites

in the area--legends have him watching the Manly-Arcane party struggling out of Death Valley (Kirk 1953:15). Hansen acquired the name George from Dr. S. G. George, who hired the Indian as a guide during his search in the winter of 1860-1861 for the Gunsight Mine (Long 1950:138-139). George Hansen died in 1944 (Weight 1960:9).

The legendary Hungry Bill was George Hansen's grandson (Kirk 1953:15). Bill supposedly could consume more food than any miner in the Panamint region (Kirk 1953:15). Bill served as a scout for the U.S. Army during the Modoc War, and as a reward, the United States government gave him legal title to the 550-acre ranch (Kirk 1953:15). When Bill died in 1928, the ranch passed into the hands of Bill's son-in-law, Tom Wilson (Palmer 1948:37).

d. Millspaugh. The site of this small town is south of Maturango Peak on the western slope of the Argus Range, just outside the study area within the limits of the China Lake Naval Weapons Center. Millspaugh was a short-lived mining town that "flared briefly" just after the turn of the century during the Tonopah-Goldfield era (Nadeau 1965:203). According to Nadeau, almost nothing now remains of the town.

e. Darwin. As the fortunes of Panamint declined, the rise of Darwin kept the mining prospects of Inyo County alive. The mining town of Darwin is located on a mesa above Darwin Wash in the north part of the Argus Range (Federal Writers Project 1939:34).

Deposits of silver and lead were found in Darwin in October 1874 (Nadeau 1965:194). Victor Beaudry, of Cerro Gordo fame, was the most prominent newcomer to Darwin (Nadeau 1965:194). From his Cerro Gordo experience, Beaudry realized that one of the first needs of a new mining area was an adequate water supply. Beaudry wanted to be the water baron of Darwin and was responsible for the construction of a 12-mile pipeline that brought water from the springs in the Coso Mountains to Darwin (Federal Writers Project 1939:34). Beaudry estimated that he could provide Darwin with 8,000 gallons of water a day (Cragen 1975:150). The pipeline leaked so much water, however, that Beaudry was never able to attain his goal, and much of the water used in Darwin had to be hauled in from Darwin Falls, eight miles away (Federal Writers Project 1939:34).

Victor Beaudry's name was almost as important to the development of Darwin as his proposed water scheme because his interest in Darwin gave the town credibility.

Darwin never had the publicity of Panamint, but Beaudry's name attracted miners from Cerro Gordo, western Nevada, and northern California (Nadeau 1965:195). By the end of 1875, Darwin boasted 20 operating mines and a population of 700 (Nadeau 1965:194). The town also had two smelters and over 200 buildings, including a dance hall (Nadeau 1965:194). The Cerro Gordo Freighting Company extended service to Darwin in 1875 (Nadeau 1965:194-195).

One of the major beneficiaries of the prosperity of Darwin was the Black Rock Saw Mill in Independence. Darwin also offered Independence ranchers a new market for their products, and the prominent Independence attorney, Pat Reddy, expressed his confidence in the future of Darwin by building a home there (Cragen 1975:156). By the end of 1875, express wagons left Independence twice a week bound for Darwin (Cragen 1975:156).

The year 1876 was a pivotal year in the history of Darwin--by summer the town's population was over 1,000 (Lee 1930:130), but in August, the Defiance smelter, the largest in Darwin, temporarily ceased operation (Nadeau 1965:195). The temporary shutdown of the Defiance smelter did not immediately close down mining operations in Darwin, however, but it was symbolic of the problems that would plague Darwin. Transportation costs similar to those which affected Cerro Gordo and Panamint also affected Darwin. Darwin was separated from Los Angeles by 275 miles of very difficult terrain, and there was simply no inexpensive method for transporting goods this distance. In the early days of the mine operation when the miners were transporting easily accessible, high-grade ore, they could sustain the freight costs (Lee 1930:130). It was difficult to justify those costs with low-grade ore.

Darwin was also not without its share of labor disputes. Although Darwin never attracted the number of Chinese workers that flocked to Panamint, there was a strong negative feeling against the few Chinese who settled in the region. Anti-Chinese feeling reached its peak in California in the late 1870s and early 1880s, and California became one of the strongest proponents of Chinese exclusion legislation pending in the United States Senate (Lingenfelter 1974:126). Anti-Chinese feelings also inspired Anglo workers to form labor unions. These unions were often weak because they were only local organizations with no outside support. One such local union was the Workingmen's Club of Darwin (Lingenfelter 1974:141). In 1878, the New Coso Mining Company reduced smelter workers' pay from \$4.00 to \$3.00 per day. In protest, the Workingmen's Club of Darwin called a

strike which lasted for months. In May 1878, when the company attempted to resume mining operations with nonunion workers, violence erupted and the sheriff's men killed one of the strikers, C. M. Delahanty. A citizen's committee exonerated the peace officers, and the union quietly folded (Lingenfelter 1974:141).

Unlike the natural disaster which abruptly struck Panamint, Darwin experienced a gradual decline. During 1877 and 1878, Panamint miners continued to flock to Darwin despite the fact that the town was undergoing an economic recession. When strikes occurred at Bodie and Mammoth City in 1878, the miners quickly left Darwin (Nadeau 1965:195). Complete economic stagnation characterized the town by the 1880s (Lee 1930:131).

It was a great disappointment to many residents of Inyo County when the railroad only went as far as Keeler and never extended into Darwin (Lee 1930:131). Darwin had always had its believers and the expectation of future booms were based on the amount of ore still available in the Darwin Hills (Lee 1930:131). Chalfant also expected Darwin to play a significant role in the future of Inyo County (Chalfant 1922:268).

Anaconda Copper Company reopened the Darwin mines in 1945 (Hall and Mackevett 1958:15). Anaconda turned the Darwin region into the largest lead-producing area in the State of California, responsible for two-thirds of the state's lead production (Nadeau 1965:195). Most of the lead has come from four mines: Defiance, Essex, Independence, and Thompson (Hall and Mackevett 1958:15). In 1948, the Anaconda Copper Company revived the Lucky Jim mine, but no ore has been taken from it since that year (Hall and Mackevett 1958:15). Anaconda closed down its operation in Darwin in 1957.

In 1967, the Darwin mines were again reactivated. One year after reactivation, the mines employed almost 100 men with a monthly payroll of \$50,000, and this proved to be a boost to the economy of Lone Pine as well (Inyo Independent, July 12, 1968, p. 1). The revival of the Darwin mines can be traced to the activity of William Skinner, who believed the mines contained enough lead, zinc, and silver to still be profitable (Inyo Independent, July 12, 1968, p. 1).

While on a fishing trip to Canada, Skinner met with representatives of the West Hill Exploration Company. West Hill responded to Skinner's interest by sending experts to examine the Darwin mines (Inyo Independent, July

12, 1968, p. 1). The company eventually signed a lease with Anaconda and contracted Skinner's Brownstone Mining Company to revive the old Defiance and Thompson mines, and the Darwin mines once again began to produce silver, lead, and zinc. The mines at Darwin have been reopened so often that they now contain over 30 miles of workings and tunnels (Inyo Independent, July 12, p. 4).

f. Lookout. Another mining camp associated with the rise of Darwin was Lookout. By early 1876, Darwin and Lookout were connected by a toll road across the Argus Range (Engle 1972:38). A pack trail linked Lookout with the Minni-etta and Modoc mines (Nadeau 1965:202)--the Modoc mine was located on the north face of Lookout Mountain and was owned by former United States Senator George Hearst (Palmer 1948 :49); the Minnietta mine was located on the south side of Lookout Mountain (Nadeau 1965:203). The machinery for the Lookout furnace was brought into the camp from the rail terminal at Caliente, and by the end of 1876, the Cerro Gordo Freighting Company began hauling silver bars from the mountain (Engle 1972:38). In 1877, the Lookout Coal and Transportation Company replaced the Cerro Gordo Freighting Company as the major transportation line operating in the Lookout region (Engle 1972:38). By the end of 1877, the population at Lookout was large enough to support a post office, three saloons, two general stores, and a community hall (Engle 1972:38). After the residents of the town were made aware of the fact that California had another town named Lookout, they changed the name of their community to Modoc (Engle 1972:38). Other references to the town of Lookout are Florin (1964:36) and Mitchell (1968:28-29).

g. Ballarat. Ballarat was an old mining and trading town located on the east side of the Panamint Valley, approximately 15 miles south of Wildrose Canyon (Palmer 1948:10). In its heyday, Ballarat was not a mining town per se but was a place miners came for supplies and entertainment (Putnam 1946:180). Gold was discovered near Ballarat in the 1890s, and the residents named the town Ballarat after a famous Australian gold mining region (Nadeau 1965:202). For the next 50 years, prospectors searched for gold in this area. Ballarat was the Inyo County mecca for the individual prospector, and thus the town was associated with legendary lone miners such as Indian Panamint Tom, Shorty Harris, French Pete, Seldom Seen Slim, and the Ballarat Saloon keeper, Chris Wicht (Bales 1941b: 10-14).

Mining in the Ballarat region was extraordinarily difficult. More often than not, the valuable ore was located high up in the gorges; and in order to obtain the

gold, miners had to navigate some of the steepest grades in the Panamint Range (Gray 1940:8). In Pleasant Canyon, for example, where much of the Ballarat gold mining occurred, it took six teams of good mules to haul a wagon of two tons (Gray 1940:8). Yet the production figures of some of the mines in the area were impressive: O. B. Joyful in Tuber Canyon, \$250,000; Gem Mine in Jail Canyon, \$150,000; and the Radcliffe and World Beater mines in Pleasant Canyon, over \$700,000 (Gray 1940:9). But for the individual prospector, the risks in Ballarat gold mining were enormous. Many veins looked more valuable than they actually were, and most prospectors never found any gold at all.

Ballarat replaced Darwin as the center of government in southern Inyo County (Hubbard 1965:3). The 80-acre town site of Ballarat was organized in 1897, and the town's original buildings were brought in from the Radcliffe Mine in Pleasant Canyon (Hubbard 1965:18). There was not enough mining in the canyons of the region, however, to sustain the town, and it is likely that Ballarat would not have lasted more than a decade if it had not been for the discovery of gold at Skidoo in 1906. Ballarat became the major business supplier for the new town, Skidoo, and also for Harrisburg in the years to follow (Hubbard 1965:86). Hubbard measures the life of Ballarat by the life of its post office, which opened on July 21, 1897, and closed on September 29, 1917 (1965:90). After World War I, Ballarat became another ghost town in southern Inyo County. Although the town did not remain, individual miners continued to prospect for gold in the Panamint Range canyons near Ballarat, and occasional miners still reside in several of the buildings.

h. Oasis Ranch. In 1872, an enterprising young man, Noah T. Piper, established the Oasis Ranch in the southeastern area of Mono County. Piper was the 14th of 15 children, whose parents had left England in 1842. He was born in Battle Creek, Michigan, on January 2, 1843, and came to California in 1855. Piper married Catherine Somerville who bore him four children: Sara, Inez, Noah T., Jr., and Maribel, who now resides in Los Angeles.

The reason Piper chose to settle in southeastern Mono County is unclear, but his decision proved to be a stroke of genius. In the following years, Piper's ranch dominated the economy of southeastern Mono County, and Piper became the area's most influential citizen. Although Piper may have come to Mono County because of the mining camps in the area, he had no interest in mining himself. His stated purpose in coming to Mono County was to establish a ranch that would provide food for the miners in the area.

The name Oasis was derived from the fact that Piper planted hundreds of cottonwood and black locust trees which significantly altered the appearance of southeastern Mono County. Piper's major occupation was cattle ranching, and he devoted most of his 2,000 acres to that purpose, slaughtering the cattle in a large stone corral on the ranch.

Piper attempted to make the ranch operation as self-sufficient as possible and grew potatoes, hay, and alfalfa besides raising cattle. The eastern Nevada mining towns of Tonopah and Goldfield were very dependent on the Oasis Ranch for their food supply, but his farm products were shipped to eastern California mining towns as well.

Although Piper profited from miners in Mono County, Inyo County, and eastern Nevada, he did not hold the occupation of mining in high esteem. Afraid that his children would be dominated by the influence of miners in the area, he hired a teacher to educate his oldest daughter Sara. She in turn instructed the younger children. When the Piper children reached their teens, they were sent to high school in Sacramento.

In a normal year, Piper hired approximately 30 farmhands, usually employing a combination of white and Indian workers. He experienced difficulty with white workers but resolved the problem by firing them and hiring Indian hands. Piper maintained a patriarchal relationship with the Paiute Indians; he and other whites in the area usually handled disputes with the Indians by themselves. In one instance, whites kidnapped an Indian named Joe Bowers and held him until tensions abated. Piper kept skulls in the cellar because they supposedly kept the Indians from stealing farm goods. He hired an Indian woman named Topsy to care for his eldest daughter and also opened the ranch once a year for Paiute tribal dances. With his influence spreading beyond southeastern Mono County, Piper was elected agricultural commissioner for Mono County in the 1880s. When mining in the area diminished at the turn of the century, Piper sold his ranch for \$100,000 and retired to Los Angeles. He died in 1910 at the age of 67. Information on the Oasis Ranch is based on an interview with Mr. Robert Roth of Riverside, California, whose grandfather was Noah T. Piper. Mr. Roth also has an excellent collection of photographs of the area.

i. White Mountain City. Little is known about the remains of this obscure town. Although the town's

location is plainly marked on U.S.G.S. maps, it is not included in the otherwise abundant literature dealing with old ghost towns in the region.

In order to gain some knowledge of the town, an old-time resident of the area, Dave Scott, was interviewed. Mr Scott's grandfather once owned Deep Springs Ranch, from approximately 1905 to 1910-12, and the land Deep Springs College now occupies. The college opened in 1917 and is the alma mater of the renowned ethnographer Julian Steward.

At the time Mr. Scott's grandfather bought the ranch, White Mountain City was in ruins. According to Mr. Scott, there are no old timers in the valley who recall anything of the history of the town. All that remains are stone walls, up to six feet high, and foundations. The last time Mr. Scott observed the town, remains of from 18 to 25 buildings could be seen, as well as the remains of a "mill and retort." The town, lying just north and near Highway 168, has been heavily vandalized, with people camping there and digging for souvenirs. Mr. Scott is not familiar with the presence of petroglyphs, which are marked on U.S.G.S. maps near White Mountain City. The petroglyphs marked on the map are those described by Julian Steward (1929:75), although he does not note the presence of White Mountain City nearby.

The local opinion is that silver was processed in the town. Long-time residents believe the ore was brought from a place locally known as Gilbert Hill, which lies eight to ten miles from the town site. Today, diggings may be seen all over this hill.

The route leading east from Owens Valley to Deep Springs and the ruins of White Mountain City is State Route 168. This route was once a toll road. The road was built by J.S. "Scott" Broder in 1873; and he lived at a tollhouse located west of Westgard Pass, collecting tolls, until 1900. In 1913 the Inyo Good Roads Club and A.L. Westgaard sponsored an Automobile Association tour on this road to promote it as part of a new transcontinental route. This failed, however, and the state took over the route in 1925. A plaque was erected at the old tollhouse site in 1974, and the site is now included in the Inyo National Forest, west of the Eureka Planning Unit.

j. Skidoo. According to Putnam (1946:190), the name Skidoo originated from a wisecrack. While the first settlers were discussing establishment of the town site, a man named Montgomery mentioned that he was planning to build a pipeline to bring water from springs on Telescope Peak, 23

miles away. The humor of the moment was expressed, "23 skidoo!" and not due to any logic, Skidoo became the town's name. The remains of this town lie east of the Panamint Planning Unit within the boundaries of Death Valley National Monument. Gold was discovered on the ledges of Skidoo in January 1906 by John L. Ramsey and John A. Thompson (Weight 1960:27), but Robert Montgomery was responsible for the birth of the town of Skidoo (Lee 1930:145). He sold his holdings in the Montgomery-Shoshone Mines in Rhyolite and moved to Skidoo (Lee 1930:145). Isolation characterized the Skidoo region--it was separated from Rhyolite by Death Valley, the Amargosa Range, and the Amargosa Desert and was isolated from the west by the Panamint Valley and two mountain ranges (Lee 1930:145). Water was piped 18 miles from Telescope Peak (Lee 1930:145). The ore had to be rich to overcome these severe geographical barriers. In a relatively short period of time, Skidoo had a bank, newspaper, and telephone service (Lee 1930:145), and within a year, Skidoo had a larger population than Ballarat, despite the fact that Ballarat had been established nine years earlier (Hubbard 1965:86). The financial panic of 1907, however, soon slowed Skidoo's growth (Glasscock 1940: 245). Activity continued in the mines for another year or so, but the camp which had developed almost overnight diminished as quickly as it had begun. Lee estimates that perhaps as much as three million dollars may have been invested in Skidoo, and that substantially less than one hundred thousand dollars came out of the mines. The Skidoo gold and silver mines shut down shortly after the close of World War I (Smith 1968:37).

Edna Perkins, who visited Skidoo in 1921, found little to remind her of the feverish mining days. She reported that all that remained of the town was a single, wide street, several abandoned buildings, stoves, broken furniture and rusted cooking utensils (Perkins 1922:159-160). Today, all that is left of the adventure of Skidoo is a cemetery, several mines, and remnants of the stamp mill (Nadeau 1965:268).

k. Harrisburg. Harrisburg, lying east of the Panamint Planning Unit and south of Skidoo, was the mining settlement most closely associated with Skidoo (Palmer 1948:34). The town was named after Shorty Harris, whom Chalfant refers to as "The Dean of the Desert Rats" (Chalfant 1942:77). Although the French Basque Peter Auguerreberry actually established the town, his claim was preempted by Frank "Shorty" Harris (Glasscock 1940:239). Within a year of its founding in late 1905, Harrisburg claimed a population of 300 (Glasscock 1940:242). Although Harrisburg collapsed along with Skidoo, Peter Auguerreberry remained at the mine

site for 36 years (Bales 1941a:17). Auguerreberry received offers for the mine running as high as \$150,000, but he refused them all and continued to work the mine with pick, shovel, and dynamite (Bales 1941a:17). The only thing left at the old mining town of Harrisburg today is the battered ruins of an old mill (Palmer 1948:34).

1. Saline Valley. Saline Valley, named for the brilliant white salt playa occurring there, has some of the highest grade salt in the world. In 1864, a farmer from the Owens Valley, whose name was Smith, discovered this deposit. Smith brought wagon loads of the salt into Owens Valley and sold it to the housewives, who used it for table purposes and for making butter. Because of the difficulties in transporting the salt from the Saline Valley to Owens Valley, Smith sold the salt for a very expensive \$20.00 per ton. Due to the excellent quality of the product, however, Smith never lacked customers, but he eventually abandoned the project because it was still too costly to haul the salt out of the Saline Valley by wagon.

The trip across the Inyo Range through Waucoba Canyon to the salt deposits took two days by wagon, even though the distance is only 12 miles by air (Ver Planck 1957:117). In 1902, the Conn and Trudo Borax Company, which owned several hundred acres in the valley, opened a small facility for borax mining (Bailey 1902:49). In 1903, the Saline Valley Salt Company was formed under the direction of L. Bourland (Ver Planck 1957:116). The activities of this company were temporarily halted in 1905 when Bourland died, but two years later the Saline Valley Salt Company began an in-depth study of the transportation problem involved in bringing salt from the Saline Valley to Owens Valley (Ver Planck 1957:117). The company ruled out the possibility of a railroad as impractical and considered the idea of constructing a pipeline but finally settled on an aerial tramway (Ver Planck 1957:117; Hanks 1882:217-226). The tramway could be used not only to bring salt out of the Saline Valley but also to ship supplies into the valley.

In 1908, surveys were begun by White Smith of the Saline Valley Salt Company to construct the tramway which would link the salt marsh of the Saline Valley with the railroad depot at Keeler. When completed, this tramway would be the steepest in the United States. Owners of the Saline Valley Salt Company estimated that the tramway would reduce transportation costs from \$20.00 a ton to \$4.00 a ton. In August 1911, the Saline Valley Salt Company signed a contract with the Trenton Iron Works, a subsidiary of the American

Steel and Wire Company, for construction of the tramway (Ver Planck 1957:117). The rugged terrain of the Inyo Range made construction of the tramway extremely difficult--an old road was reconstructed on the west slope of the mountain range, but due to the 25 percent grade, it took eight horses to move 5,000 pounds of equipment (Ver Planck 1957:117). The tramway was completed in July 1913.

The 13.4-mile aerial wire rope tramway was divided into five sections which varied in length from one and three-quarters to four miles, depending on the elevation reached by each section. Three sections of the tramway brought the salt from the valley floor to the summit of the Inyo Mountains, a distance of 7,600 feet. The other two sections carried the salt from the summit to Swansea 5,100 feet below. Normally, the tramway's capacity was 20 tons of salt per hour, but the capacity could be increased to 30 tons if necessary. The salt was transported along the tramway in 800-pound capacity buckets (Anonymous 1963:14-15). The buckets had a cylindrical shape and hung horizontally from the carrier wire. A separate control station existed at each section of the tramway. Power was supplied by 75 horsepower electric motors maintained at each control station. When the tramway began operations, two men were employed at each of the control stations and two men were required at each of the terminals. Four line riders performed the maintenance work on the tramway. The major problem that hindered the operation of the tramway was the weight of the salt--planners had estimated that the salt would weigh approximately 60 pounds per cubic foot, but the salt actually weighted 70 pounds per cubic foot (Ver Planck 1957:117).

The cost of the tramway construction proved excessive for the Saline Valley Salt Company, and in 1915 the company was forced to lease its operation to the Owens Valley Salt Company (Ver Planck 1957:118). The Owens Valley Salt Company operated the facility for a three-year period, but in 1918, this company also abandoned its interest in the Saline Valley salt works (Ver Planck 1957:118). Two years later, in 1920, the Taylor Milling Company, under the direction of G.W. Russell, revived the operation of the Saline Valley salt works but the venture only lasted one year. In 1925, G. W. Russell made another attempt to make the salt works profitable. Russell established a new company, the Sierra Salt Company, and since the tramway was in disrepair, Russell used trucks to haul the salt from the Saline Valley to Keeler (Ver Planck 1957:118). In 1929, Russell reopened the tramway and operated it for the next six years. But like his predecessors, Russell, too, was forced to shut down the facility in 1935 (Ver Planck 1957:118). The last serious attempt to make

the Saline Valley salt deposit successful on a large scale came in 1954. In that year, three men, D. O. Morrison, J. J. McKenna and Tony Pinheiro, leased the operation from T. K. Temple of Los Angeles. The trio had only minor success with the facility (Ver Planck 1957:76).

A portion of the research for this project involved examination of the A. A. Forbes photographic collection, curated at the Los Angeles County Museum, for any photographs pertinent to the study area. Although most of the collection relates to subjects in the Owens Valley and Mono Lake areas and the Sierra Nevada, several photographs taken in the Saline Valley were located. The dating of the photographic plates is difficult because Forbes did not record when they were taken. According to Nancy Walter of the Los Angeles County Museum, the Saline Valley photographs were probably taken prior to 1916. These previously unpublished photographs are included on the following pages through the courtesy of the Los Angeles County Museum of Natural History.

m. Beveridge. According to information in the manuscript Saline Valley Historical District, on file with the Bureau Of Land Management, Riverside, the town of Beveridge was named for John Beveridge, an early pioneer and later a leader in the 1912 Bull Moose Party. Beveridge, situated on the eastern side of the Inyo Range, was a talc mining district and was discovered by the W. L. Hunter party in 1877. Gold was extracted from the ledges of Beveridge Canyon from 1870 to 1900 (DeDecker 1966:1-3). Although not as much is known about Beveridge as Skidoo, more gold was mined at Beveridge than at any other gold mining site in Inyo County (Tucker and Sampson 1938:379-424). Individual prospectors have explored the Beveridge region for gold since the 1930s (DeDecker 1966:1-3). The characteristic inaccessibility of this area, however, has discouraged investors from exploring its mining possibilities.

n. Brown. In their cultural resource inventory of the El Paso-Red Mountain area, Hall and Barker (1975) review the historic resources of the Little Lake and Trona Quadrangles. These quadrangles fall marginally within the study area considered in this report.

According to the research done by Hall and Barker (1975), the major historic remains in the Little Lake Quadrangle is Brown. This town was established in 1909 as a work camp for the Owens Lake to Los Angeles aqueduct, which also runs through this portion of the study area. Brown contained a saloon, a hotel, several businesses, and a school.

PHOTOGRAPHS

Photograph No. 1. This is a view of the Borax Works built by Conn and Trudo in 1902 (Bailey 1902:49); these structures are no longer standing. The background is the northwest edge of the Saline Valley.

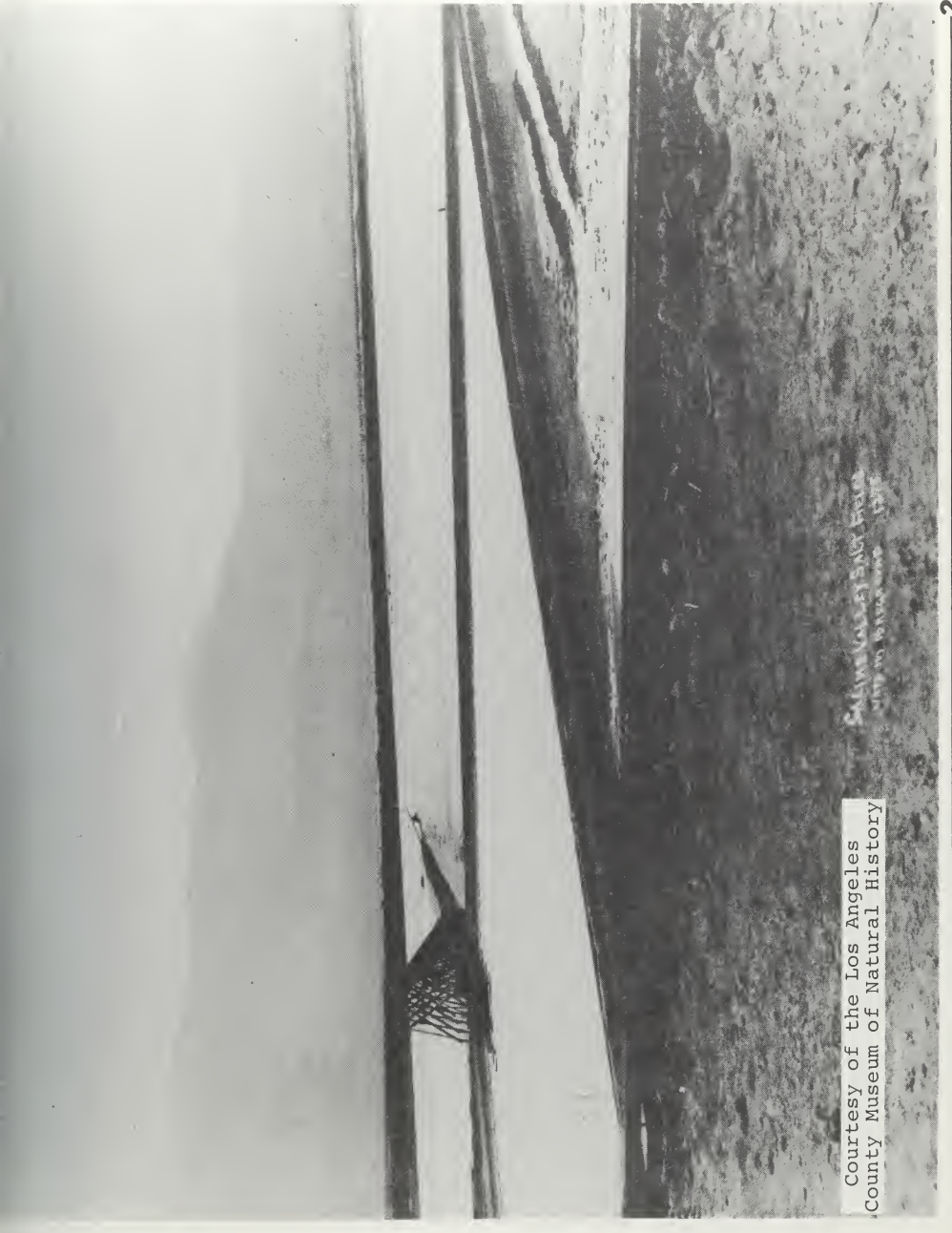
Photograph No. 2. Depicted here are the playa salt deposits, evaporation vats and, apparently, a loading ramp for the Saline Valley salt works. Some portions of the ramp and vats still remain. In the background is the north end of the Saline Valley and the Warm Springs area.

Photograph No. 3. This photograph depicts a portion of the salt tram built to move salt over the Inyo Mountains and bring supplies to the Saline Valley. Many of the tram stations have been vandalized or removed, although several remnants still stand in the Saline Valley. This view was apparently taken on the Owens Valley side of the Inyo Range.

Photograph No. 4. This photograph depicts the Saline Salt Playa with the Hunter Canyon area in the background. The mountains are part of the Inyo Range. The gentleman in the wagon and the buildings at the edge of the playa have not been identified.

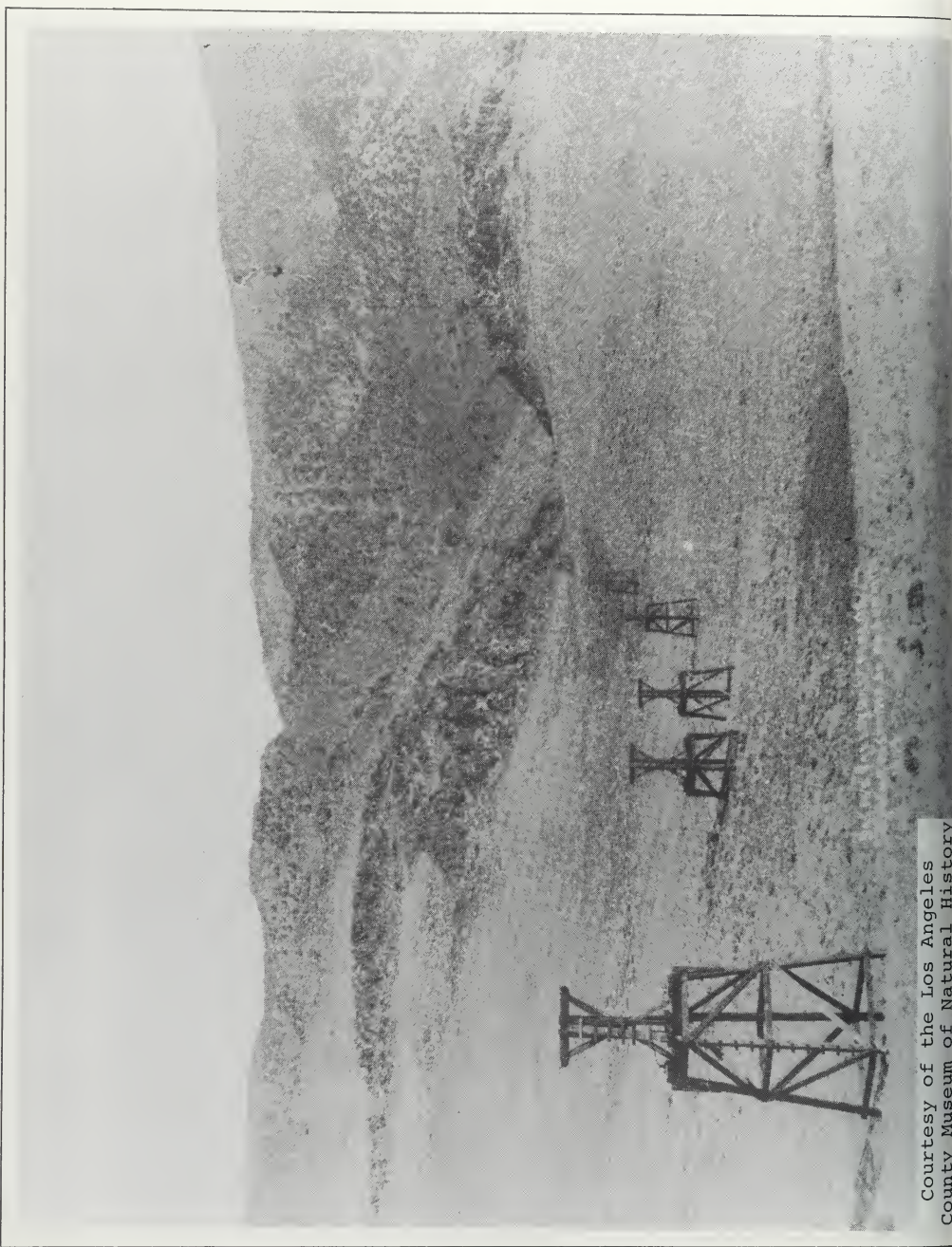


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Brown also functioned in other capacities. It served as a center for local Southern Pacific Railroad operations and as a supply center for prospectors and miners who came to the area during the 1909 Wilson Canyon gold strike.

In 1964, it was reported that all that remained of Brown was a few random buildings and not more than three or four residents (Pierson 1964).

o. Los Angeles Aqueduct. Any detailed discussion of the Owens Lake-Los Angeles Aqueduct more properly belongs to the Owens Valley region of Inyo County. A portion of the Los Angeles Aqueduct, however, passes through the southwest corner of this study area near Little Lake. The aqueduct has long been a subject of controversy in Inyo County, as it severely reduced the agricultural potential of Owens Valley. The climate of Owens Valley is similar in some ways to that of Death Valley (Wood 1973:7); however, the Owens River which flowed through the center of Owens Valley, fed by snows from the high Sierra, gave Owens Valley some agricultural potential. The termination point of the Owens River was Owens Lake at the southern end of the valley. This lake had a high degree of soda and was of no value for irrigation purposes (Wood 1973:7). Gradually, as more settlers moved into Inyo County in the last 40 years of the nineteenth century, irrigation ditches were constructed from the Owens River five miles inland, making the valley agriculturally productive (Wood 1973:7-9).

At the beginning of the twentieth century, the City of Los Angeles was experiencing a severe water shortage (Wood 1973:10). Fred Eaton, an engineer and later mayor of Los Angeles, as well as occasional resident of Owens Valley, was apparently the first person to consider resolving the Los Angeles water shortage with water from the Owens River (Wood 1973:10). In 1905, Eaton presented his plan to William Mulholland, chief engineer of the Los Angeles Water Department (Wood 1973:11). Mulholland was impressed enough with Eaton's proposal to lead a survey party into the Owens Valley to investigate possible routes for an aqueduct (Wood 1973:11). In July 1905, engineers from the Los Angeles Water Department estimated that the proposed aqueduct would provide the city of Los Angeles with 260,000,000 gallons of water per day (Wood 1973:12).

Mulholland estimated the cost of the aqueduct's construction at \$24,500,000 (Wood 1973:12). On June 12, 1907, Los Angeles voters, by a margin of ten to one,

approved a \$23,000,000 bond issue to finance the construction of the Los Angeles Aqueduct (Wood 1973:13). Mulholland believed it would take 5,000 men five years to complete construction of the aqueduct (Wood 1973:14). The major obstacle in the path of construction was the lack of railroad service into southern Owens Valley, but by the end of 1910, the Southern Pacific Railroad provided transportation into the area (Wood 1973:15). The Los Angeles Water Department also had to purchase over 135,000 acres for water rights and reservoir sites. Finally, on November 5, 1913, the first Owens River water poured through the aqueduct into the San Fernando Valley (Wood 1973:16). After completion of the aqueduct, real estate prices in the San Fernando Valley rose from \$20 an acre to \$2,000 an acre (Wood 1973:22).

Although Owens Valley was not without its opponents to the Los Angeles Aqueduct, the completed aqueduct did not have an immediate negative impact on Owens Valley residents. In 1921-22, however, Owens Valley farmers experienced two severely dry years due to light snowfall in the Sierra (Wood 1973:27). Resentment among Owens Valley residents against the Los Angeles Aqueduct mounted for the next three years; the climax of that resentment came on May 21, 1924, when a portion of the aqueduct wall two miles north of Lone Pine was destroyed by dynamite (Wood 1973:31-33). Although valley farmers received a good deal of sympathetic press in California newspapers, Los Angeles City officials continued to ignore Inyo County demands for irrigation rights to the aqueduct (Wood 1973:38). In fact, in 1925, the Los Angeles Water Board intensified its campaign to purchase more land in Inyo County (Wood 1973:38). Acts of violence against the aqueduct continued throughout the 1920s. More and more valley farmers and ranchers sold their land and left the county, and by April 1934, the City of Los Angeles owned 85 percent of the land in Owens Valley (Wood 1973:59).

Critics of the Los Angeles Aqueduct have argued that it was not necessary to destroy the agricultural potential of Owens Valley to provide water for the residents of Los Angeles. These critics believe that an aqueduct could have been built which would have provided water for Los Angeles as well as taken into consideration the needs of Owens Valley farmers and ranchers. Since the aqueduct was designed by Los Angeles City officials and built with Los Angeles bond money, it was well into the twentieth century before officials of the Los Angeles Water Department became sensitive to the citizens of Inyo County.

The demise of agriculture in Owens Valley influenced settlement patterns throughout Inyo County. Since

the pioneer days of the 1860s, Owens Valley had been the focal point of Inyo County. Because of the rugged geographical barriers that separated the various regions of the county, communication between Owens Valley and the rest of the county had never been easy. Almost all the mining ventures of the nineteenth and twentieth centuries relied heavily upon the Owens Valley for food and supplies, and when the economic energy of Owens Valley became directed toward the Los Angeles Aqueduct, the economic potential of the entire county declined. In a positive vein, this lack of economic development preserved the unique wilderness character of the entire county.

p. Trona-Slate Range. Concerning the Trona Quadrangle, Hall and Barker (1975) report that it once contained the Slate Range Mining District formed in 1861 for the purpose of exploiting gold. The deposits in the Slate Range were worked throughout the 1860s and 1870s.

A road across the Slate Range was completed by Chinese workers in 1873, and way stations were maintained along this road by the Meyerson Stage and Freight Line. During the 1890s, this road served as the main freight line between the railhead at Johannesburg, and Ballarat and Death Valley.

In 1862, borax was discovered on the playa of Searles Lake, and in 1873 a processing plant was built by the Searles brothers in the vicinity of present-day Trona. From 1873 to 1881, the Searles brothers were the major California producers of borax. The Searles brothers borax works were closed in 1898 following the death of John Searles. In 1913, the Searles holdings were taken over by the American Potash and Chemical Corporation, which is still mining the deposits today. This corporation developed other borate and rare earth deposits and founded the present town of Trona and built a rail spur to it.

Hall and Barker (1975) found a number of sources for information concerning the Little Lake and Trona Quadrangles. Pierson (1964) discusses Brown; and Chalfant (1922), DeGroot (1890), Starry (1969), Hanks (1883), Bailey (1902), Thompson (1929), Chickering (1938), and Oberteuffer (1942) discuss the history of the Trona area.

4. Conclusion. For early Euro-American settlers, the greatest attraction of the study area was its mineral wealth. Throughout the area evidence of this mining activity is prolific. The area is littered with hundreds of prospects, mine shafts, camps, and associated debris. In several

areas, such as Darwin and to the south in Trona, mining still continues. In most areas today, however, recreationists comprise the greatest population, rather than miners. Many of the towns that held hundreds or even several thousands of residents, such as Panamint, are now abandoned, or nearly so.

Not all of the settlements discussed in this section are within the study area boundaries. Skidoo and Harrisburg lie in the Death Valley National Monument; Coso and Millspaugh are in the China Lake Naval Weapons Testing Center. Although these town sites outside the study area are not of immediate interest from a resource management point of view, their histories are irrevocably linked to places and events within the study area.

The region of Inyo County under discussion has proved a difficult area to settle and control. Much of its terrain is so severe that large portions remain barely accessible despite modern transportation. The very factors which proved to be stumbling blocks for eager settlers, however, also saved much of Inyo County from the pollution and exploitation that characterize wilderness regions more readily accessible. Most of the settlements discussed in this study were short-lived experiments. With the possible exceptions of Cerro Gordo and Darwin, none of the communities established in the nineteenth century lasted significantly into the twentieth century. Other than the natural disaster that destroyed Panamint, two factors are consistently associated with the demise of every town in the area: the lack of a consistent and predictable water supply and the exorbitant transportation costs. In contrast to similar mining areas of Nevada and California, the mines shut down their operations in Inyo County because investors were unwilling to risk the capital needed to finance an efficient transportation system. Very few of the Inyo County mines were simply mined out.

Inyo County has some of the most important mineral resources in the State of California. Even with the high transportation costs and the inaccessibility of many of the mines, the production figures for the mines while they were in production are impressive. Norman and Stewart estimate the dollar value of the metallic and nonmetallic minerals recovered from the Inyo County mines between 1880 and 1950 at 138 million dollars with copper, gold, lead, silver, and zinc accounting for the majority of these minerals (1951:18). The gold recovered in Inyo County between 1880 and 1948 has been valued at \$11,916,158 (Norman and Stewart 1951:18). In recent years, especially in the Darwin area, tungsten production has also been significant (Norman and Stewart 1951:19). The Inyo Range talc belt northwest of

Darwin and extending northward to the Eureka Valley has become a major source of steatite-grade talc, which is used in the production of high frequency insulators (Norman and Stewart 1951:19). Outside of gold production, the dollar value of the other minerals recovered in Inyo County between 1880 and 1948 are as follows: silver, \$9,777,489; lead, \$20,247,972; copper, \$1,139,740; and zinc, \$4,776,150 (Norman and Stewart 1951:31).

IV. EXISTING DATA SUMMARY

A. INTRODUCTION

In addition to the general overview discussions presented in this report, an existing data inventory would be incomplete without some discussion of the recorded archaeological sites in the project area. Using recorded information often proves a difficult task in that the amount and quality of information available on site forms varies greatly. Because of this variation, the present study deals solely with those sites which have been recorded on the standardized Bureau of Land Management site forms. These general forms permit efficient evaluation of a wide variety of information about cultural resources identified in the planning areas.

Archival data also suffers from the lack of a theoretically sound sampling design. The Desert Planning Staff of the Bureau of Land Management, initially under the direction of Herrick Hanks and subsequently Eric W. Ritter, has undertaken a well thought out sampling procedure for evaluating cultural resources. Although it has some potential shortcomings, it represents a needed step in the right direction.

In conjunction with the information recorded during the execution of the sampling procedures, many sites are available from previous nonprobabilistic surveys conducted in the area. The present study provides an interesting base for correlating probabilistic and nonprobabilistic sampling for the project area.

The survey activity which is of the most interest at this time is that conducted by the Bureau of Land Management Desert Planning Staff during 1976-1977. Each planning unit was a sampling universe. Three of the planning units, Panamint, Darwin, and Eureka, were sampled with an aligned systematic sample stratified according to ecological zones. These strata included valley bottoms, playa, mountain slopes, upland flats, and pinyon-juniper. The fourth planning area, Saline, was sampled using a stratified unaligned systematic sample. Changes in funding basis, personnel, and legislative mandates account for the differences in the sampling design. It should be noted that this represents only the first-stage sample of an intended multistage program.

The differences in the sampling procedures causes some theoretical problems in comparing planning units. The use of probabilistic procedures, however, does provide some confidence in the results obtained within each area.

The sampling procedure employed by the Bureau of Land Management is based on the Archaeological Element of the California Desert Study, prepared by Margaret Weide (1973). The plan is oriented toward ". . . discovery of patterns of site location relative to a series of environmental variables and the development of projections based on these patterns" (Weide 1973:7). The archaeological basis for this approach incorporates the following assumptions.

1. extraction of economic resources was a significant determinant of the land use patterns practiced by the aboriginal inhabitants of the California desert. Location of archaeological sites, therefore, will have a regular relation to the distribution of economic resources used by the past inhabitants;

2. while we do not know these past economic systems in detail, or how the distribution of economic resources has changed through time, we may expect that they are closely related to current plant zones, physiography and hydrology;

3. that relations between these variables and archaeological locales are of sufficient strength that predictions of site densities and locations can be generated for management purposes (Weide 1973:7).

Variables used in operationalizing this approach include: three types of vegetative communities, five hydrologic factors, and six physiographic concerns (Weide 1973: 10). The variant of this scheme employed for the Eureka, Darwin, Saline, and Panamint Planning Units involved the modification of these stratifying variables into four "sampling domains," which differ from one planning unit to the other (Table 4).

A difficulty arises from the nature of the sampling design. The unit of observation--the site--and the sampling unit--an area of surface--were not the same. The object of description was not the component being directly sampled. This difficulty is inherent in the nature of archaeological data. It occurs on sites in that the sampling unit--an area of the site's surface--and the unit of observation--the artifact--do not correspond. The solution to this problem is too complex to approach at this time. Care must be employed, however, when extrapolating from one to the other.

The results of the sampling procedure have been expressed in a variety of ways. Perhaps the most comprehensive yet completed is on the Saline Valley (Anonymous 1976).

TABLE 4
SAMPLING DOMAINS

<u>Planning Unit</u>	<u>Sampling Domains</u>
Eureka Planning Unit	1. Valley Bottom 2. Mountain Slopes 3. Pinyon Juniper
Panamint Planning Unit	1. Valley Bottom 2. Playa 3. Mountain Slopes 4. Pinyon Juniper
Darwin Planning Unit	1. Valley Bottom 2. Mountain Slopes 3. Upland Flats 4. Pinyon Juniper
Saline Planning Unit	1. Valley Bottom 2. Northern Uplands 3. Mountain Slopes 4. Mountain Tops (Pinyon Juniper)

In this document, the results are presented by sampling domain and not by sampling unit. The lack of information presented on the variance between sampling units makes the results for the sampling strata of limited comparative value.

During the course of the present study, information was collected from the Bureau of Land Management's site forms. This information included 11 variables:

1. Planning Unit
2. Site Number
3. Elevation
4. Site Type (Appendix C)
5. Rock Art
6. Milling
7. Biotic Setting
8. Land Form
9. Slope
10. Historic Type
11. In Sample or Out

These variables were selected to permit the examination of several potential correlations. This list does not include all variables recorded on the BLM forms, but it represents information selected from those forms for discussion in this report. Of specific interest were the relationships between site type and biotic setting and landform, between planning units and site type, the general variation of slope, and the relationship of the probabilistic sample and the nonprobabilistic sample.

Information which would permit the analysis of variance for the sampling units themselves was not collected for this project by RECON from the site forms, thus restricting application of this analysis. It is quite important that such an assessment be performed in the future, however, both for the evaluation of the present sample's reliability and the allocation of additional sampling efforts in the area. BLM's ongoing analysis will overcome this minor problem.

Appendix D summarizes the size and proportional nature of the samples drawn in the Saline, Eureka, Panamint, and Darwin planning areas. The sample of the latter three units differed from that of the Saline Valley area. In the Saline Planning Unit, the sample unit was a square mile. In the other three units, the sampling unit was 0.125 of a square mile, or a one-eighth by one mile transect. In the Saline Planning Unit, the allocation of the sampling units was direct--two units in each strata. In the other three,

allocation of the sampling effort was proportional and unaligned.

The results of these tests have differing reliability. The smaller sampling units examined in the Eureka, Darwin, and Panamint Planning Units provide for a better estimate of the variance. The increase in the number of units of observation is important to refining the confidence in the results. The key to any estimate of variance is the number of units sampled and not the area. Given that the same amount of area was examined, the results of the Eureka, Darwin, and Panamint samples should be more accurate.

B. RESULTS

Preliminary results of the probabilistic sample of the four planning units are summarized in the discussion below. A total of 326 sites was recorded within the four planning units (Table 5).

Several associations of interest result from the comparison of sites within the probabilistic sample. The first is that there is no obvious correlation between site type and biotic setting (Table 6). While 95.4 percent of the sites fall within six biotic classifications, there is no significant correlation between the type of site and the specific setting in which it occurs. A Lambda of 0.048 (symmetric) indicates little improvement in the ability to predict one variable knowing the other. This is even more significant when considering that the asymmetric Lambda is only 0.034 with site type as the dependent variable (Table 7).

The apparent lack of association between site type and biotic setting could be based on several factors. The first which should be considered is the possibility that the number of categories involved artificially deflates the comparative statistics because it results in the existence of a great many empty categories. This potential error could be reduced by collapsing the rarely occurring site types, such as pottery loci, cemeteries, rock art, trails, and roasting pits. The biotic settings of blackbrush, shadscale, and chaparral and the categories which are nonspecific, including "isolated find" and "other," should be collapsed as well. It is possible with such modifications that a correlation of site type with biotic setting would occur. While it is not within the scope of this report to modify the site and biotic typologies used in this project, it may provide the necessary control for illuminating this relationship.

As it presently stands, the functional relationships often drawn between site types and the setting in which they are found cannot be supported. This may, in fact, be the case, and no amount of data manipulation might be able to detect a potentially nonexistent association. Davis (1978c) suggests that the association between present biotic setting and archaeological site types is inappropriate given the continually changing nature of the high desert ecology. This claim is supported by Mehringer, who states:

. . . [Present biota] are not necessarily a key to even the recent past. . . . It may be convenient to assume that these trees, within their present

TABLE 5
 SITE TOTALS BY PLANNING UNIT
 WITHIN PROBABILISTIC SAMPLE

<u>Planning Unit</u>	<u>Absolute Frequency</u>	<u>Relative Frequency</u>	<u>Cumulative Frequency</u>
Eureka Planning Unit	66	20.4	20.4
Saline Planning Unit	105	32.4	52.8
Panamint Planning Unit	64	19.8	72.6
Darwin Planning Unit	90	27.4	100.0
No Planning Unit	<u>1</u>	-----	-----
TOTAL	<u>326</u>	<u>100.0</u>	<u>100.0</u>

TABLE 6
SITE TYPE BY BIOTIC SETTING

Site Type	Barren	Salt- brush	Creosote	Joshua/ Creosote	Joshua/ Yucca	Black- brush	Sage- brush	Pinyon Juniper	Shade- scale	Chaparral	Mesquite	Riparian	Wash	Other	Total
Village	0	1	1	0	1	0	1	0	0	0	0	0	0	0	4
Temporary Camp	0	7	6	0	1	0	2	8	0	0	0	0	0	4	28
Shelter/ Cave	0	1	3	0	0	0	1	0	0	0	0	0	0	0	5
Milling Station	0	1	2	0	0	0	1	1	0	0	0	0	0	0	5
Lithic Scatter	7	37	40	0	1	1	22	10	1	0	2	0	0	22	143
Quarry Site	0	2	3	0	0	0	0	0	0	0	0	0	0	0	5
Pottery Locus	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1
Cemetery Rock	0	0	0	0	0	0	1	0	0	0	0	0	0	0	1
Alignment Petroglyph	0	0	2	0	0	0	0	2	0	0	0	0	0	1	5
Pictograph Trail	0	0	0	0	0	0	1	0	0	1	0	0	0	0	1
Roasting Pit	0	0	1	0	0	0	0	0	0	0	0	0	0	0	1
Isolated Find	6	12	24	1	0	0	17	2	0	1	0	0	1	11	75
Cairn	1	0	0	0	0	0	0	1	0	0	0	0	0	0	2
Historic Other	0	8	3	3	0	0	9	9	0	0	0	1	0	5	38
	1	1	1	0	0	0	0	2	0	0	0	0	0	1	6
TOTAL	15	70	87	4	3	1	55	35	1	1	2	2	1	45	322

TABLE 7
 LAMBDA VALUES FOR SITE TYPE BY SETTING

<u>Planning Unit</u>	<u>Symmetric Lambda</u>	<u>Asymmetric Lambda Site Type as Dependent</u>	<u>Asymmetric Lambda Setting as Dependent</u>
<u>Site Type by Biotic Setting</u>			
Eureka	.04938	.02778	.06667
Saline	.11024	.06122	.14103
Panamint	.17308	.14286	.23529
Darwin	.17886	.08621	.26154
Summary:	.04810	.03352	.05957
<u>Site Type by Land Form</u>			
Eureka	.06024	.08571	.04167
Saline	.14394	.07843	.18519
Panamint	.19672	.20000	.19231
Darwin	.13821	.15517	.12308
Summary:	.03951	.02222	.05333

ranges, have long been important to Great Basin inhabitants, but without direct evidence from archaeological excavations or linguistic data (C. Fowler 1972) such assumptions lack verification (Mehringer 1977:133).

The same lack of correlation between site type and setting was found in evaluating the landform in which sites occurred (Table 8). Here a Lambda (symmetrical) of 0.039 reflects a potential lack of association. Again, the lack of association could be the result of a real noncorrelation, the methodological weakness of the site and landform types employed, or simply sampling error. Unlike the biotic setting associations, it is difficult to discount the lack of association because of the changing ecology. This would stress the need for a reevaluation of the basis on which the categorization was developed. Of course, it is possible that a lack of correlation does not reflect a lack of association. This should be considered in future analysis.

Comparison of strata across planning units is impossible because the strata employed in each unit were different. Some confidence can be expressed for comparisons of planning units at large in that the effects of stratification are masked. These effects play a role in the nature of the results, however, and cannot be completely ignored in any conclusions drawn.

Of greatest interest is the fact that more villages were found in the Darwin Planning Unit than the other areas. While most sites are located in the Saline Valley area, Darwin has the largest number of villages, and Darwin and Eureka Planning Units have the largest number of villages and temporary camps combined. The large number of sites recorded in the Saline Planning Unit was accounted for in two major categories, lithic scatters and isolated finds, comprising 79 percent of the Saline Planning Unit sites.

While the correlation of site type and setting proved insignificant when the results of the planning units were examined conjointly, separating the planning units and examining them independently reveals a substantially different result (Tables 9 through 12). Again using Lambda as a measure of association of nominal level variables, a comparison was made between site type and setting.

Table 7 indicates the increase in association by eliminating the confusion caused by uniting planning units. Mention must be made of the fact that planning units are heuristic constructions; they were not designed for the assessment of archaeological variation. The reason that they have

TABLE 8
SITE TYPE BY LAND FORM

Site Type	Mountain	Hill	Terrace	Ridge	Alluvial		Canyon	Arroyo	Sand		Desert	Playa	Other	Total
					Fan	Dune			Pavement					
Village	1	1	1	0	1	1	0	0	0	0	0	0	0	4
Temporary Camp	1	3	3	4	6	1	1	1	6	1	1	1	2	29
Shelter/Cave	0	2	1	1	0	1	0	0	0	0	0	0	0	5
Milling Station	1	1	1	0	2	0	0	0	0	0	0	0	0	5
Lithic Scatter	11	16	18	21	44	0	2	14	4	1	12	1	143	
Quarry Site	0	1	1	3	0	0	0	0	0	0	0	0	0	5
Pottery Locus	0	0	0	0	0	0	0	1	0	0	0	0	0	1
Cemetery Rock	1	0	0	0	0	0	0	0	0	0	0	0	0	1
Alignment	1	0	1	1	2	0	0	0	0	0	0	0	0	5
Petroglyph	1	0	0	0	0	0	0	0	0	0	0	0	0	1
Pictograph	0	0	0	0	1	0	0	0	0	0	0	0	0	1
Trail	0	0	0	0	1	0	0	0	0	0	0	0	0	1
Roasting Pit	0	0	0	0	1	0	0	0	0	0	0	0	0	1
Isolated	8	7	6	14	32	0	0	3	0	1	4	1	4	75
Find	0	1	0	1	0	0	0	0	0	0	0	0	0	2
Cairn	5	4	1	6	7	4	1	0	1	0	1	0	8	37
Historic Other	2	1	0	3	1	0	0	0	0	0	0	0	0	7
TOTAL	32	37	33	54	98	6	4	24	6	3	26	3	26	323

TABLE 9
 SITE TYPE BY BIOTIC SETTING
 DARWIN PLANNING UNIT

<u>Site Type</u>	<u>Saltbrush</u>	<u>Creosote</u>	<u>Joshua/ Creosote</u>	<u>Joshua/ Yucca</u>	<u>Sagebrush</u>	<u>Pinyon Juniper</u>	<u>Other</u>	<u>Total</u>
Village	0	1	0	1	1	0	0	3
Temporary Camp	1	0	0	1	1	5	1	9
Shelter/Cave	0	1	0	0	1	0	0	2
Milling Station	1	2	0	0	1	0	0	4
Lithic Scatter	13	5	0	1	6	4	3	32
Quarry Site	2	0	0	0	0	0	0	2
Rock Alignment	0	0	0	0	0	1	0	1
Roasting Pit	0	1	0	0	0	0	0	1
Isolated Find	3	0	1	0	6	1	2	13
Cairn	0	0	0	0	0	1	0	1
Historic	5	1	3	0	7	3	1	20
Other	<u>0</u>	<u>0</u>	<u>0</u>	<u>0</u>	<u>0</u>	<u>2</u>	<u>0</u>	<u>2</u>
TOTAL	<u>25</u>	<u>11</u>	<u>4</u>	<u>3</u>	<u>23</u>	<u>17</u>	<u>7</u>	<u>90</u>

TABLE 10
 SITE TYPE BY BIOTIC SETTING
 PANAMINT PLANNING UNIT

Site Type	Barren	Saltbrush	Creosote	Sagebrush	Pinyon Juniper	Riparian	Other	Total
Temporary Camp	0	0	2	0	0	0	0	2
Shelter/Cave	0	0	1	0	0	0	0	1
Milling Station	0	0	0	0	1	0	0	1
Lithic Scatter	1	0	23	0	2	0	3	29
Quarry Site	0	0	2	0	0	0	0	2
Cemetery	0	0	0	1	0	0	0	1
Rock Alignment	0	0	2	0	0	0	0	2
Isolated Find	0	0	15	0	0	0	3	18
Historic	<u>0</u>	<u>1</u>	<u>2</u>	<u>0</u>	<u>4</u>	<u>1</u>	<u>0</u>	<u>8</u>
TOTAL	<u>1</u>	<u>1</u>	<u>47</u>	<u>1</u>	<u>7</u>	<u>1</u>	<u>6</u>	<u>64</u>

TABLE 11
 SITE TYPE BY BIOTIC SETTING
 EUREKA PLANNING UNIT

<u>Site Type</u>	<u>Saltbrush</u>	<u>Creosote</u>	<u>Sagebrush</u>	<u>Pinyon Juniper</u>	<u>Chaparral</u>	<u>Other</u>	<u>Total</u>
Temporary Camp	3	1	1	3	0	3	11
Lithic Scatter	10	5	3	3	0	9	30
Rock Alignment	0	0	0	1	0	1	2
Isolated Find	6	1	2	0	1	3	13
Historic	<u>2</u>	<u>0</u>	<u>2</u>	<u>2</u>	<u>0</u>	<u>4</u>	<u>10</u>
TOTAL	<u>21</u>	<u>7</u>	<u>8</u>	<u>9</u>	<u>1</u>	<u>20</u>	<u>66</u>

TABLE 12
 SITE TYPE BY BIOTIC SETTING
 SALINE PLANNING UNIT

Site Type	Barren	Salt-brush	Creosote	Black-brush	Sage-brush	Pinyon Juniper	Shade-scale	Mesquite	Riparian	Wash	Other	Total
Temporary Camp	0	3	3	0	0	0	0	0	0	0	0	6
Shelter/Cave	0	1	1	0	0	0	0	0	0	0	0	2
Lithic Scatter	6	14	7	1	13	1	1	2	0	0	7	52
Quarry Site	0	0	1	0	0	0	0	0	0	0	0	1
Pottery Locus	0	0	0	0	0	0	0	0	0	0	1	1
Petro-glyph	0	0	0	0	0	0	0	0	1	0	0	1
Picto-graph	0	0	0	0	1	0	0	0	0	0	0	1
Trail	0	0	1	0	0	0	0	0	0	0	0	1
Isolated Find	6	3	8	0	9	1	0	0	0	1	3	31
Cairn	1	0	0	0	0	0	0	0	0	0	0	1
Other	<u>1</u>	<u>1</u>	<u>1</u>	<u>0</u>	<u>0</u>	<u>0</u>	<u>0</u>	<u>0</u>	<u>0</u>	<u>0</u>	<u>1</u>	<u>4</u>
TOTAL	<u>14</u>	<u>22</u>	<u>22</u>	<u>1</u>	<u>23</u>	<u>2</u>	<u>1</u>	<u>2</u>	<u>1</u>	<u>1</u>	<u>12</u>	<u>101</u>

some applicability is that they involve somewhat distinct ecological niches. Unfortunately, the association is strongest when the planning unit is the dependent variable. Since knowing the site type provides an indication of the biotic setting, it would seem likely that the association is a result of the system of classification. The basis for this conclusion stems from the fact that the most often occurring resources, lithic scatters and isolated finds, tend to be clustered within the creosote, saltbrush, and sagebrush categories, while the remaining sites are scattered throughout the vegetation types. This sways the ability of knowledge of a site type to predict the setting in which it occurs. The likelihood that a site will be either a lithic scatter or an isolated find and that these two site types occur within specific vegetation associations is what is reflected in the high statistic. Little can be said for the other resources and the setting in which they occur. The lesser ability to predict site types knowing the setting stems, therefore, from the more homogeneous marginals for the biotic setting.

It is interesting to note that within the Darwin Planning Unit, flake scatters occur most frequently in the saltbrush setting while temporary camps cluster to the pinyon-juniper area. In the saltbrush, lithic scatters account for over 50 percent of the sites and temporary camps for only four percent. In the pinyon-juniper association, however, temporary camps encompass 30 percent of all sites and lithic scatters only 23 percent.

Examination of this relationship in the other planning units is inappropriate because of the proportion of the areas which fall within the pinyon-juniper biotic setting.

The association of landform and site type is even stronger than that of biotic setting and site type (Tables 13 to 16). As with biotic setting, however, the relative amounts of lithic scatters and isolated finds overshadow the effects of the other site types, thus minimizing the reliability of the measure as an indicator of association for the association at large. As with the biotic setting relationship, modification of the landform groups and site types could produce fewer categories with no representatives.

The ultimate result of this brief examination of the recorded information resulting from the Bureau of Land Management's probabilistic sample of the Darwin, Eureka, Saline and Panamint Planning Units is that the variables of site type, biotic setting, and landform have little apparent interrelationship as detailed on the standard site forms. This may be a result of the definitions of the elements, the

SITE TYPE BY LAND FORM
DARWIN PLANNING UNIT

Site Type	Mountain	Hill	Terrace	Ridge	Alluvial			Desert			
					Fan	Canyon	Arroyo	Dune	Pavement	Other	Total
Village	1	0	1	0	1	0	0	0	0	0	3
Temporary Camp	0	2	2	2	0	1	1	1	0	0	9
Shelter/Cave	0	1	0	1	0	0	0	0	0	0	2
Milling Station	0	1	1	0	2	0	0	0	0	0	4
Lithic Scatter	2	4	6	6	12	0	0	1	0	1	32
Quarry Site	0	1	0	1	0	0	0	0	0	0	2
Rock Alignment	0	0	1	0	0	0	0	0	0	0	1
Roasting Pit	0	0	0	0	1	0	0	0	0	0	1
Isolated Find	4	1	1	2	5	0	0	0	0	0	13
Cairn	0	0	0	1	0	0	0	0	0	0	1
Historic	3	3	1	2	4	0	1	0	1	5	20
Other	<u>1</u>	<u>0</u>	<u>0</u>	<u>1</u>	<u>0</u>	<u>0</u>	<u>0</u>	<u>0</u>	<u>0</u>	<u>0</u>	<u>2</u>
TOTAL	<u>11</u>	<u>13</u>	<u>13</u>	<u>16</u>	<u>25</u>	<u>1</u>	<u>2</u>	<u>2</u>	<u>1</u>	<u>6</u>	<u>90</u>

TABLE 14
 SITE TYPE BY LAND FORM
 PANAMINT PLANNING UNIT

Site Type	Mountain	Hill	Terrace	Ridge	Alluvial		Canyon	Arroyo	Sand Dune	Desert Pavement	Playa	Other	Total
					Fan	Arroyo							
Temporary Camp	0	0	0	0	1	0	0	0	0	1	0	0	2
Shelter/Cave	0	1	0	0	0	0	0	0	0	0	0	0	1
Milling Station	1	0	0	0	0	0	0	0	0	0	0	0	1
Lithic Scatter	0	2	1	2	19	0	1	0	0	3	1	0	29
Quarry Site	0	0	1	1	0	0	0	0	0	0	0	0	2
Cemetery	1	0	0	0	0	0	0	0	0	0	0	0	1
Rock Alignment	0	0	0	0	2	0	0	0	0	0	0	0	2
Isolated Find	0	0	0	1	14	0	0	0	2	0	1	0	18
Historic	<u>1</u>	<u>0</u>	<u>0</u>	<u>1</u>	<u>2</u>	<u>3</u>	<u>0</u>	<u>0</u>	<u>0</u>	<u>0</u>	<u>0</u>	<u>1</u>	<u>8</u>
TOTAL	<u>3</u>	<u>3</u>	<u>2</u>	<u>5</u>	<u>38</u>	<u>3</u>	<u>1</u>	<u>2</u>	<u>4</u>	<u>2</u>	<u>2</u>	<u>1</u>	<u>64</u>

TABLE 15
 SITE TYPE BY LAND FORM
 EUREKA PLANNING UNIT

Site Type	Mountain	Hill	Terrace	Ridge	Alluvial		Sand Dune	Desert Pavement	Playa	Other	Total
					Fan	Canyon					
Temporary Camp	1	0	1	2	4	0	0	0	1	2	11
Lithic Scatter	7	2	3	7	5	0	0	1	0	5	30
Rock Alignment	1	0	0	1	0	0	0	0	0	0	2
Isolated Find	3	1	0	4	3	0	1	0	0	1	13
Historic	<u>1</u>	<u>1</u>	<u>0</u>	<u>3</u>	<u>1</u>	<u>1</u>	<u>0</u>	<u>0</u>	<u>0</u>	<u>2</u>	<u>9</u>
TOTAL	<u>13</u>	<u>4</u>	<u>4</u>	<u>17</u>	<u>13</u>	<u>1</u>	<u>1</u>	<u>1</u>	<u>1</u>	<u>10</u>	<u>65</u>

TABLE 16
 SITE TYPE BY LAND FORM
 SALINE PLANNING UNIT

Site Type	Mountain	Hill	Terrace	Ridge	Alluvial			Canyon	Arroyo	Sand Dune	Other	Total
					Fan	Fan	Fan					
Temporary Camp	0	1	0	0	0	1	0	0	5	0	7	
Shelter/Cave	0	0	1	0	0	0	1	0	0	0	2	
Lithic Scatter	2	8	8	6	8	8	0	1	13	6	52	
Quarry Site	0	0	0	1	0	0	0	0	0	0	1	
Pottery Locus	0	0	0	0	0	0	0	0	1	0	1	
Petroglyph	1	0	0	0	0	0	0	0	0	0	1	
Pictograph	0	0	0	0	1	1	0	0	0	0	1	
Trail	0	0	0	0	1	1	0	0	0	0	1	
Isolated Find	1	5	5	7	10	10	0	0	0	3	31	
Cairn	0	1	0	0	0	0	0	0	0	0	1	
Other	1	1	0	2	1	1	0	0	0	0	5	
TOTAL	5	16	14	16	22	22	1	1	19	9	103	

size of the sample, or the application of the defined types in the field. It is not the role of this presentation to critically evaluate the procedures employed in this sample nor the ways in which the field information is translated into assessable variables. This brief examination of the recovered information has, however, indicated that some data modification may prove beneficial toward the interpretation of the probabilistic sampling results.

While there are difficulties with the sampling design as presented by the Bureau of Land Management and in the site evaluations provided in this report, there is a great amount of valuable information within this body of data. Several comparisons can be made which illuminate both scientific and management concerns.

The first of these results from a comparison between the results of the systematic sample and the previous information gained through intentional directed site surveys. A comparison of the results of types of sites by probabilistic versus nonprobabilistic sampling is presented in Table 17. It is clear from this comparison that archaeologists examining areas that they want to study provides a different set of information than actually exists.

In these types of sampling, both of which resulted in the recording of nearly the same number of sites, some key distinctions are illustrated. Nonprobabilistic sampling underplayed the number of lithic scatters and overemphasized the number of villages, temporary camps, and rock art.

Some important managerial concerns are also revealed. Where initial sampling necessarily required the examination of a complete range of slope for the potential occurrence of resources, the results of the initial test indicate that the steeper slopes can be ignored with little effect on accuracy. Table 18 shows that 97 percent of all sites occur on slopes of less than 30 percent and that even 92 percent of the sites have slopes of less than 15 percent. Elimination of all areas with over 30-percent slopes, and possibly eliminating those areas with greater than 15-percent slopes, may still permit the recording of over 92 percent of all the resources. This would permit a great cost savings in the future in field research while maintaining a high level of information recovery. When considering the greater per area expense for surveying steep terrain, holding coverage constant, the resultant increase in information per unit expense could increase substantially.

TABLE 17
SITE TYPE BY TYPE OF SAMPLE

Site Type	Probabilistic Sample		Non-probabilistic Sample	
	Absolute Frequency	Relative Frequency	Absolute Frequency	Relative Frequency
Village	4	1.2	12	4.7
Temporary Camp	29	8.9	34	13.4
Shelter/Cave	5	1.5	35	13.8
Milling Station	5	1.5	13	5.1
Lithic Scatter	143	43.9	56	22.1
Quarry Site	5	1.5	1	0.4
Pottery Locus	1	0.3	0	0.0
Cemetery	1	0.3	0	0.0
Intaglio	0	0.0	1	0.4
Rock Alignment	5	1.5	1	0.4
Petroglyph	1	0.3	4	1.6
Pictograph	1	0.3	3	1.2
Trail	1	0.3	2	0.8
Roasting Pit	1	0.3	0	0.0
Isolated Find	75	23.0	29	11.5
Cairn	2	0.6	3	1.2
Historic	39	12.0	46	18.2
Other	7	2.1	11	4.3
No site type noted	1	0.3	1	0.4
TOTAL	<u>326</u>	<u>100.0</u>	<u>252</u>	<u>100.0</u>

TABLE 18
RECORDED SLOPES OF CULTURAL RESOURCES

<u>Slope</u>	<u>Absolute Frequency</u>	<u>Relative Frequency</u>	<u>Adjusted Frequency</u>	<u>Cumulative Frequency</u>
0-5 percent	228	69.9	71.0	71.0
6-15 percent	66	20.2	20.6	91.6
16-30 percent	18	5.5	5.6	97.2
31-60 percent	9	2.8	2.8	100.0
over 60 percent	0	0.0	0.0	0.0
No slope recorded	<u>5</u>	<u>1.5</u>	<u>missing</u>	<u>100.0</u>
TOTAL	<u>326</u>	<u>100.0</u>	<u>100.0</u>	<u>100.0</u>

V. MANAGEMENT CONCERNS

While this type of study benefits anthropology, prehistory, history, and associated activities, the primary concern for its preparation is the management of cultural resources. The development of any environmentally sound program for desert use must consider the diverse, highly important cultural record of the area. It is this record which provides the information possible to understand the development of the area over time, and it is only through the archaeological record that there is any knowledge about the prehistory of the area.

In addition to being important because of the scientific information they provide, cultural resources are also important because of their intrinsic value as relics of the past. The subjective importance of historic and prehistoric resources stems from the fact that these sites represent the last tangible elements of ages gone by. While the importance of these resources will vary according to the individuals or groups considered, they do represent the only physical remains of once viable types of land use and activities.

A series of different reasons therefore exists for the importance of the cultural record. Basically, it is possible to separate these into two major categories. One of these will be called scientific importance or meaning, and the other will be termed social significance. The distinction between these is critical to any evaluation of the significance of the resource base.

Evaluation of these components requires different sets of expertise. Assessment of the scientific importance of cultural resources is the traditional realm of the archaeologist. The more subjective aspect of cultural resource management, social significance, is a new and expanding field. While some social aspects of the cultural record can be easily assessed--it takes little specialized knowledge to realize the social importance of the remains of Panamint City--other components require a broader experience base than is typical of the cultural resource manager. Perhaps the most apparent of these are the concerns of the Native American population. While the archaeologist and anthropologist should have some feeling for the potential significance of these resources to Native Americans, it is obvious that the understanding necessary to completely evaluate them rests with the Native Americans themselves. Conversely, it is the role of the cultural resource manager to integrate these concerns into a program of investigation, conservation and land use which will permit the greatest benefit to all those involved.

Recognition of the importance of cultural resources in the planning process by the Bureau of Land Management has led to an initial detailed assessment of the resource base. This evaluative base has necessarily covered an immense area of over 39,000 square miles. This area has been divided into planning units to facilitate the management of the area.

The present study was concerned with four of these areas: the Darwin, Eureka, Saline and Panamint Planning Units. These areas encompass a large amount and variety of historic and prehistoric resources of importance to the historian, the anthropologist, the Native American and the interested member of the general public. Through coordination of future land use and additional studies, all elements should be satisfactorily accommodated.

As a result of the present study, several points of importance to resource management of the area can be made. This involves recommendations for future archaeological study, areas set aside for the concerns of the Native American community, potential historic and prehistoric areas of preservation and investigation, and potential interpretive use.

Conservation of the resource base necessarily involves some preservation and some investigation. The importance of cultural resources stems, to a large extent, from the information they can provide, and this information can only be recovered through excavation or collection and analysis of the sites themselves. This is an inherently destructive process. Therefore, it is impossible to insure the protection of the value of a resource and simultaneously preserve the site itself.

Somewhat ironically, the other element of importance to cultural resources stems from the intact existence of the site itself. If viewed as a relic of the past through which people of today can associate with those of other times, the preservation of the resource itself is of primary importance.

Solution of this problem can only stem from the planned management of these resources. Through assessing the relative importance of each resource as a relic, and each site as a reservoir of information, the benefits of preservation can be weighed against those of investigation. Ultimately, it will be necessary to preserve some of these resources, to incorporate others into interpretive programs, to isolate others for the use of Native Americans, and to protect others for future archaeological-anthropological research.

Based on the research that has been undertaken in the area previously and the most recent probabilistic sample taken by the Bureau of Land Management, several conclusions and recommendations can be made. While the present study area has some of the best information concerning the development of the western Great Basin, specifically the Rose Spring, Little Lake, and peripherally the Cottonwood sites, little is known about the cultural interrelationships of the planning units. The work in Panamint Valley by Davis and others represents only a glimpse into the cultural record of the area.

The importance of the area to the understanding of past lifeways of interior California and the western Great Basin cannot be underplayed. The discovery of some of the potentially earliest materials of the New World makes this region of primary research interest. In addition, the existence of some rather distinct point types makes this area of key interest for the understanding of the development of the Far Southwest as a whole.

The nature of this area's relationship to the Southwest, coastal Southern California, and the Central Valley of California is critical to the explanation of interrelationships between each of these. The general lack of information about these areas greatly restricts the present ability to use the region in the general overview of the area.

The fact that very little is known about the area is reflected in the results of the Bureau's systematic sample. While the sample nearly doubled the number of resources recorded in the area, it suggests that the purposive results of the earlier studies were significantly biased. Furthermore, it indicates the need for substantially more surface reconnaissance in the area. While the amount of additional reconnaissance necessary for an adequate description of the area cannot be recommended at this time, it is apparent that it should be based on the amount of variance evident in the area. In order to adequately address the variation within these planning units, it is first necessary to critically evaluate the variables used in measuring the different sites, as well as the sampling procedures employed. While the work done by the Bureau of Land Management to date represents a significant step toward insuring the reliability and validity of the information collected, some refinement appears still necessary.

One such refinement is the lack of a need to survey lands with greater than 30 percent slope. The results of the initial survey of the area were required to support this

contention; however, future expenditure of time and money for examination of these marginal areas appears unnecessary.

Second, the defining criteria of the sampling units should be evaluated. While there is a great deal of argumentative support for the units established, the results of the test suggest either a lack of ability to interpret the results or an improperly established set of adopted criteria. This recommendation is not for the elimination of the criteria as presently defined but rather for the critical evaluation of those criteria.

One component of the cultural record well recognized by the Bureau of Land Management is the relationship between historic and prehistoric resources. While the traditional separation of these aspects of the cultural record has been based simply on the existence of written records, recent emphasis has been on the similarities of the types of evidence. The historic record of the area represents another change in the land use of the area. The intrusion of another cultural group should not be eliminated from the study of anthropology simply because more information about it exists. Future work in the Darwin, Saline, Panamint, and Eureka Planning Units should continue to recognize this relationship. It is only through such recognition that the anthropological potential of these resources can be achieved.

The historic sites in the four planning units provide another claim to significance. These sites, in the form of ghost towns, ranches, and abandoned mines, provide easily interpreted resources for the individuals who presently use the desert areas. While the remains of the aboriginal inhabitants of the area often require some degree of explanation, historic resources are established on a similar cultural foundation permitting the observer to readily affiliate with the resource. Because of this, the historic resource is the likely candidate for recreational use as interpretive resources.

This is not to exclude the prehistoric sites as interpretive resources, for certainly the importance of these sites must also be conveyed to the general public. When taken in conjunction, the cultural resources of the California deserts represent a unique opportunity for recreational use.

Several elements must be considered when evaluating a site as an interpretive resource. The site must be readily accessible, permitting maximum use for minimum cost. It must be in a situation which will insure its protection. This could be developed in conjunction with interpretive stations,

administrative areas, or some other intensive land use areas. More passive types of restraints, such as fencing, could be used but should be evaluated in conjunction with the fragility of the resource.

A key component to any interpretive resource is the ability of the site to provide the greatest amount of information. This would be a combination of the visual and informational components of the resource. The less there is to see, the greater the information communication necessary to interpret the site.

Finally, the potential importance of the site to archaeology and the Native Americans must be considered. The more important a site is to the understanding of the cultural development of the area or the more important it is to the aboriginal groups of the area, the more difficult it will be to incorporate it into an interpretive program.

While the concerns of the archaeologist and the general public are very important in any cultural resource management program, the concerns of the Native Americans cannot be underemphasized. In an attempt to evaluate the significance of the area to this interest, discussions were held with representatives of the Paiute and Shoshone bands of the area. As a result of these discussions, valuable information was obtained for the management of the area's cultural resources.

Today there are few, if any, Native Americans actually living within study area boundaries. Most Native Americans in the region live in Owens Valley, at Lone Pine, Fort Independence, Big Pine and Bishop. There are, however, Native American people who today have an interest in and empathy for places within the study area.

On July 18 and 19, 1978, Richard Norwood interviewed several Native Americans regarding their concerns in desert planning for the study area. They were specifically asked for information and input for this project. Those people contacted include Raymond Stone of Big Pine, Minnie Williams of Bishop, Bob Miller of Fort Independence, and Terry Miller and N. Naylor of Lone Pine. From discussions with these individuals, several issues of Native American concern were identified.

The recurring issue of importance was the right to again have access to Coso Hot Springs, a place of religious significance to both Paiute and Shoshone people (see Ethnography section). These springs are now within the boundaries of the China Lake Naval Weapons Center east of the Darwin Planning

Unit, and negotiations are currently underway with the Navy to again permit Native Americans to visit the springs. Since Coso Hot Springs is not within the study area, it is of minimum concern here. If, however, access to the springs is restored, the route to the springs may cross the Darwin Planning Unit between Highway 395 and Naval Center boundaries. In this event, the Bureau of Land Management should make a provision for maintaining existing roads according to the increased or changed traffic patterns. Should any road widening or a new access road be planned, a component of such planning should include a cultural resource survey, since this area has a high potential for the occurrence of such resources.

A second issue of concern expressed by Native Americans is the disturbance of known burial sites or places where burials are likely to occur. While Native Americans expressed a desire to leave such places undisturbed, they also do not necessarily want to specify the exact location of such places known to them for fear of potential or further disturbance. According to N. Naylor, there are several general areas within the study area which might contain burials and should be left undisturbed. These include the Hansen Ranch in the Panamint Valley, the Hunter Canyon and Warm Springs areas in the Saline Valley, the Cartago area in the southern Owens Valley, and regions just outside the study area. According to both Mr. Stone and Ms. Naylor, one indication of possible grave sites are areas where beads occur scattered on the surface. Both recommend that such areas not be disturbed. Ms. Naylor is of the opinion that archaeological sites of any time period should not be disturbed.

The RECON representative asked several times if there were any places such as Coso Hot Springs within the study area; responses to this question were negative.

Questions were asked concerning the significance of Warm Springs in the Saline Valley and other springs. Bob Miller of Fort Independence mentioned that long ago his wife planted date palms at Warm Springs with seeds imported from Death Valley. Ms. Naylor mentioned that Shoshone people still visit the springs. The issue stressed by Ms. Naylor in regard to the springs is their littered condition rather than any directly religious concern. She was of the opinion that the Shoshone have a belief system which includes a respect for the earth, and they do not like to see careless land use and litter in areas they visit (Naylor 1978, personal communication).

A third issue was raised by Raymond Stone, a Paiute religious leader. Mr. Stone would like to have a place set aside for religious use in the vicinity of Harkness Flats in the Inyo Mountains. The area he is interested in, however, falls within the Inyo National Forest west of the Saline Planning Unit and thus is of no direct concern in Bureau of Land Management desert planning.

The Coso Hot Springs and Harkness Flat issues are peripheral to the study area itself. The issue that most directly affects the study area is the actual or potential disturbance of burial sites, with the secondary issue being the litter created by careless visitors to the area. A discussion with Terry Goodwin, Shoshone Tribal Chairman at Lone Pine, confirmed that Native American people have an interest in the area and would like to provide further input in desert planning to deal with such issues of concern.

It is not within the scope of this presentation to detail the nature of land use which would maximize the conservation of cultural resources. Neither can the discussion approach specifics about potential site disturbance. Several general suggestions can, however, be made. The first step in any area or regional plan needs to incorporate the results of past work in the area. Sites which are not to be brought into the recreational program should be avoided. In areas where future land use is to conflict with the material record of the past, every effort should be made to incorporate an evaluative program with an interpretive one. In this way, scientific analysis can occur as well as desired land use.

Obviously, with only a sample of the area evaluated for cultural resources, some land use will occur in unevaluated areas. In this case, a detailed examination of the area to be involved needs to be made. While the sample provides a good foundation for the evaluation of a variety of hypotheses, it does not insure that an important resource was discovered in a specific unit of area. Because of this, it is necessary to survey all areas threatened by potential disturbance.

The information recovered from such area specific investigation cannot be considered as part of an areal sample but can and will provide important ancillary information. Any additional requirements for mitigation of impacts would necessarily be based on the nature of the sites encountered and the type of land use proposed.

VI. PROJECT STAFF

Charles S. Bull	Principal Investigator/ Supervisory Archaeologist
Richard H. Norwood	Associate Archaeologist
M. Jay Hatley	Associate Archaeologist/ Cartographer
Carol Walker	Archaeological Curator/ Researcher
Joanne Thompson	Project Coordinator
Nancy J. Hatley	Production Specialist
Eloise Feola	Production Typist
Bridget Blair	Technical Illustrator
Royce B. Riggan	Ecologist
Dr. Emma Lou Davis	Prehistory Consultant
Dr. Ronald J. Quinn	Historian
Raymond Stone	Native American Consultant
Minnie Williams	Native American Consultant
Cindy Bechtol-Groat	Production Typist
Loretta L. Cornwell	Production Typist

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APPENDICES

APPENDIX A

APPENDIX A
NATIVE AMERICAN TRADE IN OBSIDIAN AND OTHER
MATERIALS IN AND NEAR THE STUDY AREA

Obsidian, a material volcanic glass, is a relatively uncommon lithic material restricted in occurrence to approximately 40 sources throughout California and adjacent areas of southern Oregon and western Nevada.

Native American peoples throughout the western Great Basin and California valued and used obsidian, since it is especially amenable to controlled flaking techniques and tools with extremely sharp cutting and piercing edges can be manufactured from it. The desire to obtain obsidian, combined with its relatively restricted occurrence, fostered the development and maintenance of obsidian trade systems. Within recent years, there has been a growing awareness among archaeologists that studies of obsidian can be especially useful for solving certain types of problems. In general, obsidian studies have focused on two broad problem areas: the dating of obsidian artifacts through the application of obsidian hydration dating and the explication of economic exchange systems through trace element analysis and comparison of archaeologically derived obsidian and geological sources. Most recently, obsidian trade throughout California has been investigated by Ericson, Hagen and Chesterman (1976) and Jack (1976) (Ericson 1977). This study dealt in part with obsidian use and trade in the vicinity of the study area.

There are at least 15 geological sources of obsidian in and near the study area. Some of these sources have been studied in detail, both chemically and archaeologically, while others remain practically unknown. Of the 15 known sources, many have related evidence which indicates Native American exploitation.

Table A-1 is a list of the obsidian sources in and near the study area. While there has not been any systematic, objective study of obsidian from archaeological contexts within study area boundaries, it might be expected that material from any of these sources may occur in sites within the study area. Figure A-1 depicts the five known geological sources of obsidian closest to the study area and one possible source in the western Great Basin.

Locality 15 was recently recorded by Bureau of Land Management archaeologists in the Saline Planning Unit. This source (Iny-1975) does not consist of a major extensive outcrop but is an area where nodules of obsidian occur as float. Flakes and debitage in the vicinity indicate that aboriginal people knew of and exploited the source.

TABLE A-1

OBSIDIAN SOURCES IN THE WESTERN GREAT BASIN

<u>Locality</u>	<u>County</u>	<u>Quadrangle</u>
1. Sugarloaf Mountain	Inyo County, California	Haiwee Reservoir
2. Monache Meadows	Tulare County, California	Monache Meadows
3. Fish Springs	Inyo County, California	Big Pine
4. Inyo Craters	Mono County, California	Devil's Postpile Mono Craters
5. Mono Craters	Mono County, California	Mono Craters
6. Mono Glass Mountain	Mono County, California	Glass Mountain
7. Truman Canyon, West Queen Mine	Mono County, California	Benton
8. Casa Diablo	Mono County, California	Mount Morrison
9. Bodie Hills	Mono County, California	Bridgeport
10. Levitt Peak	Tuolumne County, California	Sonoran Pass
11. Mount Hicks	Mineral County, Nevada	Aurora
12. Pine Grove Hills	Lyon County, Nevada	Unknown
13. Beatty	Nye County, Nevada	Unknown
14. Fish Lake Valley	Esmeralda County, Nevada	Unknown
15. Dry Mountain, Saline Valley	Inyo County, California	Dry Mountain

Interestingly, there is a place named Obsidian Butte depicted on the map (Figure A-1). It is unconfirmed whether or not obsidian actually occurs here and, if so, whether or not Native American populations exploited it.

The Sugarloaf Mountain source is one of the more well known and has been described by a number of authors including Chesterman (1956), Farmer (1937), and Harrington (1951). It lies just within the western boundary of the China Lake Naval Weapons Center in the southwest portion of the Coso Mountains, approximately four miles from Coso Hot Springs. The quarried area at this source is described by Harrington as "colossal" in extent, including, "More than two miles of ancient diggings plainly visible along the edge of the bluff" (Harrington 1951: 15). The quarry area is concentrated along the western side of Sugarloaf Mountain where lenses of high quality smoky grey obsidian occur.

The old quarry pits extend along the obsidian ledge below the rim of a tableland some 200 to 300 feet above the valley floor. On the slope below are traces of other pits and artificial terraces, and tumbled boulders of obsidian; in some places the steep hillside is actually composed of obsidian chips, most of them man-made; you cannot step without crunching them (Harrington 1951:15).

Harrington also notes that campsites are prolific in the area, as evidenced by metates, hammerstones, and house rings. Two six-by-nine-foot test units were excavated by Harrington at this quarry site, both of which produced cultural material to a considerable depth (Test Pit 1 \div nine feet; Test Pit 2 \div 50 inches). Another fact discovered during the test is of special interest. In the second test pit:

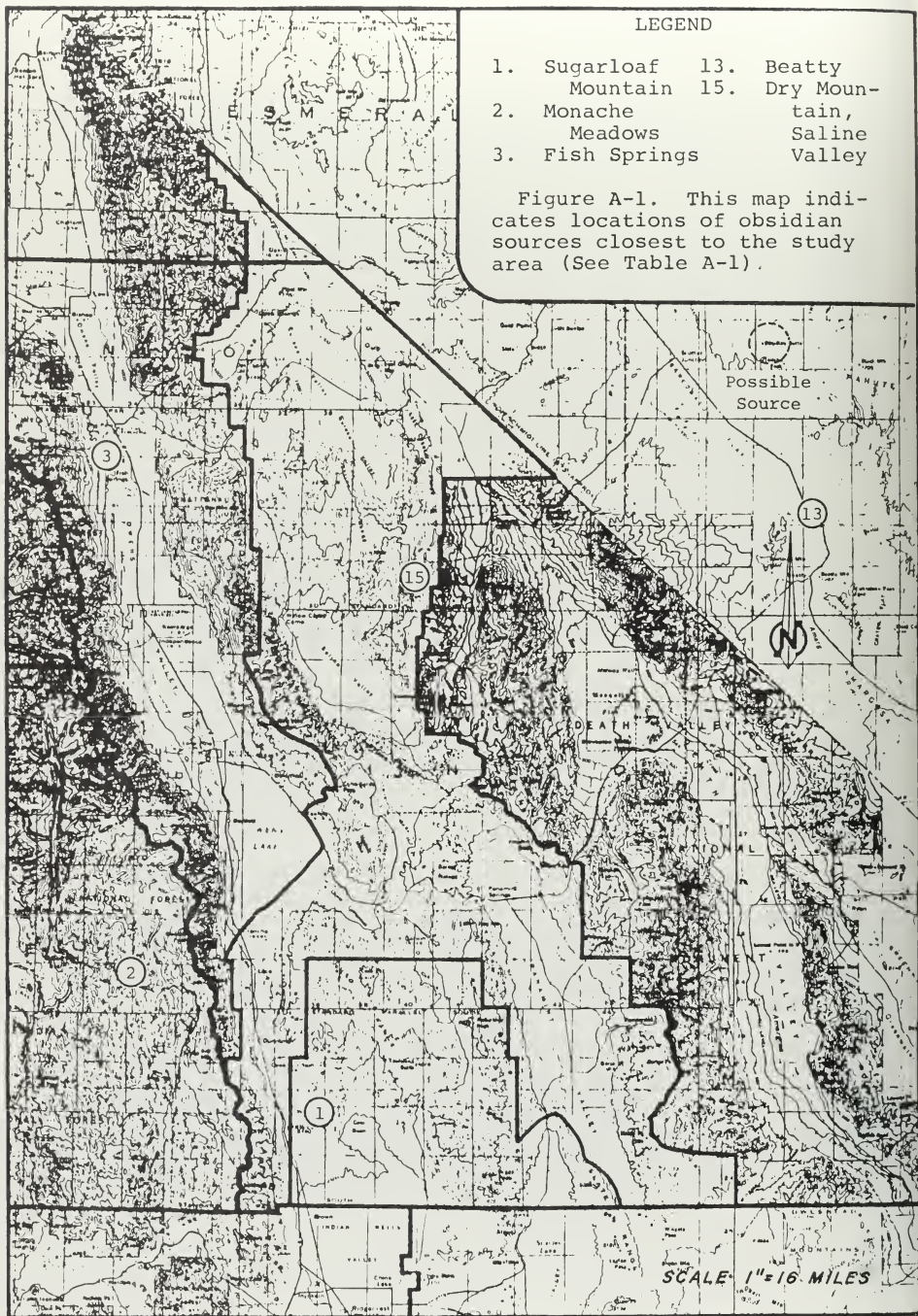
Two well-chipped large keeled scrapers were found, one at 32 inches and one at 45 inches; the latter, heavily patinated, had decayed to such an extent that a touch of the trowel caused it to crumble. We had noticed this peculiar decay of obsidian one some of the other deep specimens, not only here, but at Borax Lake (Harrington 1951:17).

Obsidian decay may be a factor related to the absence of obsidian from some of the earlier sites in the area (Davis 1978b). Stewards informants among the Owens Valley Paiute did not specifically mention exploitation of the Sugarloaf Mountain source. Farmer (1937) notes that in recent times, the Koso-Panamint came into this area from the north and likely exploited the source. According to Steward (1933), the Tubatulabal once exploited the

LEGEND

- | | |
|-----------------------|---------------------|
| 1. Sugarloaf Mountain | 13. Beatty Mountain |
| 2. Monache Meadows | 15. Dry Mountain |
| 3. Fish Springs | Saline Valley |

Figure A-1. This map indicates locations of obsidian sources closest to the study area (See Table A-1).



territory in which the Sugarloaf Mountain is located. Trace element studies of obsidian from a number of Tubatulabal and Kawaiisu sites at the extreme southern end of the Sierra Nevada and western edge of the Mojave Desert yielded samples composed entirely of the Coso Hot Springs (Sugarloaf Mountain) obsidian (Jack 1976:193). This finding did not confirm, then, the use of another obsidian source in the Randsburg, California, area by the Tubatulabal.

It is interesting to note that obsidian has uses other than tool manufacture. Both Owens Valley Paiute and Shoshoni (Koso) informants report that obsidian is used in conjunction with praying at Coso Hot Springs. Flints (obsidian), which can be "picked up by the handful" in this area are used in this prayer. "You pray and talk and drop the flints in your clothes" and "it takes the sick away from your body. . . the spirits do it." Some people pray to the directions (north, east, south, west) which signify "wind," "rain," "snow," and "east is best." One person referred to these "flints" as "arrowheads." Prayers will not be answered if these "flints" are removed from Coso--"White people do that." (Theodoratus and Smith-Madsen 1977:22.)

Mr. Stone, a consultant for this project, also mentioned that obsidian flakes would be dropped down under your clothes till they came out the bottom (1978). Those who are "pretty sick" use the "flints" before they enter the steam bath or pond. "You put the flints through your body" and "you pray at the same time. You stand and talk and shake down" (shake the "flints" through your clothes) (Theodoratus and Smith-Madsen 1977:23).

The Monache Meadow source lies in the southern Sierra Nevada west of Sugarloaf Mountain. It consists of approximately ten acres where obsidian occurs as cobbles. There are no ethnographic accounts of obsidian exploitation at this source; however, evidence in the area suggests that aboriginal people knew of and exploited it because a number of lithic workshops have been recorded in the vicinity by UCLA (Ericson, Hagan and Chesterman 1976).

The Fish Springs source is located in central Owens Valley, south of Big Pine, California, and west of the Saline Planning Unit. Obsidian occurs here as small nodules, and although the quantity of obsidian is comparatively small, the area around this source has frequent scatters of obsidian and other lithics (Ericson, Hagan, and Chesterman 1976). The source was probably important to the Owens Valley Paiute (Steward 1933), although other sources were exploited as well.

North of the Fish Springs sources and Bishop lies a complex volcanic field with several important obsidian sources. This field is in the vicinity of Mono Lake and includes Inyo Craters,

Mono Craters, Mono Glass Mountain, Truman Canyon-West Queen Mine, Casa Diablo, Bodie Hills, Levitt Peak, Mount Hicks, and Pine Grove Hills. The obsidian found at these sources varies widely in texture and color. At Inyo Crater, it is rather coarsely vitrophyritic, black and opaque, while the Mono Glass Mountain and Truman Canyon sources may be clear, multicolored, and free of phenocrysts. According to Ericson, Hagan and Chesterman, no archaeological quarry workshops were observed in the Inyo Craters area, possibly due to the generally poor quality of the obsidian, which contains numerous large phenocrysts (1976:224). On the other hand, quarry workshops have been noted at the other source areas listed above, and for some of them, there are references to their use in the ethnographic record. For example, the Owens Valley Paiute mention the use of various Mono Lake area obsidian sources including Mono Glass Mountain (Steward 1933) (Davis 1965). It is interesting to note that Steward mentioned that the Owens Valley Paiute considered one Mono Craters source to be poisonous. According to Ericson, Hagan and Chesterman (1976), "This might be explained by the fact that these craters erupted during the occupation of the area" (1976:225). The southernmost dune in the Inyo Craters was dated by potassium argon dating as less than 60,000 years B.P., while Friedman, using the obsidian hydration method, has dated various recent eruptions at Mono Craters through the period 12,000 B.P. to 1,300 B.P.

The fact that volcanic activity occurred in the area while people were living there undoubtedly influenced the cultural record of the region and furthermore may have interesting implications for archaeologists working in the area.

Obsidian from a particular source formed at a known time, and found within archaeological contexts, may serve as an "index fossil" and provide maximum dates for sites not otherwise datable. For surface sites in which lithic materials have been "sand-blasted," rendering obsidian hydration dating unreliable, as at China Lake (Davis 1978b), obsidian "index fossils" confirmed to have been derived from the dated source may be helpful in the future.

Volcanic activity is accompanied in many cases by ejection of ash over wide areas. If the eruption can be dated, and ash from the event is found in the stratigraphy of archaeological sites, minimum and maximum dates may be obtained for the site. Such dating has been successfully used elsewhere, especially in the northwestern Great Basin where the Mazama ash covers an extensive area. Whether or not ejecta from the Mono Lake volcanic field eruptions will be useful for dating sites and assemblages in and near the study area should be explored.

According to Ericson, Hagan, and Chesterman (1976), obsidian from sources near the study area was traded widely. Obsidian

from sources near Mono Lake was traded into the central Sierra Nevada and beyond as far as the coast. Obsidian from the Sugarloaf Mountain source reached the southern San Joaquin Valley and the coast, probably via the Tubatulabal and possibly the Kawaiisu.

According to Jack (1976:194), obsidian from the Sugarloaf Mountain source has been found in archaeological context as far away as Santa Rosa Island 30 miles off the Pacific Coast. In his study of obsidian trade, Jack found interesting distributions of obsidian samples in Inyo County sites, reflecting a rather free exchange of obsidian from all available sources throughout the Owens Valley and adjacent Great Basin area.

Artifacts from site Iny-76, closest to the Fish Springs source, are dominantly of Fish Springs obsidian; however in the sampled sites both north and south of Iny-76 Coso Hot Springs obsidian is most common. Obsidian from the remaining sources is distributed rather uniformly in the sampled sites throughout this region. Casa Diablo obsidian, which makes up over 90% of the sample from high Sierra sites of the Western Mono, is only $\frac{1}{4}$ as common as Coso obsidian in sites Iny-1,2, which are only about twenty miles from Casa Diablo but more than 100 miles from Coso Hot Springs. On the other hand, Casa Diablo obsidian is present in minor amount even in site Iny-372 only about ten miles from the Coso source (Jack 1976:195).

In contrast with this rather free exchange of obsidian south of Mono Lake, Jack finds a different pattern to the north, as he notes an

. . . apparent exclusive use of the Bodie Hills/Pine Grove Hills and Mount Hicks obsidian by the Washo to the northwest and, more significantly, the absence of these obsidian types in the Owens Valley Paiute sites, even though these sources are in what is normally mapped as Mono Lake Paiute territory. This exclusiveness in the use of obsidian sources may be in part due to the fact that the Washo, whose distinctness of language was unusual for a Great Basin group, were traditional enemies of the (Owens Valley) Paiute (Jack 1976:195).

These findings, supported by ethnographic data collected by Steward (1933), have implications for archaeology wherever obsidian occurs in prehistoric archaeological context. Through trace element studies, it may be possible to spatially define different groups in the archaeological record and test hypotheses concerning the relationships between them.

Besides obsidian, many other commodities are known to have been traded throughout the vicinity of the study area. The best

synthesis of trade in the study area is provided by Davis (1961). According to Davis, there are references to trade in many items among groups relevant to the study area:

EASTERN MONO (NORTHERN PAIUTE)

(Also referred to as Owens Valley or Mono Lake Paiute)

Supplied to:

"The West"	Mineral paint, salt, pine nuts, seed food, obsidian, rabbit-skin blankets, tobacco, baskets, buckskins, pottery vessels, clay pipes
Central Miwok	Pine nuts, pandora moth caterpillars, <u>kutsavi</u> , baskets, red paint, white paint, salt, pumice stone, rabbit-skin blankets
Southern Miwok	Rabbit-skin blankets, basketry materials
Tule-Kaweah Yokuts	Sinew-backed bows, pinon nuts, obsidian, moccasins, rock salt, jerked deer meat, hot rock lifters
Kings River Yokuts	Red paint
Washo	<u>Kutsavi</u>
Koso	Shell beads, various goods
Western Mono	Mineral paint, pitch-lined basketry water bottles, acorns, rock salt, pinon nuts, mountain sheep-skins, moccasins, tailored sleeveless buckskin jackets, fox-skin leggings, hot rock lifters, sinew-backed bows, unfinished obsidian arrowheads, red paint
Yokuts (subgroup not specified)	Salt, pinon nuts
Tubatulabal	Salt, pine nuts, baskets, red and white paint, tanned deer skins, <u>kutsavi</u> , pandora moth caterpillars

Received from:

"The West"	Squaw berries, shell beads, glass beads, acorns, baskets, manzanita berries, bear skins, rabbit-skin blankets, elderberries
Central Miwok	Arrows, baskets, clam disc beads, shell beads, glass beads, acorns, squaw berries, elderberries, manzanita berries, a fungus used in paint
Paiute to east	Black paint, yellow paint
Southern Miwok	Clam disc beads
Tyle-Kaweah Yokuts	Deer, antelope, and elk skins, steatite, salt grass, salt, baskets, shell beads
Western Mono	Shell beads, acorn meal, fine Yokuts baskets
Koso	Salt
Yokuts (subgroup not specified)	Shell ornaments, buckskins, acorn meal
Tubatulabal	Shell beads, acorns, manzanita berries, elderberries, baskets, rabbit-skin blankets

In comparison with the abundance of information concerning trade for the Eastern Mono gleaned by Davis, little information was available concerning Koso trade.

KOSO (PANAMINT SHOSHONE):

Supplied to:

Eastern Mono	Salt
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Received from:

Eastern Mono	Shell beads, various goods
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APPENDIX B

APPENDIX B
COLLECTIONS

A variety of data resources exist for the western Great Basin. Some relate directly to the study area and some are peripheral to it. Collection of data relating to cultural resources--historic, ethnographic, paleontological, and archaeological--has been ongoing for more than 50 years throughout the California desert. The most comprehensive guide to primary resources of cultural materials in California and the region of the study area is the recent publication titled California Indians: Primary Resources, A Guide to Manuscripts, Artifacts, Documents, Series, Music and Illustrations (Bean and Vane 1977). The following list of resources was gleaned largely from this source. The quality and value of the collections listed is undoubtedly variable and will require assessment in light of specific research needs.

1. The Bancroft Library, University of California, Berkeley, contains the 1864 recollections of John E. Jones about Inyo County Indians and a Paiute vocabulary collected by James Lord (1820-1898). In addition, the library has the ethnographic notes of Essence and Hulse, who undertook fieldwork in the Oasis, California, area in the early 1930s. The Robert H. Lowie Museum of Anthropology at the University of California, Berkeley, has many artifacts related to the western Great Basin. Specific to the study area are 88 Kawaiisu artifacts, 79 Koso artifacts, 94 Mono artifacts, 181 Eastern Mono artifacts, and 195 western Mono artifacts.

2. The Hayward Area Historical Society in Hayward, California, has "some ethnographic notes on the Paiute."

3. The Old Times Museum in Murphys, California, contains approximately 50 Paiute baskets, including four bottle baskets for water carrying and storage and a woven quiver. Mr. Horace Dodd of San Diego, California, has an unpublished manuscript on his study of the baskets.

4. The Science Museum at Diablo Valley College Science Center, Pleasant Hill, California, has arrowpoints and scrapers from Inyo County, Deep Springs Valley, and a few Mono and Panamint baskets.

5. The Art History Department at California State University, Fresno, has approximately 100 baskets, some of which are Western Mono. This includes the well documented A. E. Wilson collection.

6. The Laws Railroad Museum north of Bishop, California, contains local basketry, arrowheads, and other miscellaneous artifacts.

7. The Visitor Center Museum at the Death Valley National Monument contains artifacts from the Death Valley area and 1,500 volumes pertaining to this area.

8. The Eastern California Museum in Independence, California,

. . . has displays depicting Paleo-Indian occupation of local lacustrine systems with associated artifacts; a typology display of projectile points of the Owens Valley, and a large associated collection of arrowheads; displays including "Owens Valley Brownware" pottery, a fine and rare specimen of a rabbitskin blanket, and other items of clothing and personal adornment; . . . a very complete display of local basketry as well as a few specimens of Yokuts and Washo origin; a display of Desert Archaic game pieces including "promontory pegs", and other related artifacts; and a multiplex display of original photographs of local Paiute culture taken by Andrew A. Forbes from 1904 to 1916. In a small space this museum has an unusually large collection of cultural artifacts. These are all catalogued, but are not subject-indexed.

The Museum staff is now involved in a vigorous program of recording interviews with senior residents, Indian and non-Indian, of the County on cassette tapes. These interviews concern their memories of the old ways.

The Museum has a Mark Kerr manuscript entitled Indian Legends (1936), and a three volume manuscript of original photographs, and typed text by Carl D. Hegner, Archaeological Exploration and Survey in Southern Inyo County; a Report to Mark R. Harrington (1931). These are not known to have been published. The latter pertains mainly to Saline Valley, and the photographs show many fine specimens found "in situ" there.

The Museum has a small library which contains some rare and out of print volumes pertaining to local Indian culture (Bean and Vane 1977:40).

9. The Maturango Museum of Indian Wells Valley in China Lake, California,

. . . displays examples of the rock art and archaeological artifacts illustrating the cultures of the upper Mohave basin from the Pinto Basin era to the Shoshonean cultures (Bean and Vane 1977:42).

10. The Federal Archives and Records Service, Los Angeles Regional Archives Branch, in Bell, California, has material relevant to Native American and Euro-American history in Inyo County.

11. The Archaeological Research Association of Southern California, La Verne, California, has material pertaining to the Little Lake and Haiwee Canyon areas.

12. The Los Angeles County Museum of Natural History contains a portion of the Forbes collection which includes photographic plates relevant to the study area. Paleontological and archaeological specimens from the work of E. L. Davis at China Lake are also curated here.

13. The Los Angeles Title Insurance and Trust Company in Los Angeles, California, has the C. C. Pierce photographic collection which includes photographs of the Paiute.

14. The University of California, Los Angeles, Department of Anthropology, has over a million catalogued artifacts, many from California desert areas.

15. Bodie State Historic Park in Bodie, California, has Paiute artifacts, including three baskets, a fish net, two mortars, four or five pestles, and three photographs.

16. The San Diego Museum of Man in San Diego, California, has artifacts collected from desert areas by M. Rogers and material from a Little Lake area dry cave collected by McCown, including basketry fragments.

17. The Heard Museum of Anthropology and Primitive Art in Phoenix, Arizona, has collections which include some Mono basketry.

18. The University of Colorado Museum in Boulder, Colorado, has in its collections numerous artifacts from California desert areas, including Paiute basketry.

19. The National Anthropological Archives at the Smithsonian Institution in Washington, D.C., contains the unpublished notes of J. P. Harrington on the Kawaiisu and other California desert groups.

20. The Illinois State Museum in Springfield, Illinois, has the Thomas Condell basket collection from California, which includes three Panamint baskets and four Mono baskets.

21. The University of Michigan Museum of Anthropology, Ann Arbor, Michigan, has in its collections miscellaneous artifacts from the western Great Basin, including Mono basketry.

22. The University of Nevada, Las Vegas, Department of Anthropology, has in its collections artifacts and data from the California desert region.

23. The Desert Research Institute at the University of Nevada in Reno has extensive archaeological and archival data pertaining to the Indians of the eastern California deserts, including the Paiute.

24. The New York State Museum and Science Service, University of the State of New York, Albany, has a small collection of basketry from California, including one Koso and three Paiute baskets.

25. The Carnegie Museum, Department of the Carnegie Institute, in Pittsburg, Pennsylvania, has within its collections many artifacts from the western Great Basin of California, including Paiute artifacts, mostly basketry.

26. Deep Springs College in Deep Springs, California, has a small collection of cultural materials from the Eureka Valley, some of it collected by Julian Steward in 1935. Data concerning provenience is vague and in some cases nonexistent (Mawby 1978, personal communication).

27. The Archaeological Research Unit at the University of California, Riverside, has site records for Inyo County and Mono County. The university also has paleontological specimens collected from the China Lake area by Tedford.

28. Mary DeDecker of Independence, California, has photographs of an old structure, perhaps military, that once stood in the vicinity of Waucoba Springs Road before it was destroyed by vandals (1978, personal communication).

29. The Bureau of Land Management, Desert Planning Staff, at Riverside, California, has a small collection of points, basket fragments, and historic artifacts.

30. The University of California at Davis, California, Department of Anthropology, has the C. Merriam basketry collection, which contains specimens relevant to the study area.

31. The San Bernardino County Museum, San Bernardino, California, has collections of cultural material relating to the Panamint Valley as well as other California desert areas.

32. The California State Indian Museum in Sacramento has collections relating to California desert areas.

PERSONS AND ORGANIZATIONS CONTACTED

In an attempt to assess diverse interests in the study area and to locate collections and unpublished materials, a number of contacts were made by letter, telephone, and in person. These contacts included the individuals and organizations listed below. Responses were received from very few; this cannot, however, be taken to indicate a lack of interest in the area.

Antelope Valley Archaeological Society
Lancaster, California

Archaeological Survey
University of California, Los Angeles

Archaeological Survey Association of Southern California
La Verne, California

Tilly Barling
Environmental Coordinator
China Lake Naval Weapons Center
China Lake, California

Stanley Berryman
Toups Engineering
San Diego, California

Robert Bettinger

Bowers Memorial Museum
Santa Ana, California

Richard Brook

Josie Cantnor
Iroquois Research Foundation
Virginia

Helen Clough
Bureau of Land Management
Bakersfield, California

M. Susanne Crowley
Bureau of Land Management

Mary Paul DeDecker
Independence, California

Rollin Enfield
Bishop, California

Nancy Farrell
Guam

Federal Records Center
Laguna Niguel, California

Fresno County Archaeological Society
Fresno, California

Alan Garfinkel
Department of Anthropology
University of California, Davis

Terry Goodwin
Tribal Chairman, Lone Pine Band of
Shoshone Paiute Indians
Lone Pine, California

James Goss
Department of Anthropology
University of Washington, Pullman

Kenneth Hedges
San Diego Museum of Man

Ron Henry
Maturango Museum

Charles Irwin
Director
Eastern California Museum

Kern County Archaeological Society
Bakersfield, California

George Kukla
CLIMAP Team, Lamont Doherty Laboratory
Columbia University
Palisades, New York

Estella Leopold
Quaternary Research Center
University of Washington

John Mawby
Deep Springs College

Lucille McCown
Seal Beach, California

Clement Meighan
Professor of Anthropology
University of California, Los Angeles

Bob Miller
Local Native American
Fort Independence, California

Frank Norris
Westec Services
San Diego, California

Carol Panlaqui
Maturango Museum

Ann Peak
Fair Oaks, California

Eric Ritter
Bureau of Land Management
Riverside, California

Riverside County Archaeological Society
Riverside, California

Charles Rozaire
Los Angeles, California

Blanche Shipentower
Member
Native American Heritage Commission

Raymond Stone
Local Native American

Mark Sutton
Escondido, California

United States Department of the Interior
EROS Data Center
South Dakota

United States Geological Survey
Denver, Colorado

Nancy Walter
Natural History Museum
Los Angeles, California

Claude Warren
Department of Anthropology
University of Nevada, Las Vegas

Margaret Lyneis (Weide)
Department of Anthropology
University of Nevada, Las Vegas

Western Archaeological Center
National Park Service

Minnie Williams
Local Native American
Bishop, California

APPENDIX C

BUREAU OF LAND MANAGEMENT SITE TYPE DEFINITIONS

- A. ARCHAEOLOGICAL SITE TYPES. An archaeological site is defined as a locus of prehistoric activities which can be delineated specifically by the cultural remains present and can be separated by distance and/or observable geomorphic features from other loci of prehistoric activities (Historic sites are covered elsewhere). The cultural materials that constitute a site are basically artifacts and/or cultural features. Artifacts are objects manufactured or modified by man, such as projectile points, manos, metates, bone awls, etc. Cultural features are specific clusters of artifacts and/or other material used or assembled by man that exhibit structural association and that consist of nonrecoverable or composite matrices. Examples of cultural features are burials, roasting pits, bedrock mortars, pictographs, etc. The smallest spatial unit with which the archaeologist deals is the site. Therefore, a single artifact by itself, found with no other cultural material, becomes an archaeological site. Similarly, an isolated cultural feature (e.g., roasting pit) becomes an archaeological site. Most archaeological sites are made up of a cluster of artifacts or a cluster of artifacts with an associated cultural feature(s). This is illustrated as follows:



For planning purposes and to facilitate discussion of prehistoric behavior within the study area, 17 site types and 8 sub-types have been designated. Although initially developed to assist other Bureau specialists and Bureau management in understanding the variety of aboriginal activities manifested in the archaeological record, the archaeological site types used here have also turned out to be useful to the archaeologist working with the available data. They provide the archaeologist with a general category in which to place each site presently in the existing record. Obviously not all the sites will fit neatly into one or another of the site types but it does provide a means to begin dealing with the diversity in the archaeological record.

The site type given each archaeological site is determined by the information provided on the site record sheet. The existing site record sheets are limited in the amount of information they can provide. The site type given is the most accurate judgement that can be made based on the information available. The site types are flexible enough so that if additional information becomes available then the site type(s) can be changed if change is warranted.

Each site type has been given a descriptive name in order to make recognition easier and, on an extremely generalized level, to function as an activity indicator. The 17 archaeological site types and 8 sub-types are described as follows:

- 01 Village - This site type represents long-term or seasonal activity, usually identified as a village or base camp. A village would be identified archaeologically by primary and secondary tools (that is, tools used in the manufacture of other tools) and a variety of other artifacts, as well as floral and faunal remains which represented subsistence activities. Such a site would be characterized by extensive scatters and quantities of debris such as potsherds, fire-affected rock, whole and broken flaked stone tools, chipping waste, charred bone, milling tools, house structures, hearths, rock rings, and sometimes rock art or burials and cremations. A well developed midden is usually a component of this site type.
- 02 Temporary Camp - Temporary camps are sites that were occupied for a short length of time (e.g., one day to one month) by a few people (from an individual to several families). These sites can be identified archaeologically by scattered artifacts, tool manufacturing debris, fire-affected rocks and possibly features. They differ from the first site type by size and frequency of cultural remnants. This type is somewhat a catch-all category. It includes sites that reflect a range of artifacts and/or cultural features that in combination do not allow the site to be typed in another category (e.g., pottery with flakes). The inferred function of the site is limited camping (i.e., limited subsistence and maintenance activities). However, an open site with any combination of flaked stone artifacts, ground stone, fire-affected rocks, and/or ceramics could fit in this site type.
- 03 Utilized Shelter or Cave - This site type represents archaeological sites found exclusively in rockshelters caves or under rock overhangs. If only rock art is present then the site is typed as 12 or 13. Three sub-types have been identified. These are as follows:
- 03a Occupation Rockshelter - This sub-type represents temporary or seasonal occupation locations containing cultural debris similar to that described for village locations (01) or temporary camps (02).
- 03b Transient Rockshelter - Rockshelter or overhang indicative of extremely limited use. The inferred use is that of overnight camping enroute to other locations. These sites are usually along an aboriginal trail or route of travel. Cultural remains may consist only of an isolated tool or a few flakes and possibly some fire-affected rocks. Absent from this type is a developed midden.
- 03c Storage Rock Shelter - Rockshelter or overhang, usually small in size, containing only basketry, pottery, or other cultural remains indicative of storage activities. This would include tool or food caches.
- 04 Milling Station - This site type is a manifestation of procurement and/or processing of hard (e.g., chia) and/or soft (e.g., acorn) seeds and other food items. Associated artifacts may include manos, metates, mortars or pestles. Bedrock mortars or bedrock metates (e.g., grinding slicks or rubs) may be present. This site type may consist of an isolated metate or a single bedrock metate or any combination of

artifacts or features indicative of milling activities. Associated with this site type may be an occasional flake or flaked stone tool.

- 05 Lithic Scatter - These sites are characterized exclusively by the presence of flaked stone tools, chipping waste, cores, retouched and utilized flakes, and/or flake material such as chalcedony, chert, jasper, opal, rhyolite, or obsidian. Other cultural material is absent. Since this general site type often constitutes a major percentage of the archaeological site inventory, five sub-types are used here to allow a closer assessment of this type's variability.

From the existing site record sheets, only the variables of 1) area and 2) density or quantity of flaked stone material present can be determined with any regularity. Giving two characteristics to each of the major variables, four combinations are possible.

The characteristics for area are simply 1) large, and 2) small. Large is considered to be greater than 50 square meters. Small is considered to be less than 50 square meters.

For density of quantity, the characteristics are 1) high, and 2) low. The determination of the characteristics is dependent on key terms used on the site record sheet or on the number of artifacts observed.

A high density is determined if terms such as "dense," "heavy," "thick," "numerous," "a wide variety," etc., are used in reference to quantity of flakes and/or flaked stone tools present. If only the number or a listing of flakes and/or flaked stone tools observed is given then a rough assessment of artifacts per ten square meters is made. Generally, an estimate of an average of more than 30 flakes and/or flaked stone tools per ten square meters is considered high.

A low density is determined if terms such as "thin," "few," "light," "small number," etc., are used in reference to quantity of flakes and/or flaked stone tools present. If only the number or a listing of flakes and/or flaked stone tools observed is given then a rough assessment of artifacts per ten square meters is made. Generally, an estimate of an average of less than 30 flakes and/or flaked stone tools per ten square meters is considered low.

The four combinations of area and density are shown as follows:

DENSITY

(+) (-)
High Low

Area	Large (+)	A + +	B + -
	Small (-)	C - +	D - -

The fifth sub-type, Chipping Circle, is a distinct archaeological feature which when occurring without other flaked stone material or flaked stone tools is recorded as an archaeological site.

The five sub-types of Lithic Scatters are briefly described as follows:

- 05a Large, Dense Lithic Scatter - A locus consisting of a high density of flakes and/or flaked stone tools over a large area (i.e., high density and large area).
- 05b Large, Light Lithic Scatter - A locus consisting of a low density of flakes and/or flaked stone tools over a large area (i.e., low density and large area).
- 05c Small, Dense Lithic Scatter - A locus consisting of a high density of flakes and/or flaked stone tools over a small area (i.e., high density and small area).
- 05d Small, Light Lithic Scatter - A locus consisting of a low density of flakes and/or flaked stone tools over a small area (i.e., low density and small area).
- 05e Chipping Circle - A loci consisting simply of a core with related flakes immediately around it. Occasionally, flakes from the core evidence possible utilization. Hammerstone(s) may on occasion be found in association. A "chipping circle" is usually only one or two meters in diameter. A cluster of chipping circles (i.e., two or more) may be considered a single site if they are less than 20 meters apart and more than 100 meters from another site. Occasionally, an isolated flake or flaked stone tool may be found in the vicinity of a chipping circle. If a chipping circle is associated with other flakes and/or flaked stone tools, or if it is part of a larger site, then another site type or sub-type is utilized.
- 06 Quarry - A quarry site is a location where lithic material has been extracted from a larger mass (usually crypto-crystalline), such as a seam, vein or outcrop, for the purpose of tool manufacture. Such sites are characterized by an abundance of flakes, cores, occasional hammerstones, preforms, blanks or rejects.
- 07 Pottery Scatter - This type of site is represented by surface scatters of pottery (ceramic) sherds or broken vessels. No other artifacts or features are present.
- 08 Cemetery - Prehistoric locations for human internment comprise this site type. Surface indications may include cairns, exposed bone, mounding or markers. This site type ranges from isolated burials in shallow holes to extensive cemeteries.
- 09 Cremation Locus - A special type of internment is the cremation. Charred human bone fragments may occasionally be found in small cavities in the rock, in dune areas, in utilized shelters or caves, or as part of camps or villages.

- 10 Intaglio - These are large figures produced on desert pavement surfaces in the form of animal, human, and geometric designs. Their distribution is usually limited to areas along the lower Colorado River or Yuha Desert but isolated occurrences in other areas have been noted.
- 11 Rock Alignment - Prehistoric alignments of cobbles and boulders occur in the California Desert. Such alignments vary in size and complexity ranging from simple lines to complex abstract or geometric designs.
- 12 Petroglyph Site - Petroglyphs represent pecked or incised figures or designs on boulders, rock outcrops or shelter walls.
- 13 Pictograph Site - Pictographs are painted figures or designs which occur most frequently on the walls of sheltered caves, boulders or outcrops. The most frequent colors are red, black and white although other colors such as orange, brown, yellow and green can occur.

Note: If both petroglyphs and pictographs are present then the dominate rock art form (i.e., greatest number of elements) dictates the site type to be given (e.g., petroglyph site with pictographs or pictograph site with petroglyphs.) The lesser rock art form (i.e., smallest number of elements) is recorded as a cultural feature.

- 14 Trail - Trails are marked routes of travel between permanent villages, temporary camps, and resource procurement areas. Where they survive, trails usually are faint linear impressions or clearings in the desert pavement or slight "shelves" along hillsides and canyon slopes. Potsherds and other artifacts may occur along trails, as might rock cairns or trail shrines. However, the trail is an entity in itself--a route of travel interlinking the various activity areas and sites of the aboriginal populations.
- 15 Roasting Pit - This site type encompasses the range of rock features which includes earth ovens, roasting pits and clusters of fire affected rock. This category is used when there is an absence of other cultural remains.
- 16 Isolated Find - An occurrence of a single artifact or cultural features that does not conform to other site types are documented with this category. This includes isolated flaked stone tools, cores, manos, and other artifacts not covered by other site types (e.g., an isolated metate is included in 04). Cultural features included in this site type are single rock rings or single sleeping circles with no associated artifacts or other cultural features.
- 17 Cairn - Mounding of cobbles and/or boulders are found in the California Desert. These are referred to as rock cairns. Sometimes cairns mark trails, shrines, or burials. Cairns can appear singularly or in clusters.

- B. HISTORICAL SITE TYPES. For purposes of this section, historic sites are defined as loci of past activity or activities of Hispanic and Euro-American populations. It includes sites documented in the historic record (i.e., diaries, historic accounts, and other historic documents) and sites for which no written record or reference can be found. The historic period in the study area dates back to 1776. At the other end, a site is normally considered "historic" if it is 40 years or older. However, more recent sites that have maintained historical integrity (e.g., homesteads) or are associated with a significant event or activity (e.g., WW II training camps) may also be included.

More than two dozen historical site types have been identified in localized areas within the California desert. These site types can be placed into five cultural categories which are indicative of general activities. These cultural categories or general activities are 1) Exploration, 2) Settlement 3) Military, 4) Mining, and 5) Transportation.

1. Exploration involves historical sites associated with early expeditions, explorations, immigrations, and government surveys. Sites associated with this category are simply campsites and routes of travel.
2. Settlement includes those sites indicative of living activities and maintenance activities associated with settlement. Sites within this category include town, hamlet, mining camp, dug out, homestead, farm, ranch, school, cemetery, well, trash dump, and other structures associated with settlement.
3. Military encompasses remnants of past military activities. Sites of this category are fort, camp, outpost, redoubt, and World War II training camp.
4. Mining is a category to cover activities specifically related to the extraction and processing of locatable, salable and/or hardrock minerals. Sites included in this category are mine, shaft, adit, tunnel, mill, arrastre, and mining works.
5. Transportation deals with historical sites that were involved with public conveyance of passengers and/or goods, especially for a commercial enterprise, and sites directly related to this activity. Sites within this category are pack trail, wagon road, stage route, early automobile road, railroad, railroad station and water stopovers.

The various site types are briefly described as follows:

- 01 Town - A compactly settled area usually larger than a hamlet.
- 02 Hamlet - A small settlement.
- 03 Mining Camp - A settlement associated specifically with mining activities. This is also indicative of much more transient use than either 01 or 02.

- 04 Homestead - A tract of land acquired from U.S. public lands by filing a record and living on and cultivating the tract.
- 05 Farm - A plot of land devoted to the raising of crops.
- 06 Ranch - A plot of land devoted to the raising of beef cattle and/or other livestock.
- 07 Railroad Station - The building, remains, and/or regularly scheduled stopping place of the train for the purpose of loading and unloading passengers and freight.
- 08 Post Office - A building and/or site once officially designated as a local branch of the U.S. Post Office.
- 09 School - A building used for educational instruction.
- 10 Structure - Something that is constructed (e.g., building) of rock, adobe, wood, or a combination of these materials or other material.
- 11 Fort - An official U.S. military designation for a permanent army post that is occupied continuously by troops.
- 12 Camp (1800's) - The lowest official U.S. military designation for an army post that is usually small but has a permanent detachment of men assigned to it.
- 13 Camp (WW II) - An official military post consisting mostly of tent structures and established as a base of operation for World War II training maneuvers.
- 14 Outpost - An unofficial military designation used in the 1860's to identify a temporary post to which a small detachment of men (usually a non-commissioned officer and 3-10 enlisted men) from a regional camp were temporarily assigned.
- 15 Redoubt - A small, usually temporary, enclosed defensive work.
- 16 Mine - A pit or excavation in the earth from which mineral substances are taken.
- 17 Shaft - A vertical or inclined opening of uniform and limited cross section made for finding or mining ore.
- 18 Addit - A horizontal opening of uniform and limited cross section made for finding or mining ore.
- 19 Tunnel - A horizontal passageway through a ridge, hill or mountain and associated with mining activities.
- 20 Arrastre - A device built to grind gold-bearing quartz. The early types consisted of a low stone and dirt wall built around a large and fairly level stone, hard pan or flat rock-lined floor.

A long horizontal beam was pivoted on a vertical post in the arrastre's center. One end of the beam was harnessed to a burro or mule to provide necessary power by walking in a circle outside the low arrastre wall. A heavy chain was fastened to the beam about midway, and the free end of the chain linked to a ring bolt wedged in a heavy drag stone(s).

- 21 Ore Mill - A site where crushing machinery, usually steam engine powered, was used to pulverize ore-bearing rock to facilitate the extraction of gold and/or other metals. Five- and ten-stamp mills were most common.
- 22 Mining Works An area where mining and/or processing works (e.g., flumes, chutes, sorters, etc.) are present.
- 23 Dug Out - A shelter dug in a hillside or dug in the ground and roofed with sod or earth.
- 24 Railroad - The remains of a permanent road having a line of rails fixed to ties and laid on a roadbed or berm and providing tracks for railroad cars.
- 25 Automobile Road (Early) - Road used for early automobile travel (e.g., Model-T, etc.).
- 26 Wagon Road - Route habitually used by wagons pulled by draft animals.
- 27 Stage Route - Trail utilized regularly by the stagecoach companies for handling passengers and mail.
- 28 Pack Trail - Historic foot and pack animal (horse and mule) route of travel that was not used by wagons.
- 29 Exploration Route - Routes taken by early expeditions, explorers, travelers, and survey parties. Also included are routes used for domestic livestock drives.
- 30 Cemetery - A place with historic human internments associated with Euro-American activities (i.e., a historic burial ground).
- 31 Trash Dump - A place where refuse or other discarded materials are accumulated or dumped.
- 32 Well - A deep hole or shaft sunk into the earth to tap an underground supply of water.
- 33 Railroad Water Stop - A place along a railroad right-of-way where trains periodically stopped to take on water.
- 34 Isolated Find Singular occurrence of a historic artifact such as the following:

Bottle
Stirrup
Horseshoe
Road grader

APPENDIX D

TABLE D-1
GENERAL INFORMATION ON PLANNING UNIT

Strata	Transects	Total Planning Unit		% of PU	Transects	Sample Area		%/Sample	%/Strata
		(Sq. Miles)	(Acres)			(Sq. Miles)	(Acres)		
		Panamint Planning Unit							
Mountain Slopes	2582	322.75	206,560	45.66%	26	3.25	2080	42.62%	1.01%
Playa	507	63.375	40,560	8.97	6	.75	480	9.84	1.18
Valley Bottom	2338	292.25	187,040	41.35	24	3.00	1920	39.34	1.03
Pinyon-Juniper	227	28.375	18,160	4.01	5	.625	400	8.20	2.20
<u>Total</u>	<u>5654</u>	<u>706.75</u>	<u>452,320</u>	<u>100.00%</u>	<u>61</u>	<u>7.625</u>	<u>4880</u>	<u>100.00%</u>	<u>1.08%</u>
		Darwin Planning Unit							
Mountain Slopes	2715	339.375	217,200	45.89%	28	3.50	2240	43.07%	1.03%
Upland Flats	1557	194.625	124,560	26.32	16	2.00	1280	24.61	1.03
Valley Bottom	1333	166.625	106,640	22.53	14	1.75	1120	21.54	1.05
Pinyon-Juniper	311	38.875	24,880	5.25	7	.875	400	10.76	2.25
<u>Total</u>	<u>5916</u>	<u>739.50</u>	<u>473,280</u>	<u>100.00%</u>	<u>65</u>	<u>8.125</u>	<u>5200</u>	<u>100.00%</u>	<u>1.10%</u>
		Eureka Valley Planning Unit							
Mountain Slopes	3407	425.875	272,560	53.62%	35	4.375	2800	52.24%	1.03%
Valley Bottom	2764	345.50	221,120	43.5	28	3.50	2240	41.79	1.01
Pinyon-Juniper	183	22.875	14,640	2.88	4	.50	320	5.97	2.19
<u>Total</u>	<u>6354</u>	<u>794.25</u>	<u>508,320</u>	<u>100.00%</u>	<u>67</u>	<u>8.375</u>	<u>5360</u>	<u>100.00%</u>	<u>1.05%</u>
		Saline Valley Planning Unit							
Valley Bottom	234		149,760	36.2%	2	2	1280	25%	0.9 %
Northern Uplands	127		81,280	19.6	2	2	1280	25	1.6
Mountain Slopes	175		112,000	27.0	2	2	1280	25	1.1
Mountain Tops	111		71,040	17.2	2	2	1280	25	1.8
<u>Total</u>	<u>647</u>		<u>414,080</u>	<u>100.0%</u>	<u>8</u>	<u>8</u>	<u>5120</u>	<u>100%</u>	<u>1.2 %</u>

ER'S CARD

e overview of the Eureka,
and Darwin region; East
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