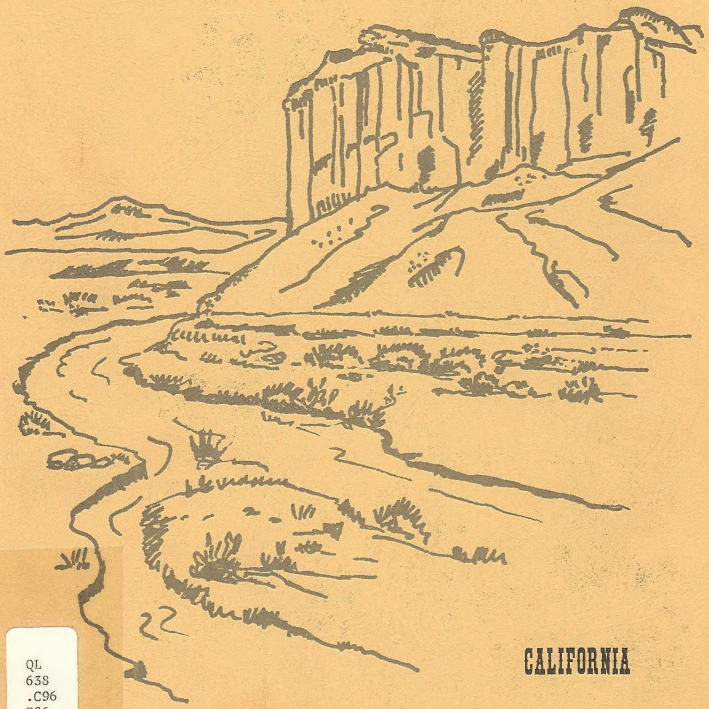
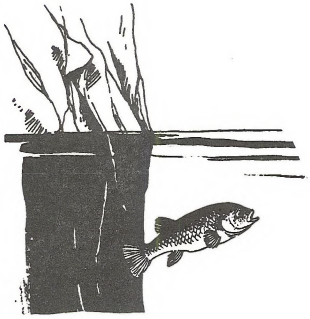
AMARGOSA CANYON-DUMONT DUNES
PROPOSED NATURAL AREA



CALIFORNIA



THE PUPFISH HABITAT PRESERVATION COMMITTEE

P. O. Box 394
Montrose, Ca. 91020
Phone: (213) 249-1564

May 10, 1972

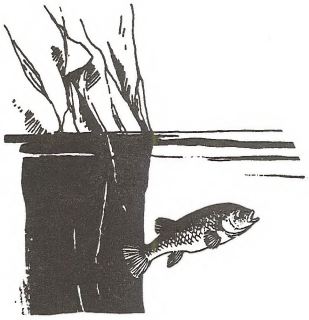
Mr. J. R. Penny, State Director
California State Office
Bureau of Land Management
Federal Office Building
2800 Cottage Way, Room E-2841
Sacramento, California 95825

Dear Mr. Penny:

The Pupfish Habitat Preservation Committee is pleased to submit to the Bureau of Land Management this report entitled, "THE AMARGOSA CANYON-DUMONT DUNES PROPOSED NATURAL AREA."

This report was prepared for the Bureau of Land Management by the members of the Pupfish Habitat Preservation Committee, an ad hoc committee formed to aid the Desert Fishes Council in its efforts to preserve and protect native desert fishes habitats, and all the total values co-existing in the desert native fishes habitats, biotic, abiotic, and cultural. This report is the result of a crash two month program involving approximately 80 scientific experts and laymen working several thousand man-hours.

We used the Bureau of Land Management, California State Office, Publications: "Planning Guidelines for the California Desert Program", January 1971 and the "Appendix to Planning Guidelines for the California Desert Program", January 1971 as the basis for content and form of this report. We are happy to be able to report to the BLM that it is possible to write a study of an area and an environmental impact study using these guidelines.



THE PUPFISH HABITAT

PRESERVATION COMMITTEE

THEREFORE, ON THIS 10th DAY OF MAY, 1972 THE PUPFISH HABITAT PRESERVATION COMMITTEE FORMALLY REQUESTS THE BUREAU OF LAND MANAGEMENT TO SET ASIDE FOR PRESERVATION AND PROTECTION THOSE LANDS IN AND AROUND THE STUDY AREA DESCRIBED IN THIS REPORT WHICH MAY BE NECESSARY TO PRESERVE THE INTEGRITY OF THE ECOSYSTEMS AND VALUES INVOLVED. WE PROPOSE THE AREA BE CALLED THE AMARGOSA CANYON-DUMONT DUNES NATURAL AREA.

We strongly urge the Bureau of Land Management to take action on this before October 1, 1972. One more season of misuse in this fragile area will result in destruction of values which are irreplaceable.

We submit this report and the scientific data herein which justifies this request. We acknowledge gratitude to the Riverside BLM staff for assuring us, February 1972, that a group from the private sector could make a formal request of this nature provided it could justify the request with necessary data. We feel confident this report will justify our request.

We sincerely hope the BLM will concur in this proposal and act promptly on this matter. We look forward to working with the BLM on this project.

Sincerely yours,

THE PUPFISH HABITAT PRESERVATION COMMITTEE

(Benjamin P. & Miriam A. Romero, Coordinators)

AMARGOSA CANYON-DUMONT DUNES PROPOSED NATURAL AREA

THIS REPORT PUBLISHED
AND SUBMITTED TO THE
BUREAU OF LAND MANAGEMENT
U. S. DEPARTMENT OF THE INTERIOR
BY THE PUPFISH HABITAT
PRESERVATION COMMITTEE

INTRODUCTION

While undertaking a survey of pupfish habitats during Fall, 1971, The Pupfish Habitat Preservation Committee inspected the habitat area in the Amargosa Canyon - Dumont Dunes area. It was readily perceived that the Amargosa Canyon-Dumont Dunes (hereafter referred to as the Canyon-Dunes area or Study Area) was somewhat isolated and, therefore, relatively undisturbed by man's activities. The destruction, both accidental and deliberate, of the pupfish habitats in Ash Meadows, Nye County, Nevada, is both well-documented and well-known to all those who are concerned with wildlife and endangered species. The Pupfish Habitat Preservation Committee (hereafter referred to as Pupfish Committee or the Committee) determined to gain protection for the native fishes in the Canyon-Dunes area.

Although primarily concerned with protection of the native fishes habitats, an inspection of the length of the Amargosa River south of Tecopa, California, through the canyon and near the dunes brought about the realization that this entire area was unique in many ways in addition to its being a pupfish habitat. It was obviously ecologically of great interest. The Amargosa River at this point along its course flows above ground all year long. This provides a reservoir for life in an otherwise harsh and arid region.

Much of the river flows underground most of the year, and particularly in summer. The presence of this year round supply of water has created an oasis in the desert supporting a variety of flora and fauna, including rare species.

The area, because of the water, has been used by several Indian cultures and is of great interest to archaeologists. The Lake Tecopa bed is rich in fossil remains and the canyon area holds much interest for paleontologists. The Old Spanish Trail and the Tonopah and Tidewater Railroad (T & T) traversed the canyon, thus making the area of interest to historians.

Aesthetically, the area is superb.

However, signs of vandalism and destruction from wheeled vehicles was apparent. Therefore, concerned not only with the pupfish habitats, but also concerned about the total values of the canyon and the obvious interrelationship of these values with the pupfish habitats, the Pupfish Committee decided to request protection of the area.

The Canyon-Dunes area is under the joint jurisdiction of the Bureau of Land Management (BLM), U. S. Department of the Interior, Riverside District Office and the BLM Bakersfield District Office. The northern half of the study area is in Inyo County and the southern half is in San Bernardino County. Some of the area is in private ownership. The study area is delineated on U.S.G.S. topographical maps covering Silurian Hills and Tecopa. (See Amargosa Canyon-Dumont Dunes Study Area Map.)

In order to determine the full range of values inherent in the study area, the Pupfish Committee arranged with highly qualified desert scientists and other specialists to carry out field surveys and studies. (See acknowledgements.) This report is the result of the compilation and analysis of the data submitted to the Pupfish Committee by these experts.

The Committee, using guidelines from BLM Directive Title 43: Subchapter B; Paragraph 2071.2: Standards for Names (see text of directive at end of Introduction) recommends that the area be designated as the AMARGOSA CANYON-DUMONT DUNES NATURAL AREA.

The Committee has found the authority for the private sector to submit a proposal for protective withdrawal of this area for its unique natural features and rare species. This authority is: Title 43: Public Lands: Interior, Subchapter B - Subpart 2072 - Procedures. (See directive at end of Introduction.) Further authority is provided by Presidential Executive Order 11644- Use of Off Road Vehicles on the Public Lands - Federal Register, Vol. 37, No. 27, Wednesday, February 9, 1972: Section 3: Zones of Use, paragraph 4-b, signed by President Richard M. Nixon. (See complete text of Presidential Order in Appendix.)

Additional directive for protection is to be found in the Antiquities Act. (See specific directives and laws at the end of the Paleontology and Archaeology portion of this report.)

The Pupfish Committee will demonstrate that (per BLM Manual 2321.6; 2321.62A., B., E., & F. (69 Stat 367;30 USC 601 et seq.) " ... there are substantial public values in the lands which cannot be protected except by withdrawal of the lands recommended. The lands are presently in use for public purposes or included in plans for such use or will be needed for such use within the foreseeable future. The acreage requested is reasonable in terms of present uses and use expected and that all the lands included ..., have a higher use for the public projects involved. The area is not adequately protected by Public Law 167."

The Committee will further demonstrate that the present use of this area which allows unrestricted use of motorized

and off road vehicles (hereafter referred to as ORV's.) is incompatible with the proposed uses. Thus, this report will enable BLM officials to comply with Presidential Executive Order 11644 - Use of Off Road Vehicles on Public Lands, Federal Register, Vol. 37, No. 27, Sec. 3: Zones of Use: (a). and Sec. 4: Operating Conditions. (See full text of order in Appendix.)

The Committee also offers recommendations for management and protection of the study area. (See next topic heading "The Study.")

Incorporated into the body of this report in the Appendix are supporting statements for this proposal submitted by scientists and interested organizations and individuals.

It is the recommendation of the Committee that this region be withdrawn for protection by BLM under authority in BLM Manual, Part 6220. Protection and Preservation of Natural Values. Sec. 6220.0-1; also Subpart 6225 - Natural Areas: 6225.01 through .0-6; also Subpart 6225 - Natural Areas: 6225.1: Use of Natural Areas. (For directives, see text at end of Introduction.)

It is also the recommendation that these designated lands within the study area be classified as Class IV: Outstanding Natural Areas and Class VI: Historical and Cultural Sites per Title 43: Subpart 2071: Type and Effect of Designations: 2071.1 (IV); and 2071.1 (VI). (For directive see text at end of Introduction.)

It is the hope of the Committee that this designation and accompanying protection be given this area before Fall, 1972, to ensure that further and continued degradation of the study area by ORV users will not occur. The Committee is certain that the data submitted in this report is sufficient for a protective withdrawal and Natural Area Classification.

DIRECTIVES & AUTHORITY FOR PROTECTIVE WITHDRAWAL OF CERTAIN PUBLIC LANDS

(The following directives were quoted in the INTRODUCTION.)

BLM DIRECTIVE TITLE 43: SUBCHAPTER B; PARAGRAPH 2071.2: STANDARDS FOR NAMES.

(a) To the fullest extent possible, standards established by the Board of Geographic Names will be followed in naming special management areas.

(b) First preference will generally be given to a geographic feature within the site or area if the feature significantly affects the utilization of the natural resources of the area.

(c) No site or area will be named after a living person ....

(d) For public identification purposes, names of sites and areas designated in accordance with the regulations in this subpart shall be brief and descriptive.

TITLE 43: PUBLIC LANDS: INTERIOR; SUBCHAPTER B - SUBPART 2072- PROCEDURES.

Source: The provisions of this Subpart 2072 appear at 35 F.R. 9534, June 13, 1970, unless otherwise noted.

2072.1 Procedure for designating areas and sites.

The sites and areas defined under 2071.1 may be designated, named, and posted by the authorized officer, after consultation and coordination with the authorized users and any other parties, organizations, and units of government which may have an interest in such action.

PRESIDENTIAL ORDER 11644 - USE OF OFF ROAD VEHICLES ON THE PUBLIC LANDS - FEDERAL REGISTER, VOL. 37, NO. 27, WEDNESDAY, FEBRUARY 9, 1972: SECTION 3: ZONES OF USE, PARAGRAPH 4-b.

> The respective agency head shall ensure adequate opportunity for public participation in the promulgation of such regulations and in the designation of areas and trails under this section.

BLM MANUAL, PART 6220: PROTECTION AND PRESERVATION OF NATURAL VALUES: SEC. 6220.0-1:

> This part provides guidelines for the management; and criteria for the use of lands to preserve, protect, and enhance areas of scenic splendor, natural wonder, scientific interest, primitive environment, and other natural values for the enjoyment and use of present and future generations.

BLM MANUAL, PART 6220: PROTECTION AND PRESERVATION OF NATURAL VALUES: SUBPART 6225; NATURAL AREAS: 6225.0-1 THROUGH .0-6; ALSO SUBPART 6225: NATURAL AREAS: 6225.1 USE OF NATURAL AREAS.

6225.0-1: PURPOSE: To describe procedures for management, protection and recreation use of lands having unusual natural characteristics.

6225.0-2: OBJECTIVE: To provide guidelines for the outdoor recreation use of natural areas.

6225.0-5: DEFINITION: The following types may be established under the regulations of this subpart:

(a) Research Natural areas.

> These are established and maintained for the primary purpose of research and education. Scientists and educators are encouraged to use research natural areas in

a manner that is nondestructive and consistent with the purpose for which the area is established. The general public may be excluded or restricted where necessary to protect studies or preserve research natural areas. Lands having the following characteristics may apply:

(1) Typical or unusual faunistic or floristic types, associations, or other biotic phenomena.

(2) Characteristic or outstanding geologic, pedologic, or aquatic features or processes.

(b) OUTSTANDING NATURAL AREAS:

These are established to preserve scenic values and areas of natural wonder. The preservation of these resources in their natural condition is the primary management objective. Access roads, parking areas and public use facilities are normally located on the periphery of the area. The public is encouraged to walk into the area for recreation purposes wherever feasible.

6225.0-6: POLICY: Where appropriate, the Bureau shall establish and record areas of sufficient number and size to provide adequately for scientific study, research, recreational use and demonstration purposes. These will include:

(a) The preservation of scenic values, natural wonders and examples of significant natural ecosystems.

(b) Research and educational areas for scientists to study the ecology, successional trends, and other aspects of the environment.

(c) Preserves for rare and endangered species of plants and animals.

6225.1: USE OF NATURAL AREAS: No person shall use, occupy, construct or maintain improvements in natural areas in a manner inconsistent with the purpose for which the area is established; nor shall he use, occupy, construct or maintain improvements

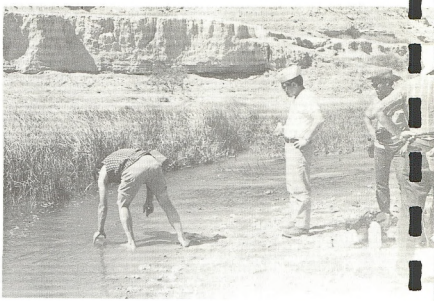
unless permitted by law or authorized by the regulations of this subpart.

TITLE 43: SUBPART 2071: TYPE AND EFFECT OF DESIGNATIONS: 2071.1 (IV); and 2071.1 (VI).

2071.1 (IV): Class IV: - Outstanding natural areas: areas of outstanding scenic splendor, natural wonder, or scientific importance that merit special attention and care in management to insure their preservation in their natural condition. These usually are relatively undisturbed, representative of rare botanical, geological, or zoological characteristics of principal interest for scientific and research purposes.

2071.1 (VI): - Historical and cultural sites.

Sites of major historical or cultural significance, either national, regional, or local. These are usually small tracts of lands containing significant evidence of American history, such as battlegrounds, mining camps, cemeteries, pioneer trails, and trading posts; or lands which contain significant evidence of prehistoric life such as pictographs, petroglyphs, burial grounds, prehistoric structures, middens, fossils, paleontological remains, and any other evidence of prehistoric life forms.



FIELD SURVEY – WATER ANALYSIS
H. FREEMAN

FIELD SURVEY – NORTHERN END OF CANYON
H. FREEMAN

FIELD SURVEY – BIRD CENSUS
J. SULLY

THE STUDY

OBJECTIVE OF THE STUDY:

It was the objective of this study to (a) evaluate the values of the Amargosa Canyon - Dumont Dunes Area; (b) to analyze the scientific data; (c) to recommend proposals for the highest possible use of this area; and (d) to recommend management and protection proposals for the area which would best utilize the land, yet would protect the values existent in the study area.

THE STUDY AREA:

The study area includes the Amargosa Canyon south of Tecopa, California, China Ranch, Willow Creek, Willow Springs, the springs at the north end of the canyon and the Dumont Dunes, (See Geography: General Description). China Ranch and Willow Creek and Willow Springs were included in the study area because that segment is an integral part of the Canyon and river ecosystem and no analysis of the ecology of the Canyon or river is possible without including China Ranch, Willow Creek and Willow Springs. The integrity of the entire ecosystem can only be maintained if great attention is given to wise management of China Ranch property. The owners of the property (see Private Inholdings) are aware of this.

STUDY DATA CONTRIBUTORS:

Those scientists and specialists who contributed scientific data for the study are listed in Acknowledgments. Members of the private sector who helped and those who contributed to the costs of having the study published are listed in Acknowledgements.

METHODS AND PROCEDURES:

All methods and procedures were carried out in careful, scientific procedures. Data was carefully researched and analyzed. All data input was contributed by acknowledged experts. Statistics for socio-economic considerations are up-to-date and the latest available and were taken from professional, reliable sources.

FIELD SURVEY – BOTANY
L. MOURI

FIELD SURVEY – BAT CAVES
J. POSTHUMUS

DATA FILE:

All original correspondence, scientific data inputs, letters, research notes, statements of support, bibliographies and references, sources of statistics are on file with the Pupfish Committee and are available for inspection for interested parties. The data was not censored, nor were any facts, statistics, or opinions deleted from the study or consideration of summary and conclusion. Minutes of the campfire discussion in which all field survey scientists, specialists, and laymen participated in an analysis of the area are available. Great effort was made for objective analysis of all data. All possible uses of the land were considered carefully before final proposals were made.

DATES OF STUDY:

Various members of the Committee have made several trips to the dunes since 1968 studying the recreational situation at that site. On October 16-17, 1971, several members of the Pupfish Committee surveyed the southern end Canyon-Dunes area. They surveyed the northern end of the canyon February 25-26, 1972. On March 17-18-19, 1972, a field survey of 34 scientists, specialists and Committee members made a scientific survey of the area. On April 4-5, 1972 another bird census was taken by experts in the Los Angeles Audubon Society (Tarble, Wells, Pollock.) On April 14-15-16, 1972, another extensive bird census was taken by 33 experts in the San Fernando Valley Audubon Society.

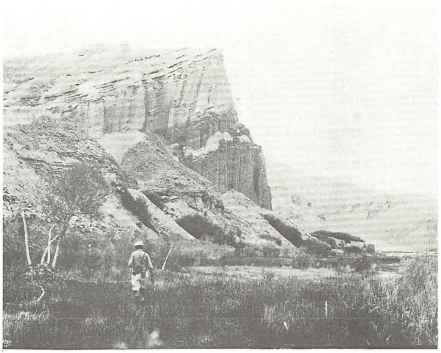
Dr. Robert Rush Miller, Ph.D., University of Michigan, world's foremost authority on native desert fishes, first visited the area in 1937 and has made subsequent surveys of the area. Members of the Desert Fishes Council have surveyed the area several times and research on the fishes has been going on.

Prof. Angus MacDonald, Valley College, Van Nuys, California, has been carrying on extensive research on the Dumont Dunes since 1966; he has also studied the geology of the canyon.

Dr. David Whistler, Ph. D., Natural History Museum has been carrying on paleontological research for several years. The Pacific Coast Archaeological Society has been investigating China Ranch sites for several years. (For complete text of their survey, see Appendix)

All data was submitted after on-site surveys and additional research were made.

Thus this report is the result of careful analyses and consideration of data submitted by scientific experts, specialists, and information and study reports from the BLM office in Riverside.



FIELD SURVEY – BIRD CENSUS S. WELLS

FIELD SURVEY – PHOTOGRAPHY C. GALLOWAY

SUMMARY AND CONCLUSIONS

The recommendations of the Pupfish Habitat Preservation Committee contained in the body of this report are based on an objective analysis of all factors involved: inherent biotic, abiotic, scientific, cultural, and aesthetic values, problems of management and protection, and socio-economic considerations.

For the purposes of this summary the values inherent in the study area are briefly presented here. However, the reader should read in detail the supporting data submitted by qualified experts in both the body of and the Appendix to this report.

A. GENERAL CONSIDERATIONS OF THE STUDY AREA

1. The study area is unique in many ways. It is NOT the same as Death Valley. The presence of a year-round supply of good water provides food and water for many species of flora and fauna.

2. There is no similar area to this one in the Desert Study Area delineated by BLM. This area is unique -- nowhere can another area be found like this one.

3. Besides being unique, it is also very fragile. Ecosystems are in delicate balance.

4. The area contains important values other than biotic.

B. THE AMARGOSA RIVER, WILLOW CREEK, AND THE SPRINGS IN THE STUDY AREA

The Amargosa River, Willow Creek, and the springs in the study area are the most important values to be considered. In relationship to the ecology of the area, the water system in the study area is THE LIMITING FACTOR. The rare and highly endangered native desert fishes, the pupfish and the dace, can only continue to exist if the flow and quality of the entire river- creek - springs system is maintained. Species of mammals such as the raccoon and the bobcat depend on water. All of the species of frogs, 37% of the species of lizards and 45% of the species of snakes are restricted to a riparian habitat. All of the waterfowl need water as do most of the other species of birds in the area. The migrating birds absolutely depend on this resting

and water area for survival in their flight across the southwestern deserts. This area is a "wet island in the desert." Animals from surrounding areas come into the canyon during years of drought and thus are able to survive.

The entire ecological balance of all species in the canyon with the exception of the few truly desert-adapted species of flora and fauna which are able to survive in extreme arid conditions, depends on the river - creek - springs water system. There must be no tampering with or altering of the water system. This cannot be emphasized strongly enough. Any human activities which would impair the flow and quality of the water should be excluded from the area.

C. BIOTIC VALUES

The area contains many species of plants, and because of its isolation, should contain rare and endemic species. The highly vulnerable desert lily is found in the dunes area.

Many species of fauna have been identified in the study area. Surveys done for this report revealed the presence of two rare and highly endangered species of native fishes, the pupfish and the dace. Eighteen species of mammals are positively identified in the region, with more yet to be positively identified. Of the mammals, the Amargosa botta pocket gopher is endemic in this area. Another species, the Amargosa meadow vole, which had been declared extinct in 1917 by the California Fish and Game, was found in 1937 in small numbers and may still live in the canyon.

A new, undescribed species of crayfish was discovered on a survey of the area for this report. There is a possible 42 species of reptiles and amphibians present. During the birding censuses taken for this report, 104 species were observed. Of these, six raptor species were identified including the highly endangered prairie falcon. Ornithological discoveries, such as the nesting of the Lucy's warblers, were made during the study which will revise range maps.

D. CULTURAL VALUES

The fossil fauna in the area is the first good record of middle Pleistocene life from the Mojave Desert. Tertiary and Late Pleistocene records were previously represented, but the Tecopa fossil deposit begins to fill the void of knowledge in between. The fossils are extremely fragile.

Existing evidence indicates abundant archaeological material representing a long span of time, perhaps as much as 10,000 years or more. The Amargosa Valley formed a boundary of four early lithic cultures, and is one of the few areas where all 4 are present. Adequate protection of this area would be an invaluable aid in sorting out the prehistory of the entire Desert area. It would appear to constitute a serious violation of the Federal Antiquities Act and also of BLM regulations if continued current use is and/or planned unrestricted ORV use in the area would be permitted by the BLM.

This area was used as a part of the Old Spanish Trail. Historical figures such as John C. Fremont, Kit Carson, and the 49-ers used this trail. The now defunct Tonopah and Tidewater Railroad went through the canyon.

E. THE AMARGOSA CANYON

In addition to the aforementioned year-round supply of water and its importance in the canyon, and in addition to the outstanding biotic and cultural features of the canyon already discussed, it must be pointed out that the canyon is also important for another reason.

The gorge from Tecopa to Sperry including China Ranch is an "ecological island." The area is isolated from the rest of the desert by geographical barriers. Through long periods of time, the species of flora and fauna in the canyon have been restricted to this area because of habitat needs. They have become so adapted that speciation has taken place and new species have evolved. The isolation of these species assures continued speciation. Already several endemic species have been discovered. Further studies will undoubtedly reveal the presence of more. The existence of many humans in the canyon and heavy use by humans in the canyon could result in the introduction of exotic species which would have an adverse effect on resident species. Exotic species could "take over" and completely eliminate endemic species, or there could be cross-breeding and speciation and evolution disrupted. The Amargosa Canyon is of prime importance ecologically. Again it must be emphasized, it is NOT the same as Death Valley.

F. THE DUMONT DUNES

The Dumont Dune system is a unique sand dunes system. Despite its small size, the Dumont Dune system contains examples of almost every type of sand dune. No other dune field in the desert is known to contain so many different types of dunes. Contrary to popular opinion, sand dune fields usually cannot

heal themselves overnight. Perhaps under exceptional conditions of high wind velocities, dunes may have the scars of use erased in a single 24-hour period. In addition to the destruction of the delicate desert environment surrounding the dunes, there is evidence that the constant movement by dune buggy erosion is fundamentally altering the shape of the Dumont field which will result in a probable removal of sand from the field by the wind. At the present, the Dumont field is located in a small protective wind shadow zone. As the dunes are lowered in height by dune buggy erosion, it is probable that more and more sand enters the wind stream to be carried from the region.

The ecology of the dunes has not been researched at all. The area around the dunes used to be carpeted with wildflowers in the spring including the desert lily. Whether seeds have survived the wheeled vehicle activity remains to be seen in a wet year. It is recommended that the herpetology and mammalogy portions of this study be read for further comment on biota of the dunes.

G. SOCIO-ECONOMIC CONSIDERATIONS

The population of the local region is small. The local economy of the region is based on tourism. However, comparative studies made indicate the current wheeled vehicle users of the dunes contribute very little to the economy of Shoshone - Tecopa, a minimal amount to the economy of the Baker area. It would appear the local area would benefit more economically from a natural area classification than a wheeled vehicle recreation use classification. (See ADDEND ON DUNES SUMMARY, p. 118.A)

Highway use figures analysis indicates the number of visitor days by current users is small. Although use is increasing, there is no indication from these analyses that wheeled vehicle users favor this area over other areas. Quite the contrary is indicated.

H. MANAGEMENT CONSIDERATIONS

Because of the proximity of the dunes and canyon and the easy access from the dunes into the canyon, and given the current social attitudes of some desert users, it would appear impossible to protect the canyon if the dunes are classified as an intensive, unrestricted off-road wheeled vehicle recreation area. Another factor to consider is the fact that the dunes area provides the only campsite location for those who would want to enjoy the natural area of the canyon. The two areas complement each other and the total area would provide a combination of variety of experiences for people interested in

nature-oriented activities. Although Death Valley is close by, it is not the same. This must be emphasized again. There would be space to play on the dunes, hiking trails, nature study, photography, and wildlife observation. The total study area would result in a unique "natural park area" in the Mojave Desert. Managing the area as one unit with protective classification would present less problems than managing two adjacent areas with totally incompatible uses.

H. BOUNDARIES OF THE STUDY AREA

The boundaries marked off to delineate the study area were for study purposes, but modification may be necessary to include other important areas in the total system that may have been excluded, but may prove to be found in the area. It is recommended the boundaries be revised to include the total Dumont Dune system. The main Dumont Dune Field was considered in this report, but this field is a part of a total system.

CONCLUSIONS

The entire area is unique. The values are numerous, are rare, and are irreplaceable once lost.

Abundant scientific data and opinion supports the conclusion that the canyon must be preserved.

There were several conflicting opinions regarding the use of the Dumont Dunes, but upon analysis of all factors: geologic, biotic, current use figures, local economy considerations, management considerations, and after closely studying supporting comments, letters and statements, it is recommended that this area, too, should be given protective withdrawal classification.

It might be brought to the attention of BLM in this portion of the report that local residents in the Shoshone-Tecopa area are very alarmed at current misuse and destruction of values of the land in their area by wheeled vehicle users.

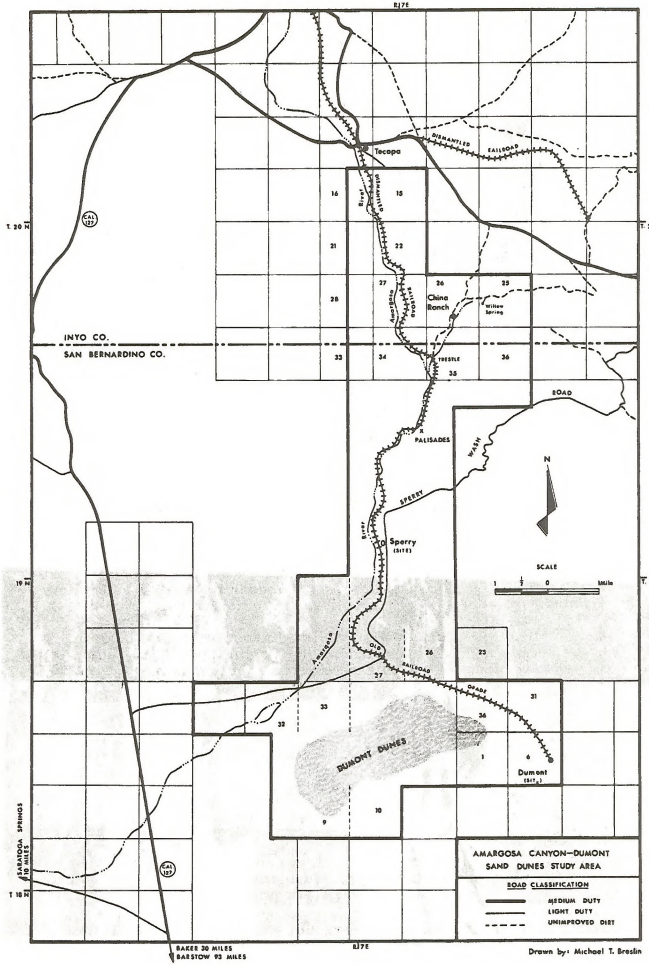
It is also recommended that the BLM conduct public hearings both in the Riverside and Shoshone area if the Bureau plans to classify the area as a recreational vehicle use area. Interested parties who helped prepare this study requested this as did the local residents of Shoshone-Tecopa area.

An early consideration of this report is recommended. Failure to fully protect the Study Area by October 1, 1972, could result in irreplaceable values being lost.

GEOGRAPHY

AMARGOSA CANYON NEAR WILLOW CREEK CONFLUENCE

B. ROMERO


R17E
T. 20 N.
T. 19 N.
T. 18 N.
Tecopa
TONOPAH & TIDEWATER RAILROAD
Tecopa Hot Springs
China Ranch
Willow Spring
INYO CO.
SAN BERNARDINO CO.
TRESTLE
ROAD
PALISADES
WASH
SPERRY
Sperry
(SITE)
N
SCALE
1 ½ 0 1Mile
AMARGOSA
OLD
RAILROAD
GRADE
DUMONT DUNES
Dumont
(SITE)
AMARGOSA CANYON—DUMONT
SAND DUNES STUDY AREA
ROAD CLASSIFICATION
MEDIUM DUTY
LIGHT DUTY
UNIMPROVED DIST
CAL 127
SHOSHONE 70 MILES
BAKER 20 MILES
BARSTOW 93 MILES
R17E
Drawn by: Michael T. Brosin

GEOGRAPHY

(The following Geography report was submitted by Prof. Angus MacDonald, M.A., Department of Earth Sciences, Valley College, Van Nuys, California.)

GENERAL DESCRIPTION

The Amargosa Canyon-Dumont Dunes Study Area encompasses an area of approximately 25,440 acres. Location is as follows: 116° 15' W. Longitude, 35° 45' N. Latitude. Tecopa, California Quadrangle 15' series, T. 19, 20 N., R. 7E. Silurian Hills, California Quadrangle, 15' series, T. 18 N., R. 7E.

The Amargosa River Canyon, also known as the Amargosa Gorge, lies approximately 40 miles north of the town of Baker in San Bernardino County, California, and immediately north of Silurian Valley. To the north of the canyon, lie two smaller communities, Tecopa and Shoshone, which are located in the extreme southern portion of Inyo County. The San Bernardino Inyo County boundary, trending in an east-west direction, roughly bisects the north-south trending canyon. The Amargosa River Canyon has been excavated in a low range of hills known as the Sperry Hills (MacDonald, 1966, p. 21) which geologically appear to be quite recent in origin. The canyon itself varies in width from about 400 feet in the northern portion to approximately 2,000 feet as it opens upon a broad alluvial fan at its southern extremity. The canyon is about 11 miles in length. The present depth of the canyon is variable. The greatest depths are found midway through the canyon in the vicinity of China Ranch. Here, depths of 960 feet occur (sec. 35, T.20 N., R. 7 E., San Bernardino baseline and meridian).

The Dumont Dune System, composed of three distinct sand dune fields, occur south of the Amargosa River Canyon. The dune system is to be found on the lowland border of two large adjoining desert bolsons: Silurian and southern Death Valleys. The largest dune field in the system, the Dumont field (T.18, 19 N., R. 7 E.), and the smaller Valjean field (T. 18 N., R.8 E.), are located in the extreme northern sector of Silurian Valley at an elevation of about 1,000 feet above sea-level. The third field of dunes, the Little Dumont field, is located in the eastern extremity of southern Death Valley at an elevation of approximately 420 feet above sea-level. The two valleys are separated immediately to the east of the Little Dumont field by the low Salt Spring Hills which rise to a maximum height of 1,052 feet.

Of the three sand dune fields comprising the Dumont Dune System, the Dumont field is by far the largest, containing a volume of approximately 6.7 billion cubic feet of sand compared to 80 million cubic feet for the Little Dumont field and 1 million cubic feet for the Valjean field (Mac Donald, 1966, p. 37). Comparatively, the Dumont Dune System is quite small when likened to the Algodones Dunes in Imperial County, which contain approximately 200 billion cubic feet of sand (Eyman, 1953, p. 20).

GEOLOGY - AMARGOSA RIVER CANYON AREA

Of necessity, the geology of the Amargosa River Canyon involves the geology of the Sperry Hills in general, as the canyon has been formed through the incision of the Amargosa River into these hills. Geologically, the canyon is known as an "antecedent canyon." This is to say that the ancestral Amargosa River flowed in the same location as it does today, before the uplift of the Sperry Hills began in probable very late Tertiary time. An antecedent valley or canyon is always the result of some kind of doming or anticlinal folding; the Sperry Hills appear to be essentially anticlinal in development.

As one moves from north to south through the canyon, first very young sedimentary rock formations are encountered, then older formations. In the southern reaches of the canyon, younger rocks reappear. Immediately to the north of the Amargosa River Canyon are the dissected lacustrine deposits of Pleistocene Lake Tecopa (Mason, 1948, p. 336). Various scattered fossil remains of vertebrates have been recovered from these deposits, but their primary geological value lies in the intricate patterns that have formed through rill and stream erosion. Their dissection has occurred rather recently. The draining of ancient Lake Tecopa apparently was the result of the lake overflowing as the impounded waters of the Amargosa River discharged to the south over the gradually rising Sperry Hills. As the river downcut, it did so through very coarse gravel and cobble deposits representing fanglomerates (Mason, 1948, p. 336). These dissected fanglomerates are exposed along the canyon as almost vertical cliffs up to 400 feet in height. It has been estimated by Mason (1948, p. 336) that these fanglomerates were deposited after or contemporaneously with the Lake Tecopa sediments. Moving down the canyon, the next rock units encountered are the volcanic tuffs, breccias and some undifferentiated volcanic flows. Mason (1948, p. 336) assigns these flows to late Tertiary time. South of the volcanics, lie the China Ranch Beds, a series of light-colored, mainly white to brilliantly pink saline claystones with some gypsum layers interbedded. It appears that these beds represent the deposits of a lake which existed in this region prior to the uplift of the Sperry Hills. The China Ranch Beds are extremely colorful and very poorly indurated as attested to by the copious amounts of rill erosion that is occurring. The China Ranch Beds also contain natural deposits of saltpeter or nitrate deposits (Noble, et al., 1922). Downcutting by the Amargosa River has exposed near China Ranch, the ancient rock forming the probable basement throughout much of this area. (SW 1/4, sec. 35, T. 20 N., R.7 E.). This Precambrian rock, which has been altered by mineralized solutions over the eons, has become extremely colorful and is, next to the colorful China Ranch Beds, the most interesting geological phenomenon in the canyon. To the south of China Ranch, the geological sequence reverses itself. First the China Ranch Beds

are encountered, then the coarse fanglomerates are again observed in the canyon walls, and finally volcanic rocks appear near the mouth of the canyon. These volcanics have been assigned an early Tertiary age (Troxel, 1961). South of the volcanic region, the canyon opens upon a broad, recent alluvial fan to empty into the southern portion of Death Valley.

Evidence of possible very recent anticlinal uplift along the east-west major axis of the Sperry Hills, closely approximating the boundary between San Bernardino and Inyo Counties, may be observed in the erosional activities of the Amargosa River. North of China Ranch, the canyon is relatively broad excepting the extreme northern portion. South of the ranch however, the river has very effectively entrenched itself for more than two miles which indicates a possible rise in gradient. Since the China Ranch Beds in the region appear to be poorly indurated, uplift must have taken place within the past few thousand years. It is, however, possible to interpret the recent entrenchment of the river in another way, through increased rainfall throughout the region. Since long-term data are unavailable, it is impossible to test the validity of this latter hypothesis.

A clue to the nature of the underlying basement rock throughout the canyon is the presence of water throughout portions of the canyon itself. From approximately 2-1/2 miles south of China Ranch to the northern extremities of the canyon, moderate amounts of water may be found flowing at the surface throughout the entire year. South of a point 2-1/2 miles south of China Ranch (1 mile north of Sperry station), water usually flows on the surface throughout the winter and spring months, but not usually during the summer. This would suggest that relatively impervious rocks, probably precambrian, may be found very close to the surface of the canyon floor north of China Ranch and for an undetermined distance below the ranch. This is further indicated by the outcropping of precambrian rock just to the south of China Ranch which has been mentioned previously.

GEOLOGY OF THE DUMONT DUNE SYSTEM

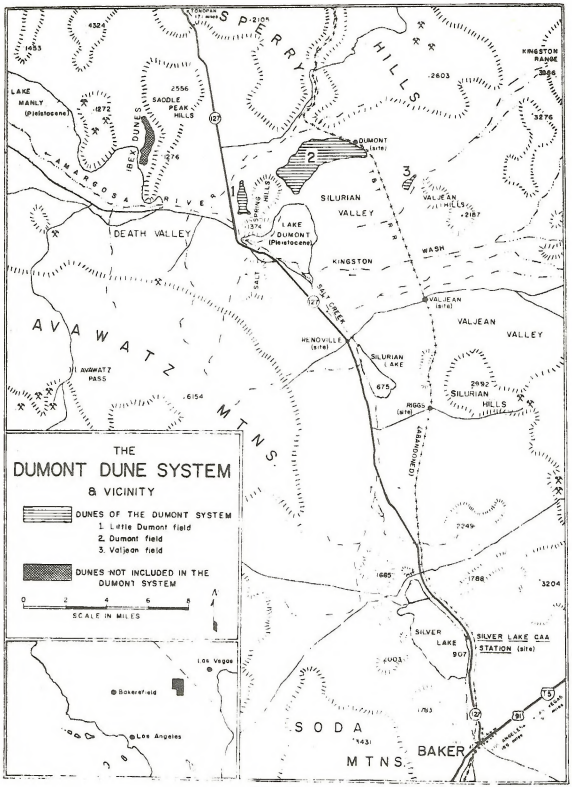
The bajada (alluvial plain) surface upon which the Dumont Dune System rests, varies from field to field. In the Dumont field, containing the most massive dunes to be found in the system, the dunes rest upon a surface which appears to have been undisturbed by fluvial action during modern times, as this surface exhibits a total lack of active wash channels or arroyos.

The Valjean field, however, is located in an active wash system along the eastern margin of Silurian Valley. Apparently very little activity has occurred along this wash system during the past few decades, but flash floods probably do occur at rare intervals. The fact that these sand dunes are the smallest in the system may be due, at least in part, to the destruction of some of the dunes by occasional flash floods. The Little Dumont field is likewise located in an active wash system similar to that observed at the Valjean field. This field, however, is situated on a broad east-west trending plain, approximately three miles in width, in the southern extremity of Death Valley. Numerous alluvial fans emanating from the Avawatz Mountains to the south give the valley a slightly greater elevation to the south.

Numerous mountains, consisting mainly of Cambrian and Precambrian strata, protrude into the main portion of the Death Valley trough, and serve as wind-blown sediment "traps". The most important of these are the Salt Springs Hills which serve as a natural wind shadow zone for westerly dune-building winds. To the east of these hills may be found the Dumont Dune field, the largest in the system.

The type of sand comprising the dune system is remarkably homogeneous. The bulk of the sand grains consist of quartz with minor amounts of feldspar and trace minerals. No intensive mineralogical study has been done on the dune sands. The average grain sizes decreases steadily from west to east however (MacDonald, 1966 p.66). This indicates that the major source of sand was and is to the west. The probable sources of sand were: (1) from the shoreline of Pleistocene Lake Manly which was located about 6 miles to the west of the Little Dumont field which contains the bulk of large grain sizes, (2) from the Amargosa River discharging sediment to the west of the Little Dumont field, and (3) the Kingston Wash, discharging into Silurian Valley about 6 miles to the south of the Dumont and Valjean Dune fields.

Research indicates that under natural conditions, all dune fields are essentially stable and non-migratory. The presence of each is determined by the presence in turn of mountains or hills which produce wind shadows or, a slowing of wind velocities from various sectors. Sand volume appears to be relatively


SPRING MTS.
KINGSTON RANGE
LAKE MANLY (Pleistocene)
SADDLE PEAK HILLS
DUMONT (site)
SILURIAN VALLEY
SILURIAN HILLS
TAMARISA
RIVER
DEATH VALLEY
LAKE DUMONT (Pleistocene)
KINGSTON
WASH
SALT CREEK
VALJEAN (site)
VALJEAN VALLEY
AVAWATZ MTNS.
AVAWATZ PASS
HENDVILLE (site)
SILURIAN LAKE
RIGGS (site)
SILURIAN HILLS
SILVER LAKE
SILVER LAKE CAA STATION (site)
SODA MTNS.
BAKER
Las Vegas
Bakersfield
Los Angeles
THE DUMONT DUNE SYSTEM & VICINITY
DUNES OF THE DUMONT SYSTEM
1. Little Dumont field
2. Dumont field
3. Valjean field
DUNES NOT INCLUDED IN THE DUMONT SYSTEM
SCALE IN MILES

MAP I

DUMONT DUNES

A. MAC DONALD

constant.

The entire Mojave Desert contains less than 1% of sand or erg surface. Despite its size, the Dumont Dune System contains examples of almost every type of sand dune, except for very large types such as "whalebacks" and "dune chains," found only in the sandy deserts of the world such as the Rub-al-Khali of the Arabian Desert or the sand-seas of the Sahara. Examples of Transverse dunes, Barchan dunes, Oscillatory dunes, Longitudinal dunes, Seif dunes, and Complex dunes are found here. No other dune field in the desert is known to contain so many different types of dunes.

The dunes are by no means stabilized. Virtually no vegetation is found in these sand dunes. Thus, they differ markedly from the Kelso to the south. The Dumont Dune System is truly a unique system and possesses qualities that must be preserved.

CLIMATE

The climate of the region encompassing the Sperry Hills, Silurian Valley, Amargosa Canyon and southern Death Valley is extremely arid. Climatic data from the Silver Laker CAA station, located about 25 miles south of the dune system, are available and tabulated from the years 1940-1952 (MacDonald, 1966, P. 27). Data for the Saratoga Springs area, Death Valley National Monument, California, approximately 15 miles west of the dunes and Amargosa Canyon, from February 1967-May 1968 has been tabulated. (Bradley, 1970, P. 113.) Current data, February 1972 for Furnace Creek, Death Valley National Monument, California and Baker, California is available from the U. S. National Weather Service, Department of Commerce, Los Angeles, California. This data is from weather stations near the study area.

TEMPERATURE-PRECIPITATION

The average precipitation for that period (1940-1952) was only 3.69 inches annually, with peaks occurring in the winter months and the summer month of August. This is typical of a desert region. Temperatures are also typical. For this same period, January temperatures averaged 46.6 degrees while during July an average of 93.1 degrees was computed. The absolute maximum temperature recorded for Silver Lake CAA station was 120 degrees, the absolute minimum 9 degrees.

WIND

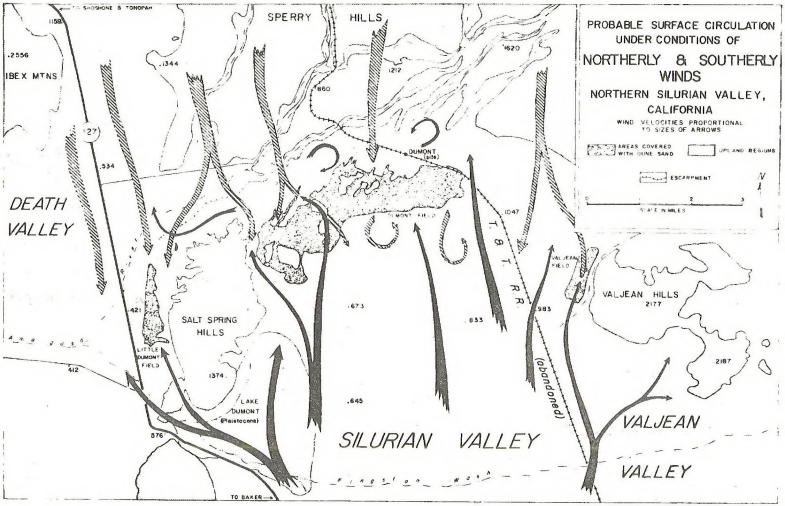
Dune building winds (winds in excess of 11 miles per hour) in the area are primarily from the west. Sand motion begins on the dune crests when the velocities reach approximately 11 miles per hour. With winds of 15-18 miles per hour, so much sand is in motion that the eyes need protection. At these velocities, successive waves of sand, approximately one and one-half feet high, move across the plain in the vicinity of the dunes. Westerly winds blow an average of 140 days out of the year. From October to March, and sometimes into late May and early June, winds blow from the north, often having high velocities. At the Dumont System some were observed to exceed 47 miles per hour. Northerly and southerly winds blow an average of 75 days out of the year. Easterly winds are extremely rare, occurring an average of 2 days per year.

EVAPORATION

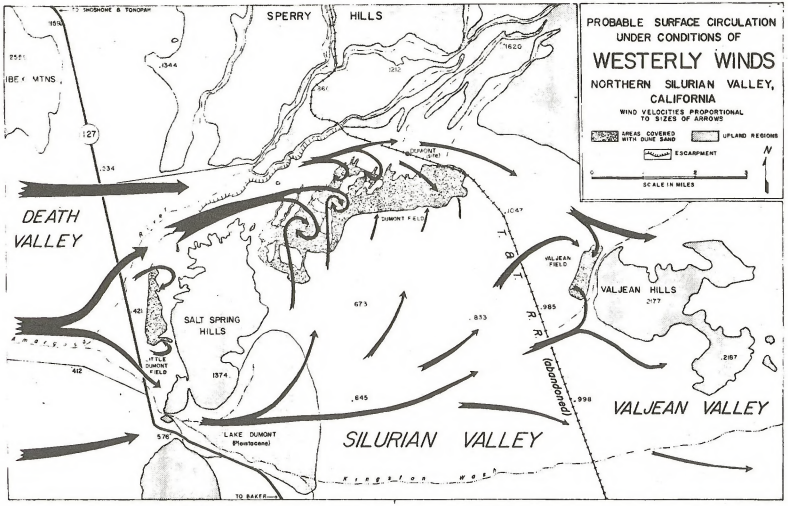
From May, 1938 to April, 1939, evaporation was measured in Silver Lake. The lake filled within a period of 3 days in March, 1938, as a result of abnormally heavy rains in the San Bernardino Mountains. At its maximum size the lake was 7 miles long and 3 miles wide. The lake had previously been dry for several years. Air temperature, and movement, and relative humidity were recorded. High desert temperatures, high rates of wind movement, and low humidity were all conducive to high rates of evaporation. During the period of observation, the maximum monthly evaporation rate was 19.75 inches. Maximum evaporation for a single day was 1.01 inches when maximum air temperature was 109 degrees, wind movement 220 miles in 24 hours, and mean humidity 54 percent.

Evaporation in the vicinity of the Dumont System is relatively rapid during summer. During the winter, cold air temperatures cause evaporation rates to decrease sharply, resulting in total evaporation of only 3.61 inches during January, 1939.

(Maps on Dumont Dunes drawn by Angus MacDonald.)


SHOSHONE & TONOPAH
SPERRY HILLS
PROBABLE SURFACE CIRCULATION
UNDER CONDITIONS OF
NORTHERLY & SOUTHERLY
WINDS
NORTHERN SILURIAN VALLEY,
CALIFORNIA
WIND VELOCITIES PROPORTIONAL
TO SIZES OF ARROWS
AREAS COVERED WITH DUNE SAND
UPLAND REGIONS
ESCARPMENT
STATUTE MILES
IBEX MTNS
DEATH VALLEY
DUMONT DUNE
DUMONT FIELD
SALT SPRING HILLS
LAKE DUMONT (Pleistocene)
SILURIAN VALLEY
VALJEAN HILLS
VALJEAN VALLEY
T & T R R (abandoned)
TO BAKER

MAP 3


PROBABLE SURFACE CIRCULATION
UNDER CONDITIONS OF
WESTERLY WINDS
NORTHERN SILURIAN VALLEY,
CALIFORNIA
WIND VELOCITIES PROPORTIONAL
TO SIZES OF ARROWS
AREAS COVERED WITH DUNE SAND
UPLAND REGIONS
ESCARPMENT
SCALE IN MILES
SHOSHONE & TONOPAH
SPERRY HILLS
IBEX MTNS.
127
DEATH VALLEY
DUMONT FIELD
SALT SPRING HILLS
LITTLE DUMONT FIELD
LAKE DUMONT (Pleistocene)
TO BAKER
VALJEAN FIELD
VALJEAN HILLS
VALJEAN VALLEY
SILURIAN VALLEY
abandoned
673
833
645
1374
1620
1344
1232
1561
1334
1421
412
576
1047
985
998
2177
2167

MAP 2

SOIL

SAN BERNARDINO PORTION OF STUDY AREA:

In a letter dated March 30, 1972, from the United States Department of Agriculture, Soil Conservation Service, Apple Valley, California, Mr. Harold L. Loudermilk, District Conservationist reported that the Soil Conservation Service does not have any information or data available on the soils in the study area in the northern part of San Bernardino County.

INYO COUNTY PORTION OF STUDY AREA:

Mr. P. Dean Smith, County Director and Farm Advisor, Agricultural Extension Service, University of California, Inyo and Mono Counties, in a communication dated April 7, 1972, enclosed soil sample data for the China Ranch area. These samples were taken because of specific agricultural problems on the ranch. See full text of Mr. Smith's letter in Appendix.

This information submitted by Mr. Smith is included in this report (See Appendix S-1, S-2) because (a) it is the only soil sampling which has been done in the area, and (b) it may be of general interest to those who have particular interest in China Ranch. Also see Appendix for soil characteristics information (Appendix C-2 and S-3)

ADDITIONAL SOIL INFORMATION:

Added information regarding general soil characteristics or types must be extrapolated from the General Description and Geology portion of this Study and also from the Botany portion of the Study.

CONCLUSIONS:

Soil analysis and soil studies of the area must be made. It is impossible to fully understand ecological implications of

CONCLUSIONS (Continued)

the Study Area unless this data is available. It would be reckless to classify lands for recreation and particularly ORV use unless complete soil studies had been made, to determine the effects of sustained use by human activity on the soils. The effect of ORV's on the soils of the mud hills is documented in the paleontological report of this Study. The effect of ORV use on desert pavement is of common knowledge to both BLM and the scientific community. The effect of ORV's on the soils containing archaeological sites is documented in the Archaeology portion of this Study. Further comments regarding soils are made in the Icthyology portion of the Study. Compaction of soils and resultant loss of fauna habitat is documented in Mammalogy and Herpetology portions of this Study. Destruction of soils results in plant destruction. It would seem imperative that soil studies be completed in the area.

WATER QUALITY CHARACTERISTICS OF THE AMARGOSA RIVER NEAR TECOPA, CALIFORNIA

(The following report was submitted by Robert D. Smith, Land and Water Use Analyst.)

On March 18 and 19, 1972, a reconnaissance of water quality characteristics was conducted along the Amargosa River south of Tecopa. The area of study and sampling points are shown on Figure 1.

The objective of the study was to investigate, on a reconnaissance level, the various water quality aspects of the Amargosa River within the study area and to relate the quality to present and future land uses.

Investigators involved in the study were Robert D. Smith (team leader), Land and Water Use Analyst; John Tenero, Water Resources Engineer; Richard Cocke, Land and Water Use Analyst; Harry Iwanaga, Hydrogeologist. All are experienced employees of the State Department of Water Resources, but off-duty volunteers for this project.

The portion of the Amargosa River studied is only a small segment of the total River system that extends from the upper basin area in Nevada to Death Valley, a distance of about 150 miles. The reach of the River investigated extends about 5 miles just south of Tecopa. The most recent record of published River discharge data is shown in Appendix A. This table shows that the average daily discharge at Tecopa is 2.21 cfs. Under certain climatic conditions and in some areas below the Palisades, water movement will be confined to underflow. A rough estimate of discharge was made at sample point 2 during the study and it was estimated at about 2.7 cfs. Willow Spring discharge (sample point 1) was judged to be about 0.27 cfs. Within this area water quality samples were obtained and analyzed. In addition, analysis of the water flowing into Willow Spring Reservoir and Creek, and an off stream impoundment south of Tecopa was conducted to better understand the influence of tributary flow to the River. The area of the River below the Palisades was not studied because surface flow rapidly diminishes below that point. In addition, numerous springs that flow into the River were not analyzed because of the limitation of time that was imposed.

Limiting factors in the study were that water quality was determined for only one point in time and historical data was not available. Also, bacteriological samples were too few and indicative of only the general pollution characteristics during a short span of time.

THE AMARGOSA RIVER FLOWS ABOVE GROUND ALL YEAR LONG WITHIN THE AMARGOSA CANYON. THE RIVER IS NOT UNIFORM ALONG ITS COURSE IN THE CANYON, BUT PRESENTS MANY FACETS OF INTEREST AND BEAUTY.

WATERFALLS ON AMARGOSA RIVER

M. BRENNER

Present development is confined to the China Ranch area where a number of mobile homes and some irrigated pasture were observed.

FINDINGS

1. Amargosa River water quality is inferior for domestic purposes because of high concentrations of flourides, sulfates, sodium, and chlorides. The springs along the River appear to be of suitable mineral quality for domestic purposes, except for the flow into Willow Spring Reservoir where an unacceptable level of ammonia was detected. A high ammonia level was also found in the off stream reservoir south of Tecopa (Point 3).

2. Contamination of the River and Willow Creek by animal or human waste was shown by limited bacteriological sampling. Coliform counts ranged from 700 to 24,000 MPN/100 ml. Spring or creek water should be treated for drinking purposes. River water should not be used.

3. Extremely high concentrations of salts in the River would preclude its use for irrigation. Willow Spring and other springs along the River are of acceptable quality for use in irrigation.

4. The salinity level of the River is maintained or improved by better quality flows from tributary springs.

5. The River, although poor quality, is a key environmental factor that supports a diverse community of plants and animals.

CONCLUSIONS

1. Biological population of the River environment is greatly dependent on the unimpeded flow of springs that are tributary to the River. Any spring diversion could seriously impair the water quality of the River downstream, and

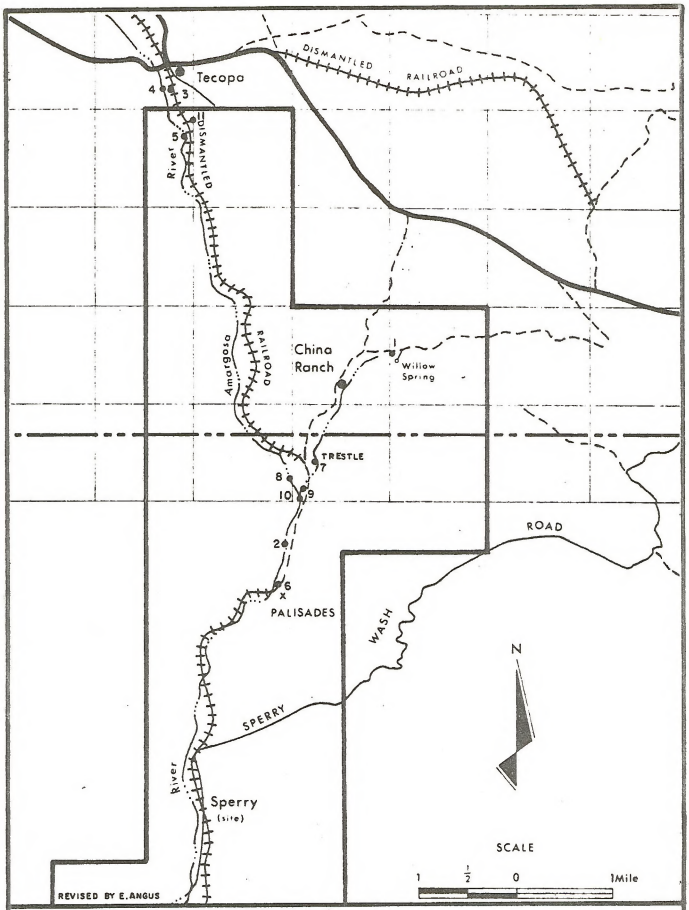


Figure 1—AREA OF STUDY AND LOCATION OF WATER QUALITY SAMPLING POINTS

increased salinity of the water might not be tolerated by certain species of wildlife.

2. The stream system provides a refuge for wildlife. The aquatics and riparian vegetation serve as a resting or nesting area for many forms of life. Pupfish and other forms of aquatic life can exist in this harsh environment by moving to spring-fed pools when surface flow diminishes. In addition, the temperature and salinity of the mainstream flow during the summer months may be too extreme to sustain appreciable life, but the springs maintain an aquatic population that will re-populate life when stream conditions improve.

3. If the state of the existing environment is to be maintained, it will be necessary to protect tributary springs from further development.

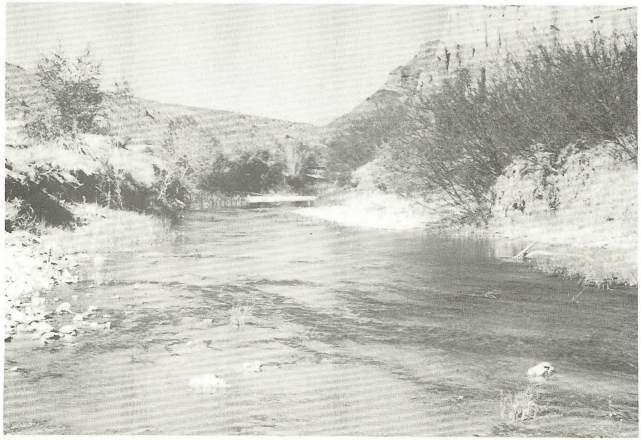
4. Use of Amargosa River water for domestic purposes is not recommended, but spring water with minimum treatment might be used with some degree of safety.

CONDUCT OF THE STUDY

The team of investigators drove or hiked to the sampling points and took all the necessary precautions required in obtaining water quality samples. Most analyses were made soon after sampling with the aid of a Hach DR colorimeter turbidity, nitrate nitrogen, poly and ortho phosphate), solubridge (salinity indicator), color comparator (pH), and through titration (dissolved oxygen). Bacteriological and ammonia samples could not be analyzed in the field; therefore, samples of water were collected on the final day of the study using standard methods. The bottles were kept under refrigeration until submitted for laboratory analysis. One sample of the River water was submitted for a more complete laboratory analysis to determine mineral constituents.

AMARGOSA RIVER J. POSTHUMUS

AMARGOSA RIVER J. POSTHUMUS



WATER QUALITY ANALYSIS

The results of the water quality analysis are shown in Table 1. Table 2 shows a more detailed laboratory analysis of sample site 2 along with comparative Colorado River water analysis. Appendix B has been included to relate the quality to limitations of use.

The most striking aspect of the River quality is shown in Figure 2.

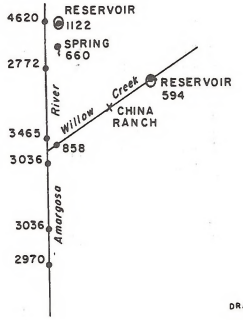


Figure 2- SCHEMATIC DIAGRAM OF TDS FINDINGS mg/L

This schematic shows the variation of total dissolved solids (TDS) on the mainstream, tributary springs, and Willow Creek. From brief inspection, it can be concluded that the salinity of the River is high, but it is kept from increasing by tributary spring flow.

Any spring diversion could seriously impair the water quality of the Amargosa downstream, and the increased salinity of the water might not be tolerated by a large segment of the biological community.

In most instances the samples exhibited a slight to strong musty odor which would indicate the presence of algae or decaying organic substances.

TABLE 1

WATER ANALYSIS AT SAMPLING POINTS
in the
AMARGOSA RIVER AREA SOUTH OF TECOPA
3/18-19/72

Sample Point	Color	Odor	Turbidity in Jackson Units	Total Dissolved Solids mg/L	pH	Nitrate Nitrogen mg/L	Dissolved Oxygen mg/L	Ortho-phosphate mg/L	Poly--Phosphate mg/L	Ammonia mg/L	Coliform MPN/100 ml	
											Dupl.	Test.
1	clear	very mild musty	0	594	8.0	1.0	7.5	0.02	0.23	1.19	-	-
2	Lt. Brown	slt. musty	20	3036	8.4	2.0	8.0	0.37	4.0	0	-	-
3	clear	strong musty	0	1122	8.1	1.0	9.9	0.80	0	1.02	700	700
4	lt. brown	strong musty	50	4620	8.4	2.0	8.4	1.15	1.3	0	2400	2400
5	cloudy	slt. musty	48	2772	8.4	3.0	-	1.30	0.2	0	-	-
6	lt. brown	slt. musty	10	2970	8.4	4.0	-	0.70	0	0	24000	7000
7	-	-	-	-	-	-	-	-	-	-	2400	700
8	-	-	-	3465	-	-	-	-	-	-	-	-
9	-	-	-	858	-	-	-	-	-	-	-	-
10	-	-	-	3036	-	-	-	-	-	-	-	-
11	-	-	-	660	-	-	-	-	-	-	-	-

mg/L = milligrams per liter
MPN = Most Probable Number

The pH of the River, springs, and impoundments was found to be relatively even, ranging from 8.0 to 8.4. These values may fluctuate during the year with changes in flow. The Agricultural Extension Laboratory analysis (Appendix C) indicated that Willow Spring pH was 7.7 in October of 1969 as compared to the 8.0 value recorded during this study. Although the water is alkaline, it does not have an abnormally high pH compared to other Southern California water sources.

Nitrate nitrogen, one of the pollution indicators, was found in only minor amounts.

Dissolved oxygen (DO) was at a high level in all analyses, ranging from 7.5 to 9.9 mg/L. The results would be consistant with above-average algae content observed in the field. The DO of the River water will probably fluctuate during the year as a result of changing temperature and salinity level. For the period of analysis, the DO level would be more than adequate to support aquatic life.

High levels of phosphates may promote excessive algae growth. The levels detected during this study were minor.

Ammonia generally results from the decomposition of nitrogenous organic matter and may, therefore, be used with other evidence to indicate pollution. It was interesting to note that high levels of ammonia were found at only two points; the reservoir south of Tecopa (Point 3), and at Willow Spring (Point 1). The flow into Willow Spring reservoir was found to contain 1.19 mg/L ammonia, while the reservoir south of Tecopa contained 1.02 mg/L. These two analyses would exceed the 0.10 mg/L maximum level recommended for prolonged use as a domestic water supply. Warm water fishes would probably not be affected, but increased levels of ammonia would be conducive to increased algae growth.

A more detailed analysis of water quality was determined from samples obtained below the confluence of Willow Creek and the River (Table 2). This data provides additional information that helps characterize the general quality limitations of the stream system. The high levels of sodium, chlorides, and sulfates are reflected in the analysis of total dissolved solids (TDS). Individually, they preclude the waters' use for extended domestic purposes. In addition, the level of sodium or the combined solids would place the quality in a class that would be injurious or unsatisfactory for agricultural purposes. The increase in TDS along Willow Creek could be attributed to concentration of salts through reservoir evaporation, possible inferior quality flows from other springs downstream, tail water from irrigation re-entering creek, ranch effluent entering creek, evaporation of creek water, and to salt pick-up along the watercourse. Further studies would be required to pinpoint the exact

TABLE 2

DETAILED WATER ANALYSIS OF
THE AMARGOSA RIVER AT SAMPLE POINT 2

	Sample Point 2 Mg/L	Softened Colorado River* Water (1970 Avg.) PPM
Total Hardness	317	152
Ca	43	36
Mg	51	15
Na	931	207
K	50	4
HCO_3	912	145
CO_3	52	1
SO_4	896	326
Cl	459	105
NO_3	1.0	1.0
F	4.72	0.5
TDS	2968	831
pH	8.7	8.4

* Analysis included for comparative purposes. Data from "The Metropolitan Water District of Southern California - Thirty-Second Annual Report, 1970". For practical purposes PPM= Mg/L

cause or causes for the degradation of Willow Creek water quality. Aquatics common to the River area have been naturally selected to survive under higher salinity conditions, or have the capability of moving to pockets of better quality water within their range of tolerance. The flouride concentration of 4.72 mg/L exceeds the maximum limit recommended by the California State Board of Public Health for domestic use. Wildlife and aquatic life may also be affected by the higher concentration of flourides.

The test for coliform bacteria is used as an indicator of fecal contamination by man and other animals. High coliform counts may be caused by non-fecal bacteria. Nevertheless, the area of highest coliform count is at a point which is frequently visited by man as evidenced by ORV tracks and strewn trash (Point 6). The results of this study are not conclusive because limited analysis were made and historical data was not available. More extensive sampling over a greater time span would be desirable, but not practical, considering the scope of the study and cost of laboratory analysis. The results do indicate, as shown in Figure 3, that comparatively high values of coliform bacteria are being introduced upstream. The high level of coliform bacteria found at the four sampling points would categorize the water as unsafe for human use, drinking or bathing, without disinfection. Information is limited on the effect of coliform bacteria on wildlife and aquatic life.

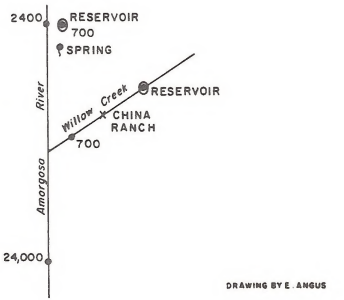
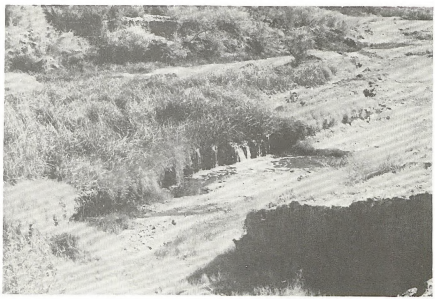
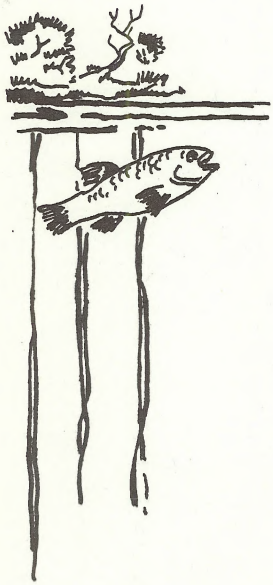


Figure 3-SCHEMATIC DIAGRAM OF COLIFORM FINDINGS
MPN/100ml

AMARGOSA RIVER
L. MOURI



AMARGOSA RIVER
B. ROMERO



THE PAST

PALEONTOLOGY

(The following report was submitted by Dr. David P. Whistler, Ph.D., Senior Curator, Vertebrate Paleontology, Natural History Museum, Los Angeles County, California.)

INTRODUCTION:

The following is a preliminary report on the vertebrate paleontological work done in the Tecopa Basin, Inyo County, California. Fossils were first reported from the basin in 1902. A small collection was made by amateurs in 1954 and turned over to the Natural History Museum of Los Angeles County. Only sporadic vertebrate paleontological work was done for the next 12 years. In the process of collecting for geochemical studies in the mid 1960's, some additional remains were found and reported on (Sheppard and Gude, 1968).

A new flurry of activity began in early spring, 1971 with the discovery of well preserved remains by another group of amateurs. The present work is a cooperative effort by three institutions, San Bernardino County Museum, University of California, Riverside and the Natural History Museum. Under regulations of the Antiquities Act, a permit was sought and received from the United States Department of the Interior to carry out paleontological investigations and excavations (Permit Number 71-CA-059 dated November 4, 1971).

Field work in the Fall of 1971 yielded fourteen new fossil localities concentrated in a two square mile area 2 1/2 miles northeast of Tecopa Hot Springs. Reconnaissance prospecting over much of the rest of the Tecopa Basin indicates that vertebrate fossil remains occur around the entire margin of the basin.

GEOLOGY

The geological setting is more than adequately described in Sheppard and Gude (1968) and Mason (1948). Summarizing, the deposits in the Tecopa Basin were formed during Middle Pleistocene in an elongate lake formed by impounding of the Amargosa River by a barrier of coarse alluvial deposits presently found in the China Ranch area. The lake deposits consist chiefly of soft mudstones and interbedded rholitic vitric tuffs. Good, natural, exposures of the deposits are found only along the washes dissecting marginal pediments. Most exposures bear a 3-18 inch thick, soft "popcorn" coating formed by slow

weathering of the monmorillonite rich mudstones.

A total of 12 volcanic tuffs ranging from 2 inches to 13 feet thick are recognizable in the exposed section. Using precise geochemical analyses, several of the Tecopa volcanic ashes have been correlated with the Bishop Ash bed (Izett, et al, 1970). The Bishop Ash is a well established Middle Pleistocene marker bed in western North America. It has been dated at 0.7 million years using radiometric techniques (Dalrymple, et al, 1965).

FOSSIL OCCURRENCE

The fossils occur in the basal 60 feet of exposed section in brown, tan and greenish-gray mudstones. Most of the fossil discoveries are found in the basal 10 feet. Many specimens are relatively well articulated. One fossil quarry occurrence has produced partially articulated remains of 17 different individuals of the same animal.

The fossil fauna from the basal 10 feet consists of:

3 different camels:	a.	?Titanotylopus
	b.	Tanupolama-like
	c.	a peculiar, short footed form
horse:	d.	Plesippus-like
mastodon:	e.	Mammut
rabbit:	f.	?Lepus
flamingo:	g.	?Phoenicopterus

Additional fossils from a single concentration possibly 50 feet higher in the section include:

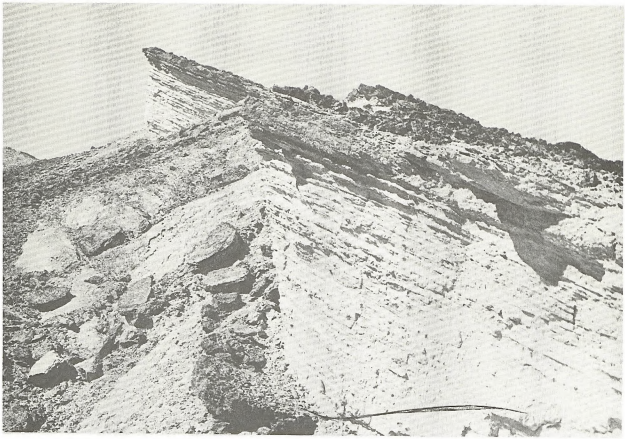
numerous rodents:	a.	?Neotoma
	b.	?Peromyscus
	c.	Spermophilus
	d.	Ondatra
small antelope	e.	? Tetrameryx
small carnivore	f.	mustellidae

The fossil occurrence represents the first well documented Middle Pleistocene record from the Mojave Desert. Tertiary and Late Pleistocene records were previously represented, but the Tecopa fossil deposit begins to fill the void of knowledge in between. At least one of the fossil forms (Camel - c) is an entirely new, previously unknown animal. The nearest probable ancestor for this peculiar camel lived in the Early Miocene some 20-25 million years ago.

FUTURE WORK

Considerable more work is needed to obtain more complete fossil records from the Tecopa Basin. This preliminary work has literally only scratched the surface. The Natural History Museum hopes to mount at least one collecting expedition per year to the area.

(See further statements by Dr. Whistler in Appendix: "Supporting Statements.")



ANCIENT LAKE BEDS M. BRENNER

INDIAN SLEEPING RINGS S. WELLS

ARCHAEOLOGY

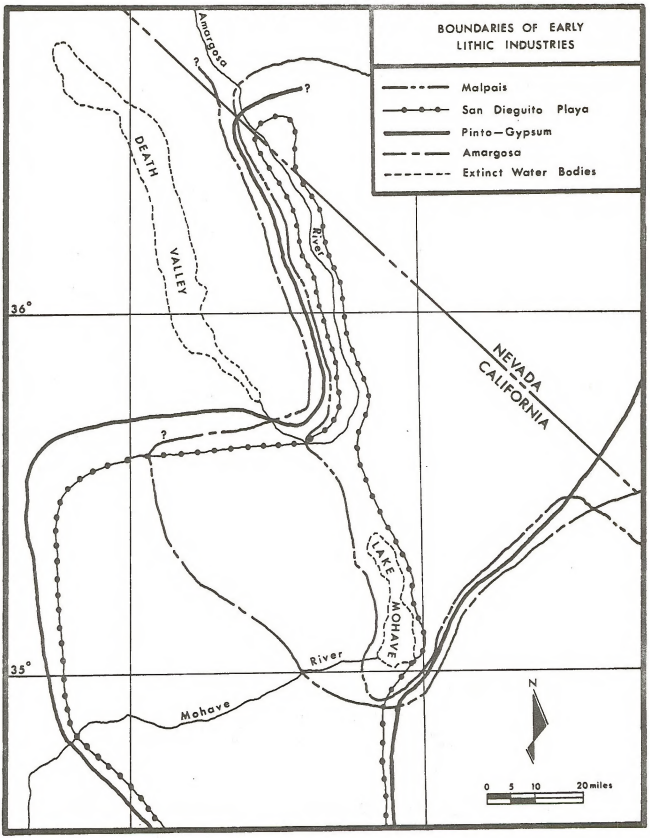
(The following report has been submitted by Dr. Sylvia Broadbent, Ph.D., Department of Anthropology, University of California, Riverside.)

The name "Amargosa" has long been familiar to archaeologists, associated with a projectile point type and a relatively ancient culture recognized by Malcolm Rogers, curator of the San Diego Museum and pioneer of California Desert archaeology. Recent visits to the Amargosa River and a survey of available information indicates that it is an area of extraordinary archaeological importance, with many traces of ancient cultures from the earliest times to the historic period, as might be expected from the present abundance of water in an otherwise extremely arid area, with a concommitant abundance of food resources for hunter/gatherer societies such as occupied the California Desert area. It has also become clear that it has been very far from adequately studied.

Although Rogers (1939) named the Amargosa Industry after the river, these were not the only cultural remains he found there. In fact, he mentions the area in connection with all 4 of the cultural complexes he recognized. The first, Malpais, was characterized by "sleeping circles" (shallow cleared circles in the desert pavement, sometimes rock-rimmed), giant gravel figures, and chopper tools; he definitely included the Amargosa River drainage in the distribution (1939:6), and sleeping circles are certainly abundant there. A "gravel alinement" figure specifically mentioned on the Amargosa River 4-1/2 mi. S. of Shoshone consists of 28 conical piles of gravel in 3 groups forming an alignment 489 feet long. Although this lies N. of the study area, on the March 18-19 study trip we found similar conical gravel piles N. of the junction of China Creek with the Amargosa in the heart of the area. Rogers thought that Malpais dated to 2000-1200 B.C.; recent thinking pushes the subsequent phase back to at least 6000 B.C., so that if Malpais is a valid entity, which is debatable, it would be earlier than that.

Rogers' discussion of his next phase, "San Dieguito-Playa Complex", is mostly concerned with "Lake Mohave", the Silver Lake-Soda Lake basin N. and S. of Baker, but he clearly included the Amargosa River Valley as an extension of this principal focus of the industry. He mentions (1939:38) "boulder-rimmed clearings" similar to Malpais sleeping circles but associated with Playa artifacts, on the west bank of the Amargosa River. Whether the Amargosa River circles are from the Playa phase or an earlier one, they are apparently quite old, since the stones within the circles

PORTION OF ROGERS MAP 1

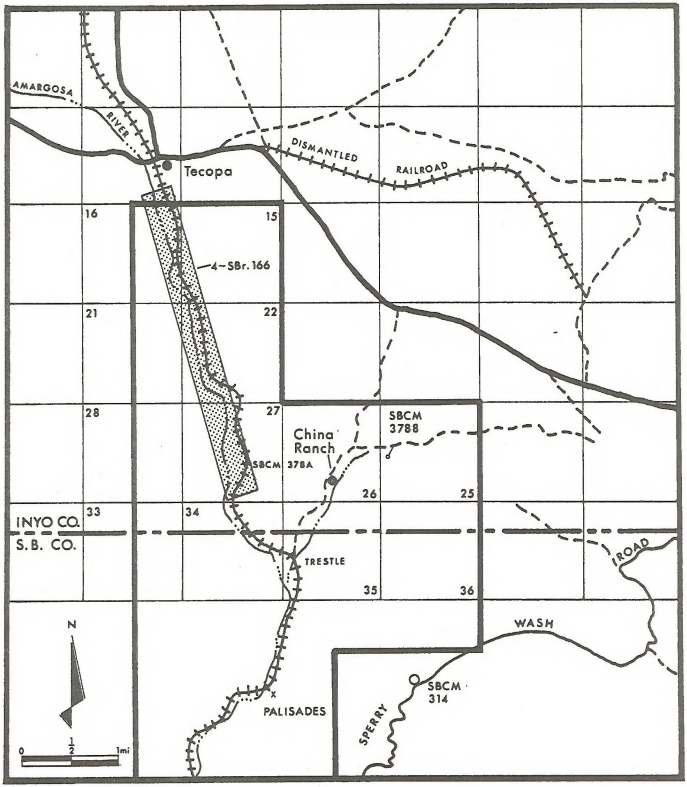


show desert varnish, as do some of the worked flakes associated with them, and there is no pottery or other late material around them. Rogers thought the Playa phase dated from 1200 to 800 B.C. Bettinger and Taylor (MS) have recently proposed a revision of the California Desert cultural sequence into C^{14} dated periods marked by projectile point types. In this system, Rogers' "Playa" corresponds to the Mohave period, with an end date of about 4000 B.C. and a somewhat uncertain beginning date, but at all events prior to 6000 B.C.

With respect to the "Pinto-Gypsum Complex" Rogers does not specifically mention the Amargosa River, but his important site on Salt Creek (1939:59-60) is on a southern tributary of the river. This site has not had the attention it deserves. Rogers reported Pinto and Gypsum points in situ in remnant of fossil sand dunes, and mentions a Pinto hearth site. To my knowledge it has not been restudied; it is not mentioned by Wormington (1957). If it is still present, it could settle the problem of the relative age of Pinto and Gypsum projectile point types, which are separated into 2 periods by Bettinger and Taylor, with Pinto characteristic of the Little Lake period prior to 1200 B.C. and Gypsum Cave one of the markers of the Newberry period, 1200 B.C. to 600 A.D. Moreover, a hearth might produce dateable charcoal. If these complexes were present on this tributary, they also probably occurred on the main stream.

The Amargosa Industry was the fourth of Rogers' early complexes, so named because it was most abundant in that drainage. He divided it into 2 phases, the first marked by triangular corner-notched projectile points and thought by Rogers to date from 200 to 700 A.D. The second had long, slender corner-notched dart points and also smaller points of similar shape, probably marking the introduction of the bow and arrow, and pottery. Rogers equated this phase with Southwestern Basketmaker III and dated it from 700 to 900 A.D. (Rogers 1939: 61-69). Thin triangular knife blades were common in both phases. The larger Amargosa points are now equated with the types Elko Eared and Elko Corner-notched, characteristic of the Newberry period, 1200 B.C. to 600 A.D., while the small Amargosa II points are identified with the Rose Springs type of the Haiwee period, 600-1300 A.D. Rogers had an apparent hiatus after Amargosa II, with the Shoshonean peoples coming in about 1400 A.D.; the new sequence has the Marana period, with the Desert Side-notched and Cottonwood Triangular point types long associated with the advent of the Shoshonean speakers, immediately after Newberry, running from 1300 A.D. to the historic period. The historic occupants of the area appear to have been the Chemehuevi or Southern Paiute, although their boundary with the Koso or Panamint is very uncertain. At all events, Kroeber (1923:595) lists "Yagats, at Amargosa" (sic) as a Chemehuevi division. The Chemehuevi belonged to the Ute-Chemehuevi branch of the Shoshonean linguistic family, while the Koso were

SITES RECORDED IN SBCM ARCHIVES



of the Shoshone-Comanche branch of the same family. Of course, it is not known what languages were spoken by the previous occupants of the area, nor what they called themselves.

Further research was done in the China Ranch area by members of the Pacific Coast Archaeological Society, an avocational group associated with the Bowers Museum in Santa Ana, in 1963; the then owners of the ranch, the Robinsons, were members of the PCAS and cooperated in the research (McKinney et al. 1971). A site survey was done by Eugene Shepard; 3 sites listed in the archives of the San Bernardino County Museum are probably the result of this. Site 4-SBr-166 runs for about 3 miles along the river from just S of Tecopa to the Southern limit of Sect. 27, about 1 mi. from the junction with China Creek; artifacts were found on the terraces, including fire stone, metates, mortars, points, pottery, bone awls, beads, drills, choppers, scrapers, hammers, a green slate pendant and a red soapstone pendant. Sites SBCM 378A and 378B, at China Ranch and Willow Spring respectively, appear to have produced similar material. Three sketch maps of the area in the PCAS report show different features and are hard to correlate with each other, but finds reported there include various house circles, chipping areas, and trails; a very deep bedrock mortar near the junction with China Creek; a quarry site; and surface finds of potsherds, scrapers, a green slate pendant, a long schist pestle, and horse teeth. Historic features noted include an inscription "JWB 1868", a house dated 1903, and a rock inscription on Sperry Wash reading "AQUI ANO 17O..." The last was reported to the San Bernardino County Museum by Arda Haenszel and recorded as SBCM 314. Its authenticity is suspect, as an early 18th century European presence in the area is not recorded and is highly unlikely; the nearest Spanish settlement at that date would probably be Santa Fe, New Mexico.

Neither the PCAS report nor the SBCM site records appear to cover all the features found on the March 18-19 study trip. These included a large complex of sleeping circles on the terrace closest to the junction of China Creek with the Amargosa River and 3 rock cairns on higher terraces; a quarry site (an outcrop of conglomerate containing chalcedony and chert) and several trails were included in the PCAS report. Near the quarry, two circles were found which were cut horizontally into the slope of the hill, a feature not previously recorded as far as I know. This constitutes important evidence for the genuinely artifactual nature of the circles, a matter about which some doubt has been expressed. South of the junction of the river and China Creek, the area has not been surveyed, but there are pavement-surfaced terraces in the area north of the Dumont Dunes which are likely to have the same kind of material as those in the northern part of the canyon. A find of fossil bison tooth in the silt deposits near the junction suggests that the "horse tooth" mentioned in the PCAS report might not be from historic animals, and that

there are excellent possibilities for vertebrate palaeontology, as elsewhere in the Tecopa beds.

The PCAS group conducted excavations in a small rock-shelter above Willow Spring. The material recovered included points, knives, scrapers, manos and a millingstone, pottery and a few perishable items (cane fragments, cordage, quids, a willow-twig splice, and a cache of seeds). Judging by the points, knives, and pottery, the material represents a mixture of Haiwee (Amargosa II) and Marana periods; unfortunately, no data is presented on stratigraphy or even the relative depth of finds. The pottery includes corrugated wares closely resembling Basketmaker-Pueblo types, but apparently made locally. The smooth wares found have been identified with Southwestern smooth wares associated with the corrugated types, but comparison with California wares such as Lower Colorado Buff and Owens Valley Brown wares ought to be considered. This appears to be the only site excavation done so far in the area. No dating by C^{14} or other methods has been done.

In summary, existing evidence indicates abundant archaeological material representing a long span of time, perhaps as much as 10,000 years or more. On Rogers' map, the clustering of cultural boundaries along the Amargosa is very striking and highly significant; it indicates that, at least in Rogers' opinion, a very authoritative one, the Amargosa Valley formed a boundary for all four of his early lithic cultures, and is one of the few areas where all 4 are present. It thus presents a unique opportunity to test the validity of Rogers' cultural sequence, which has been widely cited since it appeared but has not really been re-examined in the light of new field data; it might also be possible to determine absolute dates for the sequence by carbon dating or other means. The boundary position is theoretically very important, as it offers opportunities to establish relationships with other early cultures. Adequate protection for the archaeological resources of this area would be an invaluable aid in sorting out the prehistory of the entire Desert area. Many of the significant features are extremely susceptible to damage and destruction as usable evidence if large numbers of people are encouraged to enter the area, particularly in wheeled vehicles. Features such as sleeping circles, chipping stations, and trails are easily wiped out by off-road vehicles; some of the circles are little more than an area of different light reflectance from the surrounding pavement, and already it is difficult to tell in some cases whether a faint line on the pavement is an ancient trail or a dune-buggy track. While people do need places to play, it seems at least shortsighted and ill-advised to endanger irreplaceable, finite resources needed for serious scientific studies by exposing them to the more destructive recreational activities such as off-road vehicle riding. In fact, it would appear to constitute a serious violation of the Federal Antiquities Act and regulations implementing it (34 Stat. 225;

16 USC 432, 433), and also of BLM regulations (BLM Manual sects. 6231 and 9251; see esp. 6231.02, 6231.2, 9251.02, 9251.1, 9251.11), to permit unrestricted off-road vehicle riding in an area of such important archaeological resources without first conducting a thorough, professional archaeological study. Existing work does not constitute such a study. Rogers' reports were sketchy, tentative pioneer work, and he was notorious for publishing only his conclusions and not his actual field data. The PCAS report is a creditable effort for an amateur group but has deficiencies from a professional standpoint, such as the confusing presentation of site data on several maps and the lack of strategraphic information for the excavations. It did not cover the lower canyon, and did not report all sites even in the area studied. A far more comprehensive study is needed, and could easily produce results of signal importance to the interpretation of California Desert prehistory.

Preservation and protection of this key area for further study by future archaeologists is also important, since archaeological methods are constantly improving. If the next 30 years produce methodological advances on a scale with those since Rogers published, present standards will appear primitive and the present destruction of archaeological sites will probably be regarded as criminal. Archaeological study of areas such as this promises much more than intriguing snippets of antiquarian interest. It is the only way we can find out about past human ecological adaptations in this challenging area, and thereby gain more understanding of the behavior of that poorly-understood, not-rare-enough but endangered species, Homo sapiens.

SUMMARY OF FEDERAL & STATE LAWS AND POLICIES PERTAINING TO ARCHAEOLOGY

FEDERAL ANTIQUITIES ACT OF 1906 (34 STAT. 225)

Forbids disturbance of archaeological sites on federal lands without permit issued by the responsible agency.

HISTORIC SITES ACT OF 1935 (49 STAT. 666)

Declares that "it is a national policy to preserve for public use historic sites, buildings, and objects of national significance", gives the Secretary of the Interior broad powers to execute this policy. It should be noted that the potential of this Act has never been realized.

HISTORIC PRESERVATION ACT OF 1966 (PUBLIC LAW 89-665)

Establishes an extensive National Register of Historic (including archaeological) Sites and authorizes expenditure of funds for their acquisition and preservation.

ACT OF 1960 FOR PRESERVATION OF HISTORICAL AND ARCHAEOLOGICAL DATA AT DAM SITES

Requires the Secretary of the Interior to institute an archaeological salvage program in connection with federally funded reservoir construction; requires responsible agencies to cooperate in this program.

BUREAU OF LAND MANAGEMENT MANUAL, SECT. 6231 - MANAGEMENT OF ANTIQUITIES

Declares that BLM is "responsible for antiquities existing on lands under its jurisdiction", specifies that a "thorough, continuing inventory will be made" of such sites, and establishes policies for their protection.

BUREAU OF LAND MANAGEMENT MANUAL, SECT. 9251 - PRESERVATION OF ANTIQUITIES

Provides additions to the above.

BUREAU OF LAND MANAGEMENT MANUAL, SECTS. 3509, 3605, 11/9/70

Sects. 3509.7 and 3605.6 require that purchasers, permittees, and lessees provide for adequate archaeological surveys and salvage excavation when their activities will endanger archaeological sites.

EXECUTIVE ORDER OF MAY 13, 1971: "PROTECTION AND ENHANCEMENT OF THE CULTURAL ENVIRONMENT". RICHARD M. NIXON

Orders that "the Federal Government shall provide leadership in preserving, restoring and maintaining the historic and cultural environment"; specifies that all federal agencies shall institute inventories of their properties for historic and archaeological sites, and shall provide for their protection in concordance with P.L. 89-665.

CALIFORNIA PUBLIC RESOURCES CODE, SECTION 5097.5

Forbids unauthorized disturbance of archaeological sites on public land.

CALIFORNIA PENAL CODE, TITLE 14, PART 1, SECTION 622 1/2

Forbids destruction of archaeological sites by any person not the owner thereof.

SENATE CONCURRENT RESOLUTION NO. 43, May 8, 1963

Requests all state agencies to cooperate with programs of archaeological survey and salvage.

STATE: S.B. 215

Establishes a task force to design legislation for a comprehensive statewide archaeological program. Status: as of October 20, 1971 this bill has been signed into law by the Governor and has been implemented by the State Resources Agency.

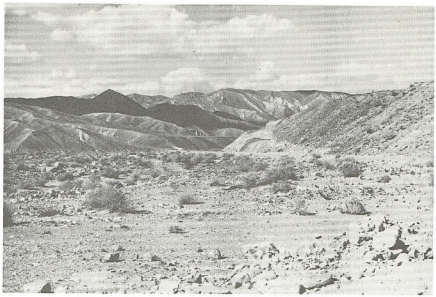
STATE: A.B. 1788

Establishes the California Archaeological Survey to coordinate archaeological research, salvage, and education in California. Modifies and tightens up requirements for archaeological protection and salvage in the Public Resources and Penal Codes. Appropriates $80,000 for operation of the Survey.

PENDING LEGISLATION

FEDERAL: S. 1245/HR 6257

Extends the provisions of the Act of 1960 for Preservation of Historical and Archaeological Data at Dam Sites to cover all forms of federally funded and permitted construction. Status: as of October 20, 1971 this bill has passed the Senate and is awaiting hearings in the House Interior and Insular Affairs Committee.



B. ROMERO

ROUTE OF THE OLD SPANISH TRAIL

J. POSTHUMUS

HISTORY

(This report was researched and submitted by Miriam A. Romero.)

EARLY EXPLORERS AND PIONEERS

In addition to its being unique for its paleontological and archaeological values, the Amargosa Canyon and Dumont Dunes area is rich in historical values. Early Spanish explorers, traders, horse thieves, Mormons and miners used the Old Spanish Trail which passed through the canyon. Later, this canyon was on the right-of-way of the Tonopah and Tidewater Railroad.

By 1773, there were five missions and two presidios in California. The Spanish had but a weak hold on California. Missionary efforts were fruitless and military stations were weak. There was desperate need for reinforcements of men, domestic animals and supplies. It is hard to understand how there could be such dire poverty in California, a land of such abundant resources. There was complete dependence on the importations of food and supplies from elsewhere. Supply ships were too small and the ocean voyage too hazardous to make shipments and travel safe and reliable. Land routes had to be discovered and utilized if the California outposts were to survive and become permanent.

There were two areas of settlement from which help could come if connecting land routes could be discovered. These were Sonora-Arizona and New Mexico. From Sonora-Arizona Father Francisco Garces, in 1771, pioneered a route over barren mountains and deserts.

New Mexico was looked upon as the more prosperous and dependable supply base for the California missions. If Spain could open and maintain a line of frontier posts between New Mexico and California, this would strengthen and consolidate their position all along the line, open new frontiers, and would also bring heathen peoples into the fold of the Catholic Church. Thus both national and ecclesiastical ends could be served by one bold venture. Such was the background for the inception of the Old Spanish Trail. Spain did achieve her goals with this Trail. This trail extended from Santa Fe, through Colorado, Utah, Nevada, and then through the Amargosa Canyon, past the Dumont Dunes, and thence along the Mojave River into Los Angeles.

OLD SPANISH TRAIL

Transportation and exchange of goods between New Mexico and California was begun by Antonio Armijo in 1829-30. From information gained from trappers and from journals of Jedediah Smith's journals of 1826-27, Armijo knew he could reach the Pacific from New Mexico. Fortunately, his diaries have been preserved and an account of his journey is available. This record is the earliest written record of explorers through the study area. He started out to find a route and on January 16-17, 1830, passed through the Amargosa Canyon and past the sand dunes with a party of 60 men. His journey from Taos, New Mexico, to San Gabriel took him three months. A trade route between New Mexico and California had been established.

The Californians were delighted to find that the New Mexican traders were willing to trade their handsome woolen goods, blankets and serapes for the horses and mules that were so abundant but little prized on the coast. The Wolfskill party traversed the Trail in 1830-31 and traded woolen goods for mules. The appearance in New Mexico of California mules caused a sensation because of the large size of the mules compared with the burros then in use in New Mexico. Out of this situation, regular commercial traffic sprang up over the Old Spanish Trail.

Pack train commerce, not wagon trains, was to be the distinctive feature of the Trail for the next two decades. The traders brought woolen fabrics from New Mexico and carried back mules, silks and Chinese goods. Not a single diary of the regular annual merchant caravans of 1831 to 1848 has been found, however. Data has to be pieced together from fragments of records in California and New Mexico. Many of the fragments are recorded in accounts of thefts of stock. The missions and presidios suffered great losses of horses and mules. Considerable detail about the activities of illegal horse theft operations exists in California archives. Large bands of horses and mules were driven north along the trail through the Amargosa Canyon and east to New Mexico.

Pegleg Smith, one of the most notorious and persistent of the horse raiders, is a name well-known in desert annals. He made a number of raids into California for horses. His name appears in Spanish documents around the year 1841 and is associated with "questionable characters, trappers, a motley gang of Frenchmen, Utes, Americans, Saquanosos and Sozones" who were taking horses from California and running them through the Amargosa Canyon and along the Old Spanish Trail. He also made considerable money selling fake maps of non-existent gold mines. Even today people are still looking for Pegleg Smith's gold mines in the deserts of California.

In 1842, the Workman-Rowland emigrant company drove 4,150 horses north along the Trail. This was the largest pack train to use the Old Spanish Trail. Mountain man, trapper, and trader Old Bill Williams passed through the Amargosa Canyon and is associated with the Old Spanish Trail.

John C. Fremont was headed along the Old Spanish Trail eastward to St. Louis in April, 1844. He caught up with a small group of packers, a party which originally consisted of three men, two women and a boy. They were horse traders. The Indians, Diggers as the traders called them, had driven off the stock, killed two men, and carried away the two women. Two of Fremont's employees, Kit Carson and Godey, gave chase. The afternoon of the next day they arrived back in camp, driving before them a band of horses. Two bloody scalps dangled from the end of Godey's gun. They had ridden 100 miles in pursuit and returned all in 30 hours. They had ridden swiftly along the Trail, around the Dumont Dunes, through the Amargosa Canyon, then around and down Rainbow Canyon which leads into present-day China Ranch, where they surprised the Indians at Willow Springs.

From his diary accounts, we know that Fremont continued north along the Old Spanish Trail, passing the large sand dunes at the southern end of the Amargosa Valley. After crossing the "barren district, where a heavy gale was blowing about loose sand" he "reached a creek of salt and bitter water." "It is called by the Spaniards AMARGOSA - the bitter water of the desert. Where we struck it, the stream bends; and we continued in a northerly course up the ravine of its valley, passing on the way a fork from the right." He continues, "Gradually ascending, the ravine opened into a green valley where at the foot of the mountain were springs of excellent water." Here he encamped among the "new acacia" - mesquites - "fragrantly sweet with yellow lacy blooms." Fremont's distances and descriptions at this point are a bit confused, so it is difficult to identify these springs positively. If he traveled the entire length of the Amargosa Canyon, the spring where he encamped was one that comes out of the mountain side about one and one-half miles south of the present Tecopa and which was later known as the "Pure Water of the Amargosa" (Mowry account). If he turned up the Willow Creek fork of the Amargosa, he camped at the spring and oasis later known as China Ranch -- named for Ah Fou, who developed a ranch there several decades later. The next morning he crossed a barren stretch of about seven miles and came to the beautiful oasis then known as the Archilette, later to be called Resting Springs.

While the main body of the Mormons was slowly pushing westward in 1846 under the leadership of Brigham Young, companies of infantry had been recruited from the Saints for service in the Mexican War. This Mormon Battalion made their way from New Mexico to California over the Old Spanish Trail following the route which was by now well-established and which led through the Amargosa Canyon and past the sand dunes. After the year of enlistment was over, the ex-soldiers returned to Utah and tried to convince Brigham Young to continue on to California,

but to no avail. However, the Mormons in Utah were faced with a problem of supporting themselves in a semi-arid desert region. The ex-soldiers suggested the Pacific Coast, with its abundant supplies of fruit, grain, horses and cattle, as a source of supply. A party was organized to go to California to bring back supplies. They left for California in November, 1847. Diaries and accounts record the details of at least three Mormon trade caravans from Utah to California and back, all of which took the route of the Old Spanish Trail through the Amargosa Canyon.

Until the '49-ers and Mormons came through the Amargosa Canyon, this part of the Old Spanish Trail had only been used by pack caravans. With the discovery of gold in 1849, the Trail began to be used by emigrant wagon trains.

News of the gold discovery at Sutter's mill in January, 1849 was carried to the world and a great rush for the gold in California began. The favored route was the Oregon Trail along the Platte, the Humboldt, and across the northern Nevada desert. However, after the tragedy of the Donner party, some '49-ers chose to follow the Old Spanish Trail to Los Angeles and then turn north to the gold fields.

Notes and diaries record the details of day-by-day trials and tribulations of the journeys. Most of the diaries describe the journey through the Amargosa Canyon. The following excerpts from various diaries are of interest.

The Jefferson Hunt Wagon Train: November 30, 1849.

"Traveled 7 miles and come to Salaratus Creek (Ed. note: Amargosa River) before descending into the bed of it we could see off to the right a large flat part of it was covered with grass and a part of it was white as snow with Salaratus, that was the head of the creek the bed of which is some 300 feet below the deserts around it and some 50 rods wide, we had to descend into it on a short and crooked ridge which was a divide between two rivers that discharged water into it in wet weather. The lower end was steep and it was with much difficulty we descended without upsetting our wagons. We traveled down the stream about five miles and camped on a fresh water stream that come into it. This stream (Ed. Note: Amargosa River) is a grand curiosity, there is quite a stream about knee deep and so strongly impregnated with alkali that it is about the color of madeir wine and is said to kill cattle when they drink it, in many places grass is plenty and good, the banks or walls on each side appear to be composition of clay lime and salaratus and in many places presents the appearance of dilapidated walls of ancient castles and other works of art and among these lives an abundance of conies and in the brush a plenty of quails."

Another account from the same wagon train: "... across the deserts from day to day until we reached a stream of water about 3 rods wide. It was so strong with alkali that we dared not allow our cattle to drink of it, but put the lash to them so that they could not get a sup as we crossed it twice."

Flake-Rich Company diary: Thursday, November 29, 1849.

"Clear at noon, we left the waggons and went about 7 miles and encampted on Saleratus Creek at a spring. (Ed. note: this is the spring that comes out of the hill on the east side of Amargosa Canyon about 2 miles below Tecopa). good grass. today as we passed along, we could see the Saleratus white like snow about 1 or 2 m. distant. along here is the meanest looking country I ever see, fit for nothing but hobgoblins to live at. the water of this creek looked like strong lie. we had to watch our animals very carefully to keep them from drinking it. I stand guard."

Flake-Rich Company diary: Thursday, November 29, 1849:

"We left the waggons, traveled 7 miles and camped on the Magosh or Saleratus Creek at a spring on the left."

Howard Egan Wagon Train Account. Thursday, December 27, 1849:

"pleasant weather we found an ox here with an arrow stuck in his side. saw fresh Indian tracks. one of the gaurd seen an Indian in the brush just before daylight and fired at him. we started at 3 o'clo this afernoon and cam 10 miles. part of the road sandy and part of it over a low wet bottom. crossed a small stream (Ed. note: Amargosa River) several times. watter not good. at 1/2 past 7 o'c camped at a spring. feed and watter good. wood plenty."

Babcock's Recollections: December 1, 1849:

"snow 18 inches in depth. small patch of grass and was snowed in-no fuel- 10 days ration left - source of supplies 21 days travel -- turned over teams to those with wives and children -- had we all remained would have had to kill cattle and could not have carried children on our backs -- 17 of us to pack things to IA - 300 miles -- left camp Dec. 1 '49 each pack weighing 35-40#. at mid-day and traveled thro snow over knee deep till 3 a.m. tried to rest but too cold at daybreak started to keep from freezing and after 4 mi came to sunny ravine where sun shone on us. at 2 p.m. traveled on to Alkali Creek (Ed. note: Amargosa River) and camped in cane grass to avoid high winds. Found creek next morning free of mush ice. soon found it necessary to travel in stream - average 16 inches deep for 10 miles."

Hamelin's Journal: Saturday, January 5, 1850:

"Rained hard all night and this morning arrising from our blankets we somewhat resembled a lot of sponge you have seen being cut for a sign in front of an apothecary's door. Had a Mo. boatman been here he would have called out 8 inches cargo. Progressed down Bitter Water Creek (Ed. Note: Amargosa River) a stream flowing from a spring of that name. We crossed this a number of times and the rain of last night having somewhat swollen it. Of course the feet were frequently immersed. The scenery today was in some respects different from any we have yet noticed -- wild and majestic in the superlative degree."

T & T TRESTLE OVER WILLOW CREEK

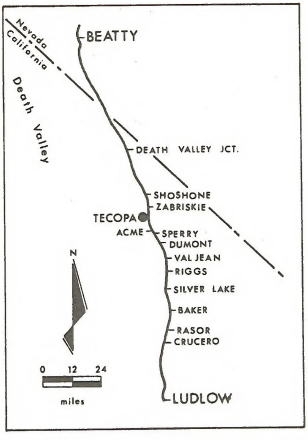
M. ROMERO

TONOPAH AND TIDEWATER RAILROAD

It was borax, rather than gold, which attracted settlers to Death Valley. William T. Coleman of San Francisco was the first to develop the deposit of borax. His 20-mule teams became famous for hauling the deposits across the desert to Mojave. In 1888 his properties passed into the hands of Francis Marion Smith. By 1904 Smith owned almost all the shares of stock in the Tonopah and Tidewater Railroad Company, a New Jersey based corporation. He envisioned this as a railroad which would serve his Lila C mine, a borax mine in Death Valley. The railroad was supposed to eventually run from Tonopah, Nevada, to the tidewaters in San Diego, California. After some political maneuvering and several changes of plans, a route was finally decided upon which would start at Ludlow, California. A tent city for construction workers was set up at Ludlow. Smith had 167 miles to construct. Developments were increasing in the Tonopah-Goldfield gold mines and Smith decided to build his railroad to service the gold mines along the Amargosa River as far as Tonopah and build a branch line to the Lila C to service that mine.

On November 19, 1905, first rails were laid in Ludlow. For the next 50 miles the tracks were laid on the flat floor of Broadwell Lake which is usually dry. Then the line pushed northward from Crucero to Soda Lake, Rasor and Silver Lake. At that time Silver Lake was an active community. One store alone did $150,000 business annually. Silver Lake was crossed on March 1906 by laying the tracks on the dry lake bed. By April the rails were continuing north across the desert plain. Surveying crews were already in Ash Meadows, Nevada. Actual surveying stopped at Goldfield.

The first 75 miles to a point just beyond Dumont were completed and ready by May, 1906. Then great difficulties were encountered. For the next 12 miles to Tecopa the railroad had to descend from the plateau into the Amargosa River Canyon and traverse its length against the sidewalls of the gorge. Involved in the construction were large cuts and fills, while 3 major trestles of up to 500 feet in length were necessary to cross and recross the river at strategic points. One contractor went bankrupt. Litigation followed. The torrid summer heat of the Death Valley area and the unwillingness or inability of the crew to cope with such abnormal working conditions slowed construction. Contemporary reports were terrifying to railroad construction workers. Reports that many "were dying in Death Valley" made the men hesitant to sign on the construction crew. In June, 1906, an abortive attempt was made to sign on Japanese workers. A total of 100 signed on. But of the 100 men only 17 or 18 were reported at work on one hot day and of that number only 8 were handling picks or shovels. The other 9 were spraying the 8



T & T RAILROAD ROUTE

with water, using that precise, skilled, but not too sanitary method used by old-time Chinese laundrymen on clothes ironing - a mouthful of water and a well-aimed "whoosh" sprinkled each coolie as fast as a human mouth could spray. When the 4th of July rolled around, the bedrolls suddenly shrunk as each coolie drank his saki. The heat was too much and a tolerant boss sent them all back to Los Angeles on the next train.

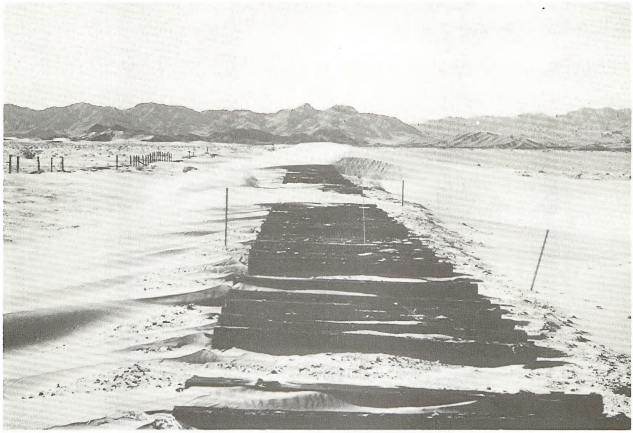
However, work continued. In July, 1906, "The Goldfield News" reported, "he", (Smith) could not get his men to work at this time of the year because of the unsufferable heat. Men died like flies, and the rest fled from the death pit."

At that time, an attempt was made to bring in Mexican laborers from Los Angeles. The Mexicans developed a rotation system, 15 days on the job and 15 days back in Los Angeles for siesta, then back on the job again. Daily arrivals and departures were too much for crew chiefs and the situation became impossible. Smith asked for outside bids at $30,000 a mile to finish construction through the canyon. The men refused to work in the summer heat and the project bogged down till cooler weather.

Construction moved along rapidly with cooler weather in the early part of 1907. Passengers began to arrive at Silver Lake. By February 10, 1907, trains operated from Ludlow to Sperry station in the Amargosa Canyon. By May, one year after the beginning of the 12 mile section of the canyon, trains were operating all the way to Tecopa. An almost impossible task had been completed. By August 16, 1907, the railroad had been pushed to Death Valley Junction. By this time, 700 men were working on the railroad. The last spike was driven at Gold Center at 3:00 P.M. Wednesday, October 30, 1907. There was no celebration. The panic of 1907 was in full force. Banks were closed and the country was depressed.

On November 25, 1907, merchandise and passenger cars were routed to Los Angeles over the T & T - A T & S F. Passengers went from Salt Lake City to Beatty, then on the T & T to Ludlow where they changed to the AT&SF. Fares from Beatty to Los Angeles were $16.25 and a round trip ticket was $26.00. The Los Angeles City Chamber of Commerce sponsored an excursion to Rhyolite in April, 1908. Angelenos were not impressed with the mining interests, but were impressed with the low price of beer. In summer 1908, Rhyolite residents took the train to San Pedro to see the U.S. fleet. Most never returned to Rhyolite.

From 1908-1914 the line was relatively active. Thousands of tons of borax ore were handled. Besides the desert heat, the problem of water -- either too much or too little -- had to be handled. It was difficult to find water of good quality in sufficient quantity for the insatiable boilers. During rainy



THE TONOPAH AND TIDEWATER, DUMONT DUNES, 1966 — A. MAC DONALD

1903 SALOON RUINS, CHINA RANCH — J. HORN

seasons, water raced down the gullies and canyons and wiped out track.

South of Tecopa along the Amargosa River Canyon, one of those rare miracles of nature in the desert appears -- a spring of free flowing water. The T & T railroad men soon discovered it and facilities for taking in emergency supplies of water were set up. The moisture in the bank of the soil made the ground unstable. A landslide occurred at Red Cut. The dirt had to be removed by hand.

In 1915 a spur line was constructed from Morrison (Acme) siding eastward up the north side of Willow Creek for 1.3 miles. The tracks ran past China Ranch and through the picturesque canyon to a gypsum deposit at Acme.

Care and feeding of passengers presented problems. An eatery was established in Shoshone by "Dad" Fairbanks. In 1919, he retired and turned the operation over to his daughter and son-in-law, Mr. and Mrs. Charles Brown. (Their daughter, Bernice Sorrells of Shoshone and their son, Charles Brown of Baker, are present owners of China Ranch.) Shoshone station prospered and a settlement was established which became an important supply center. Charles Brown became more influential in government and for years was the representative in the California Senate from Inyo, Mono and Alpine Counties.

In 1927-28 events happened which marked the beginning of the end of the T & T. The borax mines in Death Valley were becoming exhausted. Borate deposits were discovered at Boron. Traffic during the '30's was sparse. Operating expenses mounted and revenue decreased. On June 14, 1940 all operations of the T & T ceased. World War II was in progress and the War Department requisitioned the rails. By July 25, 1943, the job was completed. All rails were removed from the roadbed. Two of the locomotives went to the Kaiser Steel Plant in Fontana and one to the San Bernardino Air Base. The ties were scattered all over; a part of them were used in the Apple Valley Inn at Apple Valley; some in the building of the El Rancho Motel in Barstow. Some of the ties are still scattered along the right-of-way. They are rapidly being depleted for firewood by campers and hikers in the canyon and Dumont Dunes area. Several still are on the right-of-way through the Amargosa Canyon providing historical aesthetic value for those who have a sense of history and enjoyment in observing historical artifacts. Unless the study area is declared an historical area as well as a natural area, these few reminders of the old T & T will soon disappear through thoughtless use. One trestle is still standing; this is where Willow Creek flows into the Amargosa Canyon. It is not in a safe condition for motorized vehicles, yet is used by them to cross over Willow Creek.

Some of the employees still live in the area of Tecopa and Shoshone. They, and all who rode on the old T & T, remember the railroad with nostalgia and fondness. This old roadbed is enjoyed by railroad buffs who like to walk the right-of-way and hear the echoes of long-dimmed train whistles.

THE PRESENT

ECOLOGY

It is important to perceive that the desert is one ecosystem composed of micro-ecosystems each one having an effect on the other and, thus, in some way an effect on the whole. For a frame of reference it could be said that the desert is a circle composed of overlapping concentric circles; the smaller ecosystems overlap one another and there is continuity throughout the entire desert ecosystem.

This desert ecosystem is very fragile. Although the flora and fauna which comprise the ecosystem are adapted to survive in a harsh environment it is these very same highly specialized adaptations which make the desert so fragile and so vulnerable to misuse. Species occupy niches which frequently are very limited and highly specialized. Displacement of the species or loss of habitat might well mean extinction for species which have become so adapted to their environment that they would not be able to survive in another area, even though the environment appears to be the same.

This is particularly true when the environments have been isolated by geographical factors over a long period of time, causing evolutionary changes and speciation to take place. It is in these isolated areas, or ecological islands as they are called, where we often find rare and endemic species.

From the scientific evidence presented in this report, it is safe to say that the Amargosa Canyon from Tecopa to the Dumont Dunes is an ecological island. Because of the year-round supply of good water, this area is an "oasis in the desert" or a "wet island in the desert." It is isolated by geographic and climatic factors. The entire area around the canyon is dry and has a limited amount and varieties of flora. The barren, waterless, hills surrounding the area (see aerial photo) cut this area off ecologically from the surrounding desert areas. The points of overlap are at either end of the canyon at Tecopa and the dunes.

Because of this isolation, speciation has been taking place and, even in our preliminary survey of the area, new, undescribed species of fauna have been discovered. Presence of rare and endemic species has also been documented. This would indicate that this area is very unique and provides an opportunity for valuable, meaningful ecological research.

In addition to the uniqueness of the area because of its isolation and the fact that speciation is taking place, the year-round supply of water offers a refuge for many species of fauna.

This factor is of prime importance to all forms of desert wildlife. It is possible for fauna from surrounding ecosystems, such as the dunes, to come to the canyon for food and water. It cannot be stressed strongly enough that this refuge is particularly important to the fauna in periods of drought. As the drier, more barren surrounding ecosystems provide less and less food and water for fauna in periods of drought, the fauna can come into the canyon and thus survive these periods of drought. The canyon is a reservoir of life. Without continued existence of the total ecosystem in the canyon and the several co-existing micro-ecosystems, many animals and birds would perish in dry years. It is imperative that nothing be allowed to happen to the delicate balances of nature in the canyon, particularly to the water supply. The springs provide fresh water for those species needing good water. The spring flow helps maintain an acceptable level of salinity in the river for other species. Nothing must be permitted to happen which would affect the water flow and quality in the springs, the creek and the river.

It must also be stressed that this area is not the same as Death Valley. The ecology of the canyon is completely different from Death Valley because of the presence of a year-round supply of good water.

From analyzing the fauna data in this report, the area contains a variety of species. Analysis of bird census lists indicate this is a migration flyway for birds and the canyon oasis provides a major resting area. Of importance is the presence of raptors.

Species on all levels of the food chain are present, including raptors and predators. This kind of ecological situation is rapidly on the decline because of severe loss of raptors and predators on public lands. This area is, in fact, a wildlife refuge. It is relatively undisturbed and all species can live and interreact without disturbance.

A summary of the ecology of the dunes follows these two statements submitted by desert ecologists on the study team.

The following statements submitted by Dr. Robert M. Chew, Ph.D., University of Southern California, regarding the ecology of the canyon are important.

DR. ROBERT M. CHEW, Ph.D.

Amargosa Canyon: An excellent opportunity for preservation of a natural area of great scientific merit.

The Amargosa Canyon, south and west of China Ranch is an area of great natural beauty. Its ecological nature is even more unique, and until careful and close control of any recreational use can be insured, preservation of the area as a natural unit should take precedence.

The canyon area is very special, in ecological ways, for the following reasons:

(a) The canyon and adjacent broader valley is is the interface of four biological situations: the barren (of vegetation) eroding hills of marine sediments, the arid desert of creosote bush and salt bush, the salt-desert meadow, and the relatively fresh running water of the river and its pools. This is an unusual combination.

(b) The physical structure of the Amargosa River in this area provides a variety of situations: water just under the surface in the meadows, narrow streams where this is drawn together at the surface, pools of different areas and depths and vegetation, several small waterfalls.

(c) The running water is relatively fresh, but where the water evaporates it creates a highly saline situation. There is then a variety of salinity situations.

(d) In the small side canyons the tree canopy of the canyons (15-20' high) is on the same level as the shrub canopy of the desert adjacent to the canyons.

These special characteristics provide the opportunity for unique ecological studies:

(1) There is the opportunity to study the ecology -- the total interactions of life and physical environment -- in a meadow of salt-grass and sedge. To my knowledge this sort of study has not yet been done in the inland

valley. This could be checked out in the reference: Chapman, Valentine J. (1960) Salt Marshes and Salt Deserts of the World. Interscience Publishers. 392 p.

(2) The physical conformation of the Amargosa River in this area makes it suitable for detailed studies of the interaction of terrestrial and aquatic habitats. There are several points at which simple wiers could be built to monitor the flow and the quality of the water above and below study sites. For example, the stream could be monitored above an area of meadow, and then again below the meadow. The change is then a summary of all the changes effected in the meadow. With careful and detailed work the total changes within this section of watershed could then be analyzed into its important components, e.g. input of organic matter by cattle, water quality changes due to transpiration by the meadow plants.

It is by the use of such special experimental areas that some of the major advances in ecology have occurred in the last several decades. For example, the study by H.T. Odum of Silver Springs, Florida, which is much of the basis for our understanding of aquatic ecosystems: (H.T. Odum. 1957. Trophic structure and productivity of Silver Springs, Florida. Ecological Monographs 27:55-112) and experimental studies of forest watersheds, such as those in the Hubbard Brook Experimental Forest: (Liken, G.E. et al. 1969. Nitrification: Importance to nutrient losses from a cutover forested ecosystem. Science, 163:1205-1206).

(3) The horizontal intergrading of the arid desert canopy with the canopy of trees in the small canyons is an unusual opportunity for the study of interactions of different faunas along an abrupt boundary and with an unusual equality of height: i.e. 15-20 foot high tree tops on the same level with and immediately adjacent to desert shrubs.

(4) The four way interactions of arid desert, salt desert, soil barren of plants, and aquatic habitats offer a broad scope for the study of adaptations, interactions and intergradations of living systems at all levels from individual species to whole communities of organisms.

(5) The various situations of running water offer an opportunity for the study of the biology of pup fishes, a very special and unique animal, and other aquatic life. Some of the situations are probably too extreme for a particular species in one way, some too extreme in another, and others tolerable to optimum. It is the examination of the extremities of existence that often gives the understanding of the ecology of a species or a community.

The actions that are necessary to maintain the scientific merits of the area are quite obvious, and relatively easy at this point.

(a) Vehicular traffic on the meadows needs to be stopped. The changes wrought by wheel tracks on meadows are well documented in forest meadows as at Yosemite, and probably also at Death Valley. There seems to be little such damage thus far, but there is some, and the lure to drive across the valley and up the opposite hills has been irresistible to some people. Since the canyon area is presently relatively inaccessible, with a little effort access could be barred up the narrow canyon and across private property, except by permit from the BLM or some other administrative unit.

(b) The physical structure of the river's narrow channels and falls must not be played with, as therein lies much of its utility for scientific study. Any scientific study that places artificial measuring wiers across the stream flow will have to be done very carefully and in a reversible manner.

(c) Further breakdown of the walls of the canyon and of the hills by vehicular traffic (or maybe even foot traffic) could increase to a detrimental point, with regard to the quality

of the stream flow.

(d) The impact of cattle on the meadows and water needs to be assessed, and the grazing policy may need to be modified.

SUBMITTED 4/11/72 (Signed "Robert M. Chew")
Robert M. Chew
Professor of Biology
University of Southern California
Los Angeles, California

The following statement on the ecology of the study area was also submitted.

AMARGOSA RIVER REPORT
(March 18-19, 1972)

Frank C. Vasek, Professor Botany, University of California, Riverside

Wilbur W. Mayhew, Professor of Zoology, University of California, Riverside

Lloyd P. Tevis, Resident Biologist, Boyde Deep Canyon Desert Research Center, University of California, Riverside

The Amargosa River area near Tecopa is in one of the most arid regions in North America. Weather records for the region indicate that air temperatures have ranged from -7°C (20°F) to 52°C (125°F). The average annual rainfall is less than 2 inches per year (McKinney, 1971). Nevertheless, water is relatively abundant, and permanent, in this location (Amargosa River, China Creek, Willow Spring, etc.). The presence of permanent surface water occurs in very few places in the California deserts in addition to the Amargosa River drainage (ie., San Felipe Creek, Mojave River). To-date, none of these unique locations has been preserved.

The flora and fauna in the Amargosa River drainage is much more diverse and abundant than in the surrounding area, due to the presence of permanent water. This is important to

some species at all times. However, it is vitally important to many other species (both plants and naimals) during periods of excessive drought. The numbers of individuals of these species, and the areas the species occupy, become considerably reduced under such adverse conditions. The areas with permanent water then supply adequate habitat for a few individuals of such species. These individuals serve as a reservoir for the species in question, thereby preventing extinction of the entire population. These individuals later serve as the nucleus for an enlarged population when more favorable environmental conditions return to the region.

Habitats as fragile as the one in question are easily damaged by overuse. Also, recovery from such damage is extremely slow under desert conditions, even when total protection is provided after the damage occurs. For example, there is still visible evidence of the activities, in the early 1940's of General Patton's tanks in the California deserts, even in locations that have been essentially undisturbed since then. Excessive overuse of an area by humans can completely destroy it as a viable ecosystem, even though the destruction is unintentional. The values inherent in this portion of the Amargosa River drainage could be totally destroyed by relatively little human activity. Intensive off-road vehicle (ORV) use of the area is one such human activity that could do irreparable harm to this location. Consequently, we feel that no road of any kind should be established along the old Tonapah and Tidewater Railroad right of way. Construction of such a road would require draining some of the wet areas on which fish, crayfish, amphibians, aquatic insects and plants depend.

At this date, it may prove difficult, if not impossible, to save the entire region from ORV use. Therefore, we propose a compromise. We recommend that ORV use continue to be permitted on the Dumont Dunes, but that the Amargosa River gorge be placed off-limits to ORV's. Our survey of the Dumont Dunes on Sunday (March 19th) indicated that these dunes contain few plants, and thus few animals. The nature and location of these dunes is such that they are relatively sterile biologically (compared to the Kelso Dunes, and particularly to the Algodones Dunes Imperial Sand Hills). Driving dune buggies over the bare sand causes little permanent damage to the dunes, whereas ORV use in the Amargosa River drainage could soon destroy its value. There is an adequate road from Highway 127 to the Dumont Dunes already, so that access through the Amargosa River gorge is not necessary for the utilization of these dunes. Thus, the ORV users cannot feel they have been totally eliminated from the region. We may be able to save the most important area of that region from ORV use by our willingness to compromise.

There might be some objections (from BLM) to preserving a desert area so close to the rather large Death Valley National Monument. However, we feel it should be strongly emphasized that similar conditions do not exist in Death Valley National Monument, despite its size.

(End of Vasek, Tevis, Mayhew Report.)

ECOLOGY OF THE DUMONT DUNES:

No studies have been made of the ecology of the Dumont Dune System. The area is not stabilized by vegetation. However, there is some vegetation. There are abundant flowers in a wet year. There is the presence of reptiles, especially Uma, the importance of which is discussed in the Herpetology Report in this study. Mammals inhabit the area.

Although it would appear that the dunes are not as biologically rich as other dune systems, it must be emphasized that ecological studies and species surveys have not been conducted. Thus, it is not possible to make definitive statements on the ecology of the dunes.

Ecologists will not be able to conduct ecological survey of the dunes if present ORV use continues. Valid decisions for future ORV use must be based on all values of a study area. This includes biotic, abiotic and cultural values.

BOTANY

(The species list in this report was submitted by Dr. Philip C. Baker, Ph.D., Biology Department, California State College, California; Dr. Frank C. Vasek, Ph.D., Department of Botany, University of California, Riverside; Dr. Lloyd P. Tevis, Ph.D., Biologist, Boyd Deep Canyon Desert Research Center, University of California, Riverside; Dr. Wilbur W. Mayhew, Ph.D., Department of Zoology, University of California, Riverside; Eileen McKinney, Pacific Coast Archaeological Society, Costa Mesa, California; Prof. Angus MacDonald, Valley College, Van Nuys.)

Preliminary botanical surveys were made on March 18-19, 1972. This season on the desert, 1971-72, has been exceptionally dry as has been the last four years. Thus, there were few, if any, flowering plants. Because of the size of the area involved, it was not possible to do surveys in all parts of the canyon or dunes. In correspondence with Dr. Phillip Munz, he indicated he had never botanized the area, although he had done some botanizing near Tecopa.

The botanical data in the study area is incomplete. It was not possible on the preliminary survey trip to do the kind of study necessary to find rare and endemic or endangered species. This should be done as soon as possible; however, until we have a wet year, this will be difficult to do. It is important that the area be undisturbed so these studies may be carried out. These are long-range studies and would require several years.

The plateau between the Amargosa River and the large Dumont Dune Field, as late as 1967, was covered with coreopsis and desert lilies in the spring. There has not been a good flowering year since that year in that area. Prof. Angus Mac Donald, Valley College, Van Nuys, has slides which document the carpet of wildflowers all around the dunes areas, including the highly vulnerable desert lily. Since that time, the area has been torn up by dune buggies and motorcycles. Whether the fragile desert lily has survived this type of use so destructive to wildflowers remains to be seen when the next wet year occurs.

If this area is removed from ORV use, perhaps the coreopsis can make a come-back; the desert lily is very fragile

DESERT LILY

A. MAC DONALD

and vulnerable. The come-back would take much longer.

It is not wise to indicate that this area is barren of plant life if the survey is taken either during non-growing months, or during years of drought. It would seem prudent to survey this area carefully before opening it to ORV use. Also, it would seem prudent to coordinate surveys with any research scientists working in an area. In the case of the dunes, it is a geologist who has such fine documentation of the wildflower situation in the dunes during wet years.

(The following statement is a contribution to this report submitted by Dr. Phillip C. Baker, Ph.D. Dr. Baker also contributed to the species list.)

The significant statements concerning justification of this Amargosa River Canyon as a Natural Preserve have been made with reference to or in the context of discussions of other disciplines which are included in this whole report. There are a few items which, as a botanist, I wish to point out again. The area of our concern is a rather unique OASIS IN THE DESERT, or a WET ISLAND IN THE DESERT, which serves as that reserve for much of the biological life, and is simply dramatically different from the surrounding terrain. Such a unique situation seems to be worthy of some protection, simply for its uniqueness as an ecological area. On the basis of our botanical observations (conducted during one weekend in March, 1972) during a severely dry year there is scarcely any data that would indicate rare and endemic species. These could only be found with regular and careful study of the area, in its undisturbed nature, not after it is disturbed by additional human use. A sufficient study of this area should take at least several years so that various seasons and various yearly climatic conditions can produce their respective floras. At present the flora looks rather indicative of the north eastern Mojave desert.

The following list of vascular plant species found in preliminary surveys was submitted by Baker, Vasek, Tevis, Mayhew, McKinney, and MacDonald.

LIST OF VASCULAR PLANT SPECIES IN THE STUDY AREA	Dumont Dunes	China Ranch	Amargosa River Near Willow Creek: Rocky Slopes	Dry Flats	River-Bottom	Springs	Am. River & Springs 1 mi. So. of Tecopa: Rocky Slopes	Alkaline Flats
Abronia villosa - sand verbena	x	x						
Acacia Gregii Gray - catclaw		x						
Allenrolfea occidentalis - pickleweed		x						
Amaranthus fimbratus - fringed amarantha		x						
Amphipappus fremontii - chaffbush			x					
Andropogon virginicus bearugrass						x		
Anemopsis californica - yerba mansa						x		
Apium graveolens - celery						x		
Apocynum cannibinum - dogbane						x		
Argemone munita - prickly poppy	x							
Atriplex canescens - wingscale		x	x					
Atriplex contertiflora - shadscale			x					
Atriplex hymenelytra - desert holly			x				x	
Atriplex Lentiformis - quail brush				x				
Atriplex polycarpa - cattle spinach		x		x				
Atriplex parryi - parry saltbrush	x							
Baccharis sarothroides - broom baccharis						x		
Baccharis sergiloides - squaw water weed					x			
Baccharis viminea - mule fat		x						
Bassio hyssopifolia						x		
Chara sp.					x			
Cirsium mohavense - thistle						x		
Cladium mariscus - sawgrass						x		
Coreopsis calliopsidea - leafy-stemmed coreopsis	x							
Datura meteloides - western jimson		x		x	x			

	Dumont Dunes	China Ranch	Amargosa River Near Willow Creek: Rocky Slopes	Dry Flats	River-Bottom	Am. River & Springs 1 mi. So. of Tecopa: Springs	Rocky Slopes	Alkaline Flats
Distichlis spicata - salt grass					x	x		
Echinocactus polycephalus - cotton-top		x	x					
Encelia farinosa - brittlebush		x	x					
Encelia frutescens - rayless encelia			x					
Ephedra virides - squaw tea		x						
Eriogonum sp.		x						
Eriogonum inflatum - desert trumpet	x							
Eriogonum racemosum var. desertum - red-root buckwheat						x		
Eucnide urens - rock nettle			x					
Euphorbia albomarginata - white-margin Euphorbia					x	x		
Ficus sp. - fig		x						
Franceria dumosa - burrobush		x						
Glycyrrhiza lepidota - wild licorice						x		
Helianthus sp. - sunflower		x						
Heliocharis parishii - spike rush						x		
Heliotropium currassavicum heliotrope						x		
Hesperocallis undulata - desert lily	x							
Hilaria rigida - galleta grass		x						
Hofmeisteria pluriseta - arrowleaf			x					
Holocantha Emory;		x						
Juncus cooperii - rush		x			x	x		
Juncus xiphiordes - rush						x		
Larrea divaricata - creosote bush	x	x	x					

	Dumont Dunes	China Ranch	Amargosa River Near Willow Creek: Rocky Slopes	Amargosa River Near Willow Creek: Dry Flats	Amargosa River Near Willow Creek: River-Bottom	Am. River & Springs 1 mi. So. of Tecopa: Springs	Am. River & Springs 1 mi. So. of Tecopa: Rocky Slopes	Am. River & Springs 1 mi. So. of Tecopa: Alkaline Flats
Lepidium fremonti - desert alyssum							x	
Lythrum californicum - loosestrife						x		
Malvastrum rotundifolium - five-spot mallow	x							
Nitraria occidentalis -					x	x		
Opuntia basillaris - beavertail cactus		x	x				x	
Oenothera clavaeformis - brown-eyed primrose			x				x	
* Oxystylis lutea - false clover							x	
Peucephyllum Schottii - pygmy cedar			x					
Phacelia crenulata - wild heliotrope		x						
Phacelia pachyphylla - thick-leaved phacelia	(dry wash bed)							
Pluchea sericea - arrow-weed		x			x			
Phoenix dactylifera - date palm		x						
Phoradendron californicum - desert mistletoe		x		x		x		
Phragmites communis - common reed		x						
Populus Fremontii - cottonwood		x						
Prosopis juliflora - mesquite		x						
Prosopis pubescens - screw-bean mesquite		x			x	x		
Salix gooddingii - willow		x						
Salsola kali - russian thistle		x						
Salvia columbariae - chia		x						
Scirpus Olneyi - olney bulrush					x	x		
Solidago californica - rock goldenrod						x		

	Dumont Dunes	China Ranch	Amargosa River Near Willow Creek			Am. River & Springs 1 mi. So. of Tecopa		
			Rocky Slopes	Dry Flats	River-Bottom	Springs	Rocky Slopes	Alkaline Flats
Sphaeralcea ambigua - desert mallow		x						
Sporobolus airoides - dropseed		x						
Stephanomeria sp.			x					
Sueda fruticosa - seep-weed				x				
Tamarix aphylla - tamarisk		x						
Tamarix gallica - tamarisk					x			
Tamarix petandra - tamarisk				x				
Typha latifolia - cattail						x		
Vitis girdiana - grape						x		

* Uncommon

AMARGOSA RIVER

J. SULLY

ICTHYOLOGY

NATIVE FISHES: DESERT PUPFISH (Genus CYPRINODON)

(The following report was submitted by The Desert Fishes Council, Bishop, California. Contributing writers were: E. P. Pister, California Department of Fish & Game; Robert E. Brown, California Department of Fish & Game; Dr. Robert R. Miller, Ph.D., Museum of Zoology, University of Michigan; Dr. Carl L. Hubbs, Ph.D., Scripps Institute of Oceanography, La Jolla, California; Dr. Robert Feldmeth, Ph.D., Department of Zoology, Claremont College, California.)

Pupfish are small egg laying fish of the Family Cyprinodontidae which are found in fresh, brackish and salt waters along the Atlantic Coast south to Yucatan and throughout the west. The pupfish of the Death Valley area are believed to be descendants of Cyprinodon variegatus, the species which inhabits the eastern and gulf coasts of North America. C. variegatus is found in estuary and salt marsh habitats where it has become adapted to a broad range of temperatures and salinities.

Ancestral pupfish are believed to have migrated up rivers and into large inland lakes that existed in the non-glaciated parts of North America during the pleistocene. In this radiation, pupfish populations became established as far west as the Owens Valley in eastern California and in a number of habitats in Texas, Arizona and northern Mexico.

When the ice sheets of the pleistocene retreated and climatic conditions became drier, pupfish became restricted to existing bodies of water such as springs and shallow streams and rivers. The pupfish which inhabit the aquatic habitats of the Death Valley region today are descendants of an ancestral population of Cyprinodon which had a broad and continuous distribution 10,000 to 30,000 years ago. Death Valley contained the large pleistocene Lake Manly which was filled by the Amargosa River which drained western Nevada. A series of other lakes as well as the Mojave and Owens Rivers were also connected to this aquatic system and pupfish probably occupied all of these habitats. As the climate became hotter and drier, Lake Manly and most of these other watercourses disappeared leaving only small, isolated pupfish populations in the few remaining oases which have a constant water supply. In this area there are four or perhaps five species of Cyprinodon which have developed as a result of this isolation. Salt Creek in central Death Valley is inhabited by C. salinus. Cottonball Marsh just south of Salt Creek has a similar

pupfish which may be a species that is distinctly different from C. salinus. At the southern end of the Monument in Saratoga Springs is C. nevadensis the species that also occurs in the Amargosa River and the Ash Meadows area to the east. This species has been isolated in several habitats long enough for a number of subspecies to develop. C. radiosus is limited to the Fish Slough area of Owens Valley and C. diabolis, the smallest and most distinctive species, is found only in Devil's Hole, a long isolated spring on the eastern side of the Amargosa River basin.

Many of the ponds and springs in the area are thermally heated and range from 78° to over 100° F. Also, some of the waters are somewhat saline and Cottonball Marsh has a salinity equal to that of sea water. To tolerate the thermal extremes of shallow desert pools and streams which are near freezing in temperature in winter and over 100°F in summer and the high salinity which may be present requires a tremendous degree of physiological adaptability.

Although quite tolerant, pupfish in the Amargosa area are endangered, however, mainly due to pumping and diversion of water from wells and streams. Many of the spring habitats are dropping due to high pumping rates of the wells used to provide water for irrigation. Earth dams have been bulldozed across tributary streams and the Amargosa River itself in recent months and all these types of habitat alterations seriously endanger pupfish.

Pupfish have been able to survive drastic environmental and habitat changes for the thousands of years they have occupied the Amargosa River area, but they require water to survive. If man continues to divert and pump water away from the small desert streams and springs, the pupfish will not survive this decade.

NATIVE FISHES: PUPFISH ECOLOGY

Pupfish inhabiting the Amargosa River exhibit life history patterns and habitat requirements generally unique to these populations.

Adult fish require water of sufficient clarity to perform successfully a ritualistic set of pre-spawning behavior patterns which are visually mediated. Territorialism preceding reproductive behavior occurs only in waters approaching the 62^{o}-70^{o} range, depending upon the time of year. Eggs extruded singly in quantities of over 100 per week during the reproductive season (based on laboratory studies) possess adhesive filaments allowing their adherence to substrate materials. These eggs exhibit ionic, osmotic, oxygen, and temperature optima for both rate of development and percent survival of hatched fry. These optima are related, within broad limits of tolerance, to the characteristics of the area inhabited. Eggs develop most rapidly at low oxygen levels of about 2-3 mg/l., temperatures ranging from 75-85^{o} F, and salinities of 10-20 mg/l. with Na^{+}/Ca^{++} ratios of 5 to 1.

Fry seek out the warmer areas and are dependent on bacteria, diatoms, and algae for food. Erosion results in deposition of alkali and alkali soils upon the substrate and thereby reduces drastically the availability of food for the pupfish population.

Studies of mosquitofish, guppies, and forms of pupfish related to those inhabiting the Amargosa gorge have revealed that these fishes are intolerant of pesticides, oils, detergents, and other pollutants.

Larger adults inhabit the deeper pools, while dace inhabit waters of higher velocity and pool bottom peripheries. Adult pupfish are omnivorous, opportunistically insectivorous, and are very effective algae grazers.

Young pupfish reach sexual maturity in one to two months at lengths of 15 to 25 mm, depending upon water temperature. Thus, several generations may be produced during the summer and autumn months.

Females are smaller and brownish, as compared to the larger, irridescent blue territorial males. The females seek out undercut banks, weeds, and cavern areas and swim during the day into the rocky, reedy, deeper areas which are occupied by males. The timing of of female movement into territorial areas is apparently related to their physiological capability to produce and extrude eggs.

The abundant vegetation in the Amargosa River gorge obviously provides food and living space for insects upon which pupfish feed and also provides a vital vegetational buffer to flash flooding, thereby minimizing changes in the river channel. This principle may be easily seen by comparing the channel within the Amargosa gorge with the Amargosa river bed north of Shoshone.

THIS PORTION OF THE AMARGOSA RIVER IS THE TYPE LOCALITY FOR TWO SPECIES OF DESERT FISHES, THE PUPFISH AND THE SPECKLED DACE.

DESERT PUPFISH

M. ROMERO

NATIVE FISHES: SPECKLED DACE

Living with the pupfish is a population of the speckled dace. Rhinichthys osculus. Although the information is unpublished, Dr. Robert R. Miller, Ph.D., noted in his doctoral thesis (1944) that the populations of dace here probably represent a race of this species distinct from those in the upper Amargosa River (near and above Beatty) and in the Springs and ditches of the Ash Meadows region. The latter area contains the spring representing the type locality of Rhinichthys osculus nevadensis. Whether the populations that still survive in the upper Amargosa and those inhabiting Amargosa Canyon will eventually receive a formal scientific designation is uncertain, but the populations from each of the three localities can readily be distinguished by a number of characteristics.

NATIVE FISHES: TECOPA PUPFISH

In addition to the above two species of native fishes, the distinct possibility exists that certain spring areas in and adjacent to the Amargosa gorge may harbor populations of the highly endangered Tecopa pupfish (Cyprinodon nevadensis calidae).

NATIVE FISHES: CONCLUSIONS

The segment of the river in the study area contains the type locality of two native fishes and possibly a third, currently on the endangered species list.

Inevitable habitat destruction will result from the following factors:

1. Soils within the gorge are of an easily eroded type. Modification of the existing railroad bed to accommodate regular vehicular travel would unquestionably create a siltation problem which, in turn, would seriously degrade the stream habitat. This condition would, of course, be aggravated by flood flows which must be expected in desert areas.

2. If the general gorge area were made readily available for vehicular use, it is unlikely that this use could be restricted to any specific roadway. This would result in destruction of riparian vegetation, and flood

plain vegetation is notoriously slow to recover from mechanical injury.

3. Human use and littering of the streambed would result in a deterioration of water quality and a dispersal of endemic faunal populations.

4. Increased human use (particularly from vehicles) increases the very real danger of the introduction of exotic species. Competition and predation by exotic species has been one of the major factors in the decimation of endemic fishes.

5. Increased use (again particularly from vehicles) will increase fire hazards. Also, inasmuch as "new" territory for vehicular use often tempts the overly enthusiastic motorist to use these areas as "proving grounds", there would be increased danger from gasoline and oil spills which, if they were to enter the river, would result in a heavy loss of aquatic life and would exert an enduring detrimental effect on the aquatic and riparian environments.

(For the full text of the statement of the Desert Fishes Council, see the appendix, "Supporting Statements.")

MAMMALOGY

(Data for this report was submitted by: Kathryn Bezy, Department of Zoology, University of California, Los Angeles; Vernon C. Bleich, Department of Biology, California State College, Long Beach, California; Dr. Frank C. Vasek, Ph.D., University of California, Riverside; Dr. Wilbur W. Mayhew, Ph.D., University of California, Riverside, and Dr. Lloyd P. Tevis, Ph.D., University of California, Riverside)

Eighteen species of mammals were found to live in the Study Area. Mammals live -- trapped or seen in the study area by above named scientists on field surveys conducted on March 18-19, 1972 and April 15-16, 1972, were:

Black-tailed Hare - Lepus californicus

Audubon Cottontail - Sylvilagus audubonii

Antelope Ground Squirrel - Ammospermophilus leucurus

Valley Pocket Gopher - Thomommys bottae providentialis

Merriam Kangaroo Rat - Dipodomys merriami

Desert Kangaroo Rat - Dipodomys deserti

Western Harvest Mouse - Reithrodotomys megalotis

Cactus Mouse - Peromyscus eremicus eremicus

House Mouse - Mus musculus

Deer Mouse - Peromyscus maniculatus

Coyote - Canis latrens mearnsi

Western Pipistrelle Bat - Pipistrellis hesperis

Raccoon - Procyon lotor

There is supporting evidence, as indicated of the additional mammals in the area:

Woodrat - Neotoma Sp. (scats and footprints)

Desert Kit Fox - Vulpes macrotis (scats, tracks, badly damaged kit fox skull 2 mi. SSE-China Ranch.)

Ringtail Cat - Bassariscus astutus (footprints, reported as seen by owner of ranch)

Opossum - Didelphis marsupialis (Observed by residents of China Ranch)

Bobcat - Lynx rufus (Observed by residents at ranch. Several were shot and killed in area this year by caretaker on ranch.)

Amargosa Botta Pocket Gopher - Thomomys bottae amargosae (mounds)

There is a great likelihood of:

Amargosa meadow vole - Microtis californicus scirpensis (See Besy report.)

(K. Bezy report on mammals follows.)

MAMMALS OF THE AMARGOSA RIVER AND DUMONT DUNES

The following report results from a four-day survey, conducted on March 18-19, and April 15-16, 1972, of the mammals of the Amargosa River Valley south of Tecopa, and the Dumont Dunes, Inyo and San Bernardino Counties, California.

This survey is by no means complete; there may be many mammals overlooked, including bats, skunks, the grey fox, Urocyon cinereoargenteus, the round-tailed ground squirrel, Spermophilus tereticaudus, and the Amargosa meadow vole, Microtis californicus scirpensis. I have not done an extensive literature search of the mammals found here, but am basing this report on the most recent summary of North American mammals, Hall and Kelson, 1959. According to their range maps, the raccoon and opossum have not previously been reported in this area, and have apparently extended their ranges. A literature search might reveal that these animals have been reported here since 1959.

The habitats

In the study area there are several important mammal habitats: the river and its associated tules and cattails, adjacent meadows, and canyon walls; the desert scrub and Dumont Dune area; and the riparian community at Willow Springs. Each of these habitats provide the habitat requirements of the animals that live there.

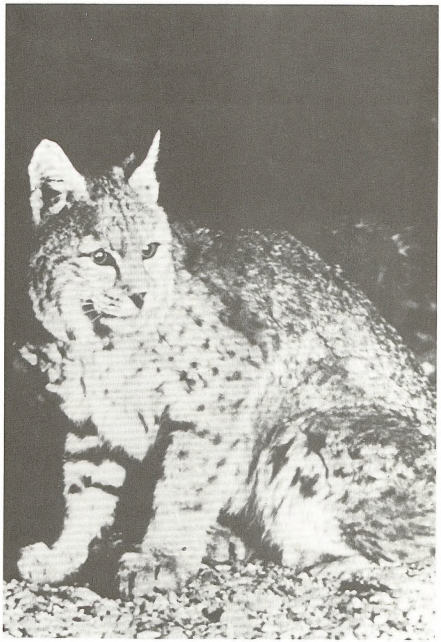
The river is bounded on the east by light-colored cliffs of sedimentary rock, on the west by rugged black volcanic cliffs, and the caves, rock piles and crevasses in these walls provide shelter for the raccoons, ringtailed cats, bobcats, woodrats and the Western pipistrelle which lives in cracks in the rocks, and is found near waterways. Raccoons feed chiefly along streams, marshes, and ponds, and their paw prints were seen at the mouth of a cave along the river, and 1.5 miles north at Willow Springs, where one was reported to have been seen by others in the area. The pocket gophers, also, live near springs and along the river, where the soil is moist enough to make their burrows in. The dusty floors of the caves are covered with woodrat pawprints and scats, and ringtail cat paw prints were seen in fewer numbers. Ringtail cats are found generally in rocky areas where they can make their dens, and where woodrats and deer mice are abundant.

Coyotes and desert kit foxes are found throughout the study area. The desert scrub habitat and the Dunes also support two species of kangaroo rat, the deer mouse, harvest mouse, wild house mouse, and ground squirrels. These rodents, and seeds and insects, constitute the coyote's chief food. The desert kit fox is almost always found with coyotes and its range coincides closely with that of the desert kangaroo rat, Dipodomys deserti, on which it feeds. Grinnel, Dixon, and Linsdale (1937, p. 417) conclude "that kangaroo rats constitute the 'staff of life' of the kit fox in such localities."

Effect of Off Road Vehicles

Abundant species and total numbers of mammals are found in this small area, including many which do not occur in the dry desert except at rare localities such as this, because their distributions are limited by presence of permanent water. Unfortunately, many "off road vehicles" (ORVs) have been driven in this area recently, and this unique place will soon be destroyed unless the river and dunes are protected. At a marsh upstream from China Ranch, at the "air strip", the numbers of ORV tracks were noticeably increased in the four weeks between the first day of the survey and the last day.

THE STUDY AREA IS RICH IN WILDLIFE. RAPTORS AND PREDATORS INHABIT THE AREA. COMPLETE ECO-SYSTEMS STILL EXIST WHICH MAKE THIS AREA VALUABLE FOR RESEARCH.



BOBCAT

I have already discussed the river and meadow dwelling rodents, and the raccoons, ringtail cats, and bobcats which feed on them. The destruction of the meadows, river, and desert scrub by ORVs will result in extermination of the wildlife here, and extinction in the case of the Amargosa pocket gopher, s subspecies occurring only at the Amargosa River. The greatest number of ORVs are used in the Dumont Dunes, where they immediately endanger the habitat of the large desert kangaroo rat, coyote, and desert kit fox. The desert kit fox is especially threatened here because of its narrow habitat requirements and restricted range. Grinnell, Dixon, and Linsdale (1937, p. 409) state:

> The kit fox is one of California's least known fur bearers, partly because of the relatively small proportion of the State's area it inhabits -- or did inhabit, for of recent years its range has become much smaller even than it was originally. This fox is narrowly specialized to live successfully on the southern deserts and on those parts of the Pacific drainage where the summers are hot and arid conditions prevail. Because the kit fox occupied territory in western California much of which has been taken over for man's uses, it has pretty much vanished from the country west of the desert divides.

Value as a Study Area

There is still much more to learn about the lives and habits of coyotes and foxes, and the Dumont Dunes, which have been, until recently, undisturbed, provides an ideal place for further study of them.

The Amargosa River also offers the opportunity to study isolated mammal populations and rare mammals. The river bottom itself could be considered analogous to an island, because of its isolation in the desert, where indigenous forms of mammals have been found, and where new forms of animals and plants may be found in the future.

I have mentioned the Amargosa botta pocket gopher, Thomomys bottae Amargosae, which occurs only in the Amargosa Valley and was previously known only from the type locality at Shoshone (Hall and Kelson, 1959). The Amargosa meadow vole, Microtis californicus scirpensis, a small marsh-dwelling rodent, has been listed by the California Fish and Game as extinct since 1917. The animal was in fact collected in 1937 on the Amargosa River (Allen, 1942) and may still live here. They were found "in exceedingly small numbers, at two desert seepages, where, however, the favoring conditions might at any time be wiped out" (Allen, 1942, quoting Dr. Joseph Grinnell). Allen goes on to say of this meadow vole, "On

account of its living in such very localized swamps ... the race is in a precarious state much like that of an animal living on a few small islands where the environment may become unsuitable through slight changes."

(V. Bleich report on mammals in Study Area is as follows:)

Introduction

This report is the result of a very limited amount of field work done in the Amargosa Canyon south of Tecopa, Inyo County, California, during March, 1972. Although far from being complete, it should give some insight into the species of mammals found there, and includes notes and comments on each.

This checklist consists of two sections. Part one deals with those species that are known to occur in the study area, or the immediate vicinity thereof, and part two is a list of mammals that may possibly occur there. (For Bleich Checklist see Appendix M-1.)

Field work was limited to three days, and during this period 230 trap-nights yielded 17 rodents of five species. Additional materials (bones, scats, etc.) were collected and returned to the Bird and Mammal Museum, California State College, Long Beach, where they were identified by comparison with specimens on deposit there.

The catalogue of mammal specimens in the Bird and Mammal Museum was carefully checked for records from the vicinity of the study area. Many specimens are recorded from the Kingston Mountains, east of the study area, and additional records from the vicinity of Shoshone are noted. Some specimens from distances up to 100 miles from the study area are also listed, as these localities were the closest records to the study area that were available.

Range maps from Burt and Grossenheider (1964), Hall and Kelson (1959), and Ingles (1965) were consulted to help determine which species of mammals not collected in the study area may be found there. Hall and Kelson (1959) was used to determine subspecific designation of mammals that may occur in the area.

Due to the very short amount of time allotted for this study and preparation of the report, it was impossible to adequately investigate the study area and the ecological significance of the mammalian species found there. Much more research needs to be done in order to more fully understand the distribution and ecology of the mammals occurring in this area.

Summary and Conclusions

Twelve species of mammals were determined to be present in the study area. In addition, 19 more species may also occur there.

Of the 31 mammals listed in this checklist, two (Microtus californicus scirpensis and Thomomys bottae amargosae) are endemic to the Amargosa Valley, being found nowhere else in the world. Two more (Bassariscus astutus nevadensis and Vulpes macrotis arsipus) are declining in numbers, and are protected by law in California.

Since the Amargosa Valley offers the unique situation of a permanent river flowing through a very arid region with two endemic species of mammals, it would seem wise to protect this area (The Tecopa-Dumont Sand Dunes Study Area) as fully as possible from outside influences.

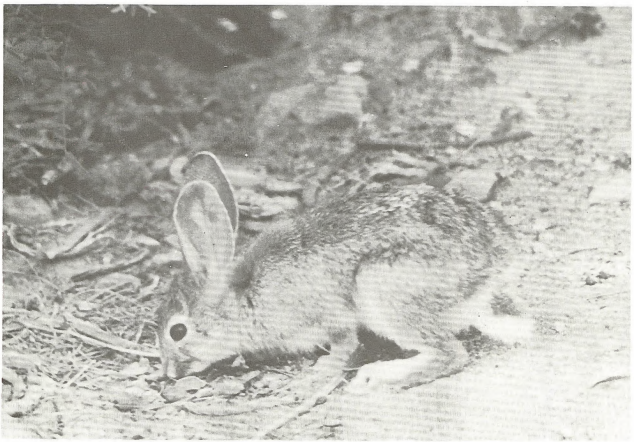
Based on the results of this survey, the following recommendations are made.

1) That off road vehicles not be allowed to use the Amargosa Valley south of Tecopa, and north of the Dumont Sand Dunes, as destruction of the Scirpus Olneyi-Distichlis spicata association along the river could lead to the immediate extinction of M.c. scirpensis, if indeed it is still extant there.

2) That off road vehicle use be restricted to not more than 50 percent of the Dumont Sand Dunes. Intensive use of the sand dunes would probably lead to a reduction of the Dipodomys deserti population there, and this could have a drastic effect on the population of the kit fox in that area. French, Maza, and Aschwandan (1966) reported that Dipodomys is a major constituent in the diet of Vulpes macrotis in the Mojave Desert.

KANGAROO RAT

JACKRABBIT



3) That a more thorough study of the area be undertaken by the Bureau of Land Management before any intensive off road vehicle use is allowed in the area.

SPARROW HAWK

AUDUBON'S WARBLER

ORNITHOLOGY

(The following statement was prepared after analyses of data submitted by Dr. Laszlo J. Szijj, Ph.D., Associate Professor of Zoology, Department of Biological Sciences, California State Polytechnic College, Pomona, California; Shirley Wells, Breeding Bird Survey Coordinator for the U. S. Sports Fisheries and Wildlife, Jan Tarble, Los Angeles Audubon Society, and Paul and Patricia Nelson, San Fernando Valley Audubon Society.

Members of the Audubon Societies participated in the census efforts.)

The Study Area has proven to be very rich in bird life. This area had never been censused before the fall of 1971. No bird check lists were available for the area. Because of the lack of census data on the area, various members of the Los Angeles and San Fernando Valley Audubon Societies volunteered to undertake study trips to determine which species are either resident or use the area. (See Acknowledgements.)

Bird censuses were made October 16-17, 1971; March 18-19, 1972; April 4-5, 1972; and April 14-15-16, 1972. The October, 1971 census was taken near the Willow Creek, China Ranch area. No census of the fall migration, especially waterfowl, has been made as yet. Breeding bird censuses have not yet been made during the month of May. June and August are excellent "birding" months in the Death Valley region and a census should be taken of the Study Area during these months. Compilation of birds utilizing any given area takes several years.

However, in the time span of this study, 104 species were observed and identified. The weekend of April 15-16, 1972, was especially fruitful producing a count of 86 species.

Six species of raptors were consistently seen in the Study Area throughout the Fall, Winter and Spring: the Sharp-Shinned Hawk, Cooper's Hawk, Red-Tailed Hawk, Marsh Hawk, Sparrow Hawk, and the highly endangered prairie falcon.

Because of the various types of habitats ranging from marshes, water ponds and pools, mesquite and desert shrub, to the large variety of habitat in the China Ranch area, this area can support large bird populations and many species of birds. A close analysis of the list will readily show that many of these birds depend on the continued existence of fresh water in the Study Area. The birds are not limited to China Ranch,

but are seen throughout the canyon.

In addition to the presence of so many raptors in the Study Area, several exciting discoveries were made by those doing the census. Crissal thrashers were seen at all census times; this extends their range farther north than previously known. The Virginia's Warblers were an unusual sighting for this region. But of the smaller song birds, the definite sightings of Lucy's Warblers nesting was by far the most significant. This extends their range considerably. Lucy's Warblers have been sighted in Death Valley, but no breeding there has been recorded. Thus, already it has been demonstrated that this area is used by birds heretofore never known in this range. It is highly probable that similar discoveries will be made, which will contribute greatly to updating ornithological records and maps. It is well-known that these discoveries will be of interest to ornithologists, ecologists, and Audubon Societies not only in the United States, but throughout the world.

The Audubon Societies plan to cooperate fully by continuing their censusing of the area and as data becomes available, it will be forwarded by the Pupfish Committee to BLM offices.

(The following statement and analysis of the bird life in the Study Area has been submitted by Dr. Laszlo J. Szijj, Ph.D.,)

1) The Death Valley region, in spite of its barren appearance, is a significant migratory pathway for birds in both the spring and the fall. Most of the species which move through there, do so at night, but many of them settle for rest in various vegetated patches, especially where water is available, before continuing the journey. There appear to be two reasons why individual birds might stop in the desert (and utilize an area such as the canyon-ranch area):

   a) They are species of limited flight powers, which must make frequent stops to complete the journey, such as grebes, rails, coots, and many smaller species, such as warblers, gnatcatchers, hummingbirds, etc.

b) They are individuals (usually birds of the year) which are in weakened condition and would completely exhaust themselves if they did not utilize the resources offered by the area.

For these reasons, China Ranch (and environs) seems to be an indispensable stopover point for thousands of birds each season, which otherwise would either perish or would jeopardize their completing the migration if there was significant alteration of or interference in the area. I might add that many of the species which move through here are quite shy (herons, hawks, etc.) and even if the area was not altered significantly, the continued presence of humans and their activities would definitely disturb them.

2) The China Ranch area, and the whole Death Valley Region, represent a rather unique type of environment which is an ideal place for the study of behavioral and physiological adaptations of organisms to extreme environmental conditions. Since these areas are rapidly dwindling in size, or are being altered at a fast rate, now is the time to think about their preservation. Once they are gone, no amount of good will can bring them back.

3) A number of characteristic desert species (the most important of these being the Prairie Falcon) are definitely endangered forms of wildlife, and we should do everything to protect their last strongholds.

(Statement by Jan Tarble, Los Angeles Audubon Society, April 12, 1972)

Re: Lucy's Warblers in China Ranch and Amargosa Canyon.

Pat and Paul Nelson and I listened to Lucy's Warblers singing on the ranch March 19th. I taped the song and two individuals responded. Shirley Wells and I saw and heard at least two singing Lucy's Warblers April 5th in two separate

locations, on the ranch and in the canyon. Again, I taped the song and the response was vociferous. Mrs. Wells and I would not be surprised to find that the bird is breeding in the area. Unfortunately, we were not able to examine a bird in the hand, and their breeding season extends well beyond our May 1st deadline.

In the literature, Reilly, in describing the bird's range and status, states that it breeds from southern Nevada, Utah, and southwest Colorado south to northwest Mexico and southwest New Mexico. Grinnell and Miller show the bird breeding south to Picacho in the Colorado River Valley and in the Chemehuevi Valley north to latitude 35, which is just north of Needles. McKaskie reports successful breeding by more than one pair in Morongo Valley in 1971. The birds are regularly reported from Death Valley, but I have found no evidence of breeding in the State north of Latitude 35 and west of the Nevada boundary.

April 14-15-16 field trip: Lucy's Warblers (2 pairs) were definitely seen nesting and feeding young almost under the trestle over Willow Creek. This fact is documented by Paul and Patricia Nelson, Arthur and Irene Langton, Charles Bernstein and Richard Starr, San Fernando Valley Audubon Society. In addition, 33 members of the San Fernando Valley Audubon on that field trip observed the nesting Lucy's Warblers.

A check list of birds in the Study Area as observed by study team members follows:

BIRDS OF CHINA RANCH AND AMARGOSA CANYON - Page 1	10/1/71	10/17	2/26/72	3/18-19	4/4-5	4/15-16
PODICIPEDIDAE						
Podilymbus podiceps - Pied-Billed Grebe				x	x	
ARDEIDAE						
Ardea herodias - Great Blue Heron		x		x		
Butorides virescens - Green Heron					x	
ANATIDAE						
Anas strepera - Gadwall				x		
Anas carolinensis - Green-Winged Teal		x		x		x
Anas cyanoptera - Cinnamon Teal				x	x	x
Spatula clypeata - Shoveler				x	x	
Bucephala clangula - Common Goldeneye				x		x
Bucephala albeola - Bufflehead				x		x
Oxyura jamaicensis - Ruddy Duck				x	x	
Aythya americana - Redhead				x		
Aythya valisineria - Canvasback						x
CATHARTIDAE						
Cathartes aura - Turkey Vulture				x	x	x
ACCIPITRIDAE						
Accipiter striatus - Sharp-Shinned Hawk				x	x	x
Accipiter cooperii - Cooper's Hawk					x	x
Buteo jamaicensis - Red-Tailed Hawk				x	x	x
Circus cyaneus - Marsh Hawk				x		x
FALCONIDAE						
Falco mexicanus - Prairie Falcon				x	x	x
Falco sparverius - Sparrow Hawk		x		x	x	x

BIRDS OF CHINA RANCH & AMARGOSA CANYON - Page 2.	10/1/71	10/17	2/26/72	3/18-19	4/4-5	4/ 15-16
PHASIANIDAE						
Lophortyx gambelii - Gambel's Quail		x		x	x	x
Phasianus colchicus - Ring Necked Pheasant					x	x
RALLIDAE						
Rallus limicola - Virginia Rail					x	x
Fulica americana - American Coot		x		x	x	x
CHARADRIIDAE						
Charadrius vociferus - Killdeer				x	x	x
SCOLOPACIDAE						
Capella gallinago - Common Snipe				x		
Totanus melanoleucus - Greater Yellowlegs						x
RECURVIROSTRIDAE						
Recurvirostra americana - American Avocet		x				
COLUMBIDAE						
Zenaidura macroura - Mourning Dove		x		x	x	x
CUCULIDAE						
Geococcyx californianus - Roadrunner				x	x	x
STRIGIDAE						
Bubo virginianus - Great Horned Owl				x		x

BIRDS OF CHINA RANCH AND AMARGOSA CANYON - Page 3.

	10/1/71	10/17	2/26/72	3/18-19	4/4-5	4/15-16
CAPRIMULGIDAE						
Phalaenoptilus nuttallii - Poor-Will				x		
Chordeiles acutipennis - Lesser Nighthawk						x
APODIDAE						
Aeronautes saxatalis - White-Throated Swift				x	x	x
Chaetura vauxi - Vaux's Swift						x
TROCHILIDAE						
Calypte costae - Costa's Hummingbird						x
ALCEDINIDAE						
Megaceryle alcyon - Belted Kingfisher	x			x	x	x
PICIDAE						
Colaptes cafer - Red-Shafted Flicker	x			x		x
TYRANNIDAE						
Tyrannus verticalis - Western Kingbird				x		x
Sayornis nigricans - Black Phoebe				x		x
Sayornis saya - Say's Phoebe	x			x	x	x
Empidonax traillii - Traill's Flycatcher						x
Contopus sordidulus - Western Wood Pewee						x
Pyrocephalus rubinus - Vermilion Flycatcher				x		
Empidonax difficilis - Western Flycatcher						x
ALAUDIDAE						
Eremophila alpestris - Horned Lark						x

BIRDS OF CHINA RANCH AND AMARGOSA CANYON - Page 4.

	10/1/71	10/17	2/26/72	3/18-19	4/4-5	4/15-16
HIRUNDINIDAE						
Tachycineta thalassina - Violet-Green Swallow				x	x	x
Iridoprocne bicolor - Tree Swallow					x	x
Stelgidopteryx ruficollis - Rough-Winged Swallow				x	x	x
Hirundo rustica - Barn Swallow						x
CORVIDAE						
Corvus corax - Common Raven		x		x	x	x
Corvus brachyrhynchos - Common Crow				x	x	x
PARIDAE						
Parus inornatus - Plain Titmouse				x		
Auriparus flaviceps - Verdin		x		x	x	x
TROGLODYTIDAE						
Troglodytes aedon - House Wren					x	x
Thryomanes bewickii - Bewick's Wren		x		x	x	x
Campylorhynchus brunneicapillus - Cactus Wren				x		
Telmatodytes palustris - Long-Billed Marsh Wren		x		x	x	x
Catherpis mexicanus - Canyon Wren						x
MIMIDAE						
Toxostoma dorsale - Crissal Thrasher		x		x		x
Mimus polyglottos - Mocking Bird						x
TURDIDAE						
Turdus migratorius - Robin				x		x
Sialia currucoides - Mountain Bluebird						x
Sialia mexicana - Western Bluebird				x		x

BIRDS OF CHINA RANCH AND AMARGOSA CANYON - Page 5.	10/1/71	10/17	2/26/72	3/18-19	4/4-5	4/15-16
TURDIDAE (Continued)						
Hylocichla guttata - Hermit Thrush						x
Hylocichla ustulata - Swainson's Thrush						x
SYLVIIDAE						
Polioptila melanura - Black-Tailed Gnatcatcher					x	x
Regulus calendula - Ruby-Crowned Kinglet		x		x	x	x
Polioptila caerulea - Blue-Gray Gnatcatcher						x
MOTACILLIDAE						
Anthus spinoletta - Water Pipit				x		x
PTILOGONATIDAE						
Phainopepla nitens - Phainopepla		x		x	x	x
LANIIDAE						
Lanius Ludovicianus - Loggerhead Shrike				x		
STURNIDAE						
Sturnus vulgaris - Starling		x		x	x	x
VIREONIDAE						
Vireo solitarius - Solitary Vireo					x	x
Vireo gilvus - Warbling Vireo				x		x
Vireo vicinior - Gray Vireo						x

	10/1/71	10/17	2/26/72	3/18-19	4/4-5	4/15-16
PARULIDAE						
Vermivora luciae - Lucy's Warbler				x	x	x
Dendroica auduboni - Audubon's Warbler		x		x	x	x
Dendroica nigrescens - Black-Throated Gray Warbler					x	x
Vermifora celata - Orange-Crowned Warbler						x
Vermiforma ruficapilla - Nashville Warbler						x
Geothlypis trichas - Yellowthroat				x	x	
Wilsonia pusilla - Wilson's Warbler					x	x
Vermifora virginiae - Virginia's Warbler						x
Dendroica coronata - Myrtle's Warbler						x
PLOCEIDAE						
Passer domesticus - House Sparrow		x		x	x	x
ICTERIDAE						
Sturnella neglecta - Western Meadowlark	x			x	x	x
Xanthocephalus xanthocephalus - Yellow-Headed Blackbird					x	x
Agelaius phoeniceus - Red-Winged Blackbird				x	x	x
Icterus cucullatus - Hooded Oriole					x	x
Icterus bullocki - Bullock's Oriole						x
Euphagus cyanocephalus - Brewer's Black-Bird						x
FRINGILLIDAE						
Carpodacus mexicanus - House Finch				x	x	x
Spinus psaltria - Lesser Goldfinch					x	x
Passerculus sandwichensis - Savannah Sparrow				x	x	
Pooecetes gramineus - Vesper Sparrow				x		
Amphispiza bilineata - Black-Throated Sparrow				x		x
Junco caniceps - Gray-headed Junco				x		
Spizella passerina - Chipping Sparrow		x		x	x	x

BIRDS OF CHINA RANCH AND AMARGOSA CANYON - Page 7.	10/1/71	10/17	2/26/72	3/18-19	4/4-5	4/15-16
FRINGILLIDAE (Continued)						
Zonotrichia leucophrys - White-Crowned Sparrow		x		x	x	x
Melospiza lincolnii - Lincoln's Sparrow					x	x
Melospiza melodia - Song Sparrow				x		x
Pheucticus melanocephalus - Black-Headed Grosbeak						x
Passerina amoena - Lazuli Bunting						x
Spizella breweri - Brewer's Sparrow						x

NO. OF FAMILIES: 37

NO. OF SPECIES: 104

AMPHIBIANS & REPTILES OF THE TECOPA-DUMONT DUNES AREA

(This report (printed verbatim), was submitted by Dr. Robert L. Bezy, Ph.D. and Dr. John W. Wright, Ph.D., both of the Natural History Museum of Los Angeles County, Section of Herpetology.)

On 18-19 March and 15-16 April, 1972, we surveyed the amphibians and reptiles along the Amargosa River in the vicinity of China Ranch and on the Dumont Dunes. During this field work three species of frogs and six species of lizards were observed (see Table I). This is estimated to be only 60% of the species of amphibians and 16% of the species of reptiles that, on the basis of available ecological and geographical information (Stebbins, 1954; 1966) would be expected to occur in the area. There are two reasons for these low percentages. First, reptiles are generally most active during their reproductive season in late spring (late April and May) and the field work done to date was too early in the year for full activity of these temperature sensitive ectotherms. On the other hand, because amphibians in this area are dependent on winter rains for breeding and are thus active in early spring, a much greater percentage of the expected species were observed. The second reason for the low percentage of the expected reptiles species actually observed is that many of these are secretive and nocturnal. To accurately determine the number of species of reptiles present in this area will require extensive field work because many of the species are rare and difficult to observe. The high temperatures and low humidity of this generally arid region have allowed the survival only of species that avoid these harsh conditions by being active at night and/or living in the buffered micro-environments available in cracks and crevices, or under leaf litter, rocks, or logs.

The remainder of the report is based on the list of species predicted to occur in the area (Table I). Although more extensive field work may indicate that a few of these predicted species do not actually occur in the area, these studies are just a likely to reveal the occurrence of species that were not predicted. Needless to say, the known geographical and ecological ranges of some of the species leaves somethwat of a question as to whether or not they do indeed occur in the area. These questions themselves constitute one of the greatest values of the area to a biologist. In Table I these species are indicated by a question mark in the occurrence column.

Although a great number of habitats occur in the study area, these can be grouped into two groups on the basis of their importance to the ecological distributions of the amphibians and reptiles. The ground-water dependent ecosystems such as the river, springs, and streams themselves and, more importantly, their associated habitats such as marshes, meadows, and gallery forests of willows, cottonwoods and mesquites, all comprise the riparian habitats and here live many moisture-dependent species of amphibians and reptiles (Table I) that could not otherwise inhabit this extremely xeric area of North America. These riparian species are actually relictual populations, remnants of the past ages when the area was more mesic and allowed the widespread occurrence of these moisture-requiring species. All of the five species of frogs, six (37%) of the 16 species of lizards and nine (45%) of the 20 species of snakes are restricted to this habitat (Table I). The second major habitat group is composed of the desert habitats such as the salt bush bottomlands, the creosote bush flats, the rocky slopes, and the canyon walls. Here live the species that are better adapted to the extreme aridity of the area and are thus widespread in the Mojave Desert (Table I). The one species of turtle, ten (63%) of the 16 species of lizards, and 14 (70%) of the 20 species of snakes and none of the five species of frogs live in these drier habitats.

To date no endemic species are known to definitely occur in this area. (An endemic species is one whose distribution is limited exclusively to the area under consideration.) However, two forms listed in Table I as possibly occurring in the area (Bufo boreas nelsoni and Gerrhonotus panamintinus) do have quite small ranges. Gerrhonotus panamintinus is known only from the Panamint, Nelson, and Inyo Mts. where it has been recorded at a minimum elevation of 2800 feet (Stebbins 1966:135). Further studies in the Tecopa area might reveal that this rare alligator lizard occurs in these riparian habitats, particularly around Willow Springs. The Amargosa toad (Bufo boreas nelsoni) is presently known only from the Amargosa River Valley in the vicinity of Springdale and Beatty, Nye Co., Nevada (Stebbins 1966:60) and further study might demonstrate this species to occur near the springs or in the marshes and meadows in the Tecopa study area.

The study area is located in the extreme northeastern part of the Mojave Desert where low minimum winter temperatures, extremely high maximum summer temperatures, and low relative humidity are combined to produce an environment that is inhospitable even to a desert-adapted reptile. This area constitutes somewhat of an ecological and geographical barrier between the Mojave Desert and the Great Basin. This is reflected by the high percentage of amphibians and reptiles that reach the limits of their distribution in the study area (Table I). Four (80%) of the five species of frogs, 5 (31%) of the 16 species of lizards, and 4 (20%) of the 20 species of snakes reach their

distributional limits in the area. The importance of the riparian habitats in this area is further underscored by the fact that only 4 (16%) of the 25 species occurring in the desert habitat have distributional limits in the vicinity of the study area; while 9 (45%) of the 20 species occurring in the riparian habitats meet impenetrable ecological barriers in this area. Thus, for many species the Amargosa River area offers their last chance for survival in this extremely arid region.

EFFECT OF HUMAN USAGE ON THE STUDY AREA

Amphibians and reptiles are probably less sensitive to human environmental disturbance than are other vertebrates. The human activities that would probably have the greatest effect on the herpetofauna are (1) the deliberate killing of the larger lizards and snakes; (2) the continued disruption of the dunes; and (3) disturbance of the riparian ecosystem. These are ordered in terms of increasing effect on the amphibians and reptiles.

ORV usage on the Dumont Dunes effects the reptiles living there in two ways. First, the tracks of the vehicles prevent vegetation from becoming established in areas where dune stabilization is beginnin g (e.g. the extreme western part of the dunes). Reptiles do not inhabit large unstabilized dunes, but live on the dune margins and on stabilized dunes where vegetation affords shelter from the heat and allows the development of an ecosystem in which there are rodents (which the larger snakes eat) and insects (which the lizards and smaller snakes eat). Considerable evidence was observed to indicate that ORV usage destroys vegetation and rodent burrows, thus retarding the conversion of the biologically drab, active dunes into the biologically rich, stabilized dunes. This situation is particularly critical for Uma scoparia, perhaps the most beautifully adapted sand-dwelling lizard in the New World. The Dumont Dune area is approximately the northern limit of this species (Norris, 1958) and its habitat (stablilized dunes) are rapidly being destroyed by ORV usage. It is nothing less than a tragedy to have the evolution of this spectacularly sand-adapted organism be brought to an end by human toys.

Although most of the species of amphibians and reptiles that live in desert habitats (Table I) are not highly sensitive to man's activities in the area, the riparian species are highly so. These species, like the pupfish, are closely tied to the health and integrity of the aquatic habitat. Continued ORV usage in the Amargosa River Canyon can be expected to considerably alter the riparian habitat by disrupting the aquatic and semi-aquatic vegetation, packing of the soil (thus preventing the re-establishment of the vegetation), resulting in increased erosion and deterioration of water quality. This type of ecological disturbance would be expected to have a devastating impact on the riparian amphibians and reptiles of the area.

TABLE I

Amphibians and reptiles of the Tecopa-Dumont Dunes study area. Under "Range Limits," species that range widely in this area are marked with an X; species whose geographic limits occur approximately in the Tecopa area are marked by W, E, N, or S indicating whether this is the western, eastern, northern or southern limit; I indicates an introduced species. Under habitat, R indicates occurrence in riparian habitats, while D indicates occurrence in desert habitats. Data is from this study (*) and Stebbins (1954, 1966).

Scientific Name	Common Name	Range limits	Habitat
	FROGS AND TOADS		
Bufo boreas nelsoni	Amargosa toad	(?) W	R
*Bufo punctatus	red-spotted toad	W	R
*Hyla regilla	Pacific tree frog	E	R
Rana pipiens	leopard frog	(?) W	R
*Rana catesbeiana	bullfrog	I	R
	TURTLES		
Gopherus agassizi	desert tortoise	X	D
	LIZARDS		
Coleonyx variegatus	banded gecko	X	D
Dipsosarus dorsalis	desert iguana	X	D
*Sauromalus obesus	chuckwalla	X	D
*Callisaurus draconoides	zebra-tailed lizard	X	D
Uma scoparia	Mojave fringe-toed lizard	X	D
*Crotaphytus collaris	collard lizard	X	R
*Sceloporus magister	desert spiny lizard	X	R
Urosaurus graciosus	long-tailed brush lizard	(?) N	D

TABLE I (Cont.)

Scientific Name	Common Name	Range Limits	Habitat
	LIZARDS (Cont.)		
*Uta stansburiana	side-blotched lizard	X	D
Phrynosoma platyrhinos	desert horned lizard	X	D
Eumeces gilberti	Gilbert's skink	(?)X	R
*Cnemidophorus tigris	western whiptail	X	D
Gerrhonotus panamintinus	Panamint alligator lizard	(?)S	R
Heolderma suspectum	Gila monster	(?)W	R
Xantusia vigilis	desert night lizard	(?)N	R
Crotaphytus wislizeni	leopard lizard	X	D
	SNAKES		
Leptotyphlops humilis	western blind snake	X	D
Lichanura trivirgata	rosy boa	(?)N	D
Diadophis punctatus	ring-neck snake	(?)X	R
Phllorhynchus decurtatus	spotted leaf-nosed snake	X	D
Masticophis flagellum	coachwhip	X	D
Masticophis taeniatus	striped whipsnake	(?)W	R
Salvadora hexalepis	western patch-nosed snake	X	D
Pituophis melanoleucus	gopher snake	X	DR
Arizona elegans	glossy snake	X	D
Lampropeltis getulus	common king snake	X	D
Rhinocheilus lecontei	long-nosed snake	X	D

TABLE I (Cont.)

Scientific Name	Common Name	Range Limits	Habitat
Thamnophis elegans	wandering garter	(?)W	R
Sonora semiannulata	western ground snake	X	R
Chionactis occipitalis	western shovel-nosed snake	X	D
Tantilla planiceps	western black headed snake	(?) X	R
Trimorphodon lambda	Sonora lyre snake	(?) W	D
Crotalus cerastes	sidewinder	X	D
Crotalus scutulatus	Mojave rattlesnake	X	DR
Crotalus mitchelli	speckled rattlesnake	X	D
Hypsiglena torquata	night snake	X	DR

ENTOMOLOGY

(This report, printed verbatim, was prepared by the Section of Entomology, Natural History Museum of Los Angeles County.)

The following is a very brief account of the few insects taken by the herpetologists of the LACMNH during a short visit to China Ranch, March 19-20, 1972, and April 15-16, 1972.

The aquatic insects in the Amargosa River drainage are particularly interesting, as one might expect in a closed drainage system. Endemism in aquatic forms runs much higher in an area such as this. A very good example of this is found in the Hemipterous family Naucoridae, the Creeping Water Bugs. By far the most localized species of this family in California are Ambrysus funebris and A. amargosus. These little species have thus far been taken only in waters flowing from springs in the Amargosa River System in southern Nevada and Death Valley, California. These are but two examples.

The two above mentioned naucorids are not often found but a more common one Ambryus californicus, was taken with other insects at Willow Springs and the Amargosa River at China Ranch near Tecopa, Inyo County, California. The typical A. californicus is found in southern California while a larger form (ssp.) is found in northern California. The naucorids were taken in company with water beetles of the families Dytiscidae (2 species) and Hydrophilidae (1 species) and an assortment of several species of immature insects including naiads of the Dragonfly family Aeshnidae.

There are many highly restricted endemic species in the springs of this highly xeric area. Unfortunately, entomologists have not critically surveyed this area except for the limited forms that fall within a few specialties. It is extremely important that a survey of insects, particularly aquatic and semiaquatic, of this area be undertaken before it is ruined by the "recreation-minded urbanites."

DISTRIBUTION OF CALIFORNIA CRAYFISHES

CHINA RANCH

B. ROMERO

LIMNOLOGY

There has been no research on the limnology of the Amargosa River, Willow Creek, or Springs as far as we could ascertain. The waters of the river and creek and of the Springs are not uniform in quality (See Water Analyses). This would indicate there are varying limnological situations existing in the area.

The following report which will be of interest to limnologists and ecologists was submitted by Dr. Frank C. Vasek, Professor of Botany, University of California, Riverside; Dr. Wilbur W. Mayhew, Ph.D., Professor of Zoology, University of California, Riverside; Dr. Lloyd P. Tevis, Ph.D., Resident Biologist, Boyde Deep Canyon Desert Research Center, University of California, Riverside.

CRUSTACEANS

Crayfish - species unknown.

According to Riegel (1959), no crayfish have been found in California east of the Sierras south of Lake Tahoe. None have been reported from any desert area of California. No one at UCR has been able to identify to species (or even to genus) the specimen we captured in the spring area, 1 mile south of Tecopa. Consequently, the specimen is being sent to crayfish specialists outside California for positive identification. Known distribution of all California crayfish is indicated on the accompanying map.

The map accompanying this Crayfish report is taken from: J. A. Riegel (1959), The Systematics and Distribution of Crayfishes in California. California Fish & Game, 45 (1) 29-50.

SOCIAL AND ECONOMIC ENVIRONMENT

(Data, discussion, and analysis submitted by John M. Sully, Community and Environmental Factors Unit, California Division of Highways, Los Angeles.)

General information necessary to analyze socio-economic considerations which would apply to the California Desert is very limited. Government agency data on the desert did not include any specific information on the Shoshone-Tecopa-Baker area. Without up-to-date, relevant data it is difficult to extrapolate meaningful conclusions in the socio-economic area which would aid in management decisions. The information used in this portion of this report was all that was available for the area. However, the socio-economic considerations contained in this report do reflect latest available information. The conclusions were reached after analysis of available information.

DEMOGRAPHY

Demographic analyses of the region surrounding the study area would include considerations of Death Valley, Death Valley Junction, Shoshone, Tecopa and Baker. The Death Valley Division and the Newberry-Baker Division of the U.S. Bureau of the Census Statistical Areas are the sources of demographic statistics for the region.

The total population of these two divisions is 3,009 (1970 census.) Within a fifty mile radius of the Amargosa Canyon - Dumont Dunes, the population is approximately 1,000. The nearest city with a population over 1,000 is Las Vegas (pop. 124,161) which is 90 miles from Shoshone. The communities of Shoshone, Tecopa and Tecopa Hot Springs are unincorporated.

LOCAL ECONOMIC ACTIVITIES

The economic base for the area is tourism and the mining of talc and iron ore. The mining operations are relatively small. The number of people employed in the mines was not determined. There is some cattle-ranching in the area. Interviews with local residents indicated the area relied heavily on tourism as a source of income.

Local businesses are few. In Tecopa, the businesses are: grocery store/filling station, restaurant, tavern, motel, trailer park, rock shop and beauty parlor. Those in Tecopa Hot Springs are: several hot springs spas, Inyo County Park, a cafe, and a gas station with a limited line of hardware and general merchandise. Shoshone businesses include: a garage/gas station, food market, motel, a trailer park, restaurant/cocktail lounge, a propane distribution which services Pahrump, Nev., Death Valley, Shoshone, Tecopa and Baker area, a wholesale gasoline distributor, and wholesale beer distributor. These businesses in Shoshone are owned and controlled by the Chas. Brown Co. The Unified High School is located in Shoshone. Persons interviewed stated most of the shopping, except for groceries, was done in Las Vegas, or by catalog order.

Tourist trade is derived mainly from Death Valley National Monument visitor traffic. The Tecopa Hot Springs visitors are the second source of tourist trade. Other sources of tourist trade are minor.

Campers and ORV users using the Dumont Dunes contribute very little to the local economy, especially the Shoshone-Tecopa area. The dunes users are self-contained and they bring enough supplies with them from urban areas to supply their needs while in the dunes. Hence, they are not dependent on local businesses for their needs.

Economic studies in relationship to Camper-oriented tourists who stay in camp grounds located short distances from small towns support the conclusion that users of the dunes area do not contribute much to the local economy. At least one such study concluded that campers contributed about 76¢ per person per day for food after a stay of six days in the area. During the first five days nothing was contributed.

In the BLM publication, THE CALIFORNIA DESERT, "Economic Impact of Recreational Use," p.191, it is stated, "In a recent study on California's tourism industry, prepared for the U. S. Department of Commerce by Economics Research Associates of Los Angeles, it was determined that California residents spent an average of $11.50 per party on one-day pleasure trips in 1966. On overnight trips, the average daily expenditure was $22.00 per party. Party size was estimated at 3.9 persons."

In comparison with the studies mentioned above for campers, $11.50 per day per party seems high. At 76¢ per person, this would be $2.96 per party per day spent by campers. The $11.50 per day per party seems high in relationship to desert recreation use, primarily because in many of the desert recreation areas there is no place to spend money.

The first study mentioned also indicated that in general campers do not leave their recreation area to go to outside areas either for supplies or recreation. This would seem to be particularly true of the California desert.

Money invested in camping and recreational equipment does not have any effect on the area visited, but only on the area where the equipment is purchased.

HIGHWAY USE AND VISITOR DAYS ANALYSIS

The traffic count figures used in this analysis are from the California Division of Highways 1971 Traffic Publication, Accumulative Traffic Counts for year 1970. Later figures are unavailable at this date.

EXPLANATION:	PEAK MONTH	means any day in that peak month - not the month.
	AVERAGE ANNUAL	means average day in a year - not average of 12 mos.
	PEAK HOUR	means the highest traffic count in the highest month in the highest day.

All figures are average figures accumulated by counters left in a location over periods of weeks. Counters at check points are periodically read at regular intervals so averages can be determined. This periodic reading is done daily - a day being from 0100-2400 of same day. Traffic counts are the accumulation of traffic passing over the counter, and in recreation areas, such as the dunes area, may often be the result of a single user repeatedly passing over the counter.

COUNTER CHECK LOCATION	Mile Post #	Peak Hour	Peak Month	Annual Aver.
Intersection Hwy. 127 in Baker	--	100	750	500
Hwy. 127 Irwin Rd. (1st counter north of Baker)	29.79	70	490	350
Hwy. 127 S.B. Inyo Cnty Line (1st counter north of Dumont Dunes turnoff)	41.47	70	490	350
Hwy. 178 (Shoshone-Pahrump) counter at Jct. 127 and 178	14.75	85	610	380
D.V. Jct. Rt. 190 West	42.15	65	340	270
Hwy. 127 Nev. State Line	62.19	50	190	120
Badwater, D.V.	111.73	220	1400	880

To determine number of cars in a year past a given point, multiply Annual Average x 365. To determine number of visitor days: (Annual Average x 365) x 3.9.

The above data shows that between the Irwin Road, which was the first check point north of Baker, and the San Bernardino-Inyo County line, which is north of the dunes turn-off, there was no difference in the averages. This would indicate that the number of cars turning off for either Saratoga Springs or the dunes was minimal and not enough to have any effect on averages. A one-time spot check survey of use of the dunes in which a counter was used to determine usage, would not reveal enough data on which to base total visitor days. There would be no way to determine single cars passing over counter several times.

Visitor day figures based on highway use figures are only valid if the counter was in operation over a period of weeks and an average was taken. It would also depend greatly on where the counter was placed in relationship to recreation use, particularly if ORV use is the dominant use.

The traffic coming into Shoshone from the east must be mostly local traffic since that count has no increase effect on either the D.V. Jct. figure nor the San Bernardino-Inyo County figure.

The drop-off between the Inyo-S.B. County line and D.V. Junction can be attributed to local traffic into Tecopa, Tecopa Hot Springs, the local mines, Shoshone, the road into Death Valley over Jubilee Pass, Death Valley Junction and Ash Meadows, Nev.

In determining ORV use of sand dune use, highway use figures for Hwy. 78 between Brawley and Glamis provide a point a point of comparison.

COUNTER LOCATION	MILE POST	PEAK HRS.	PEAK MO.	ANNUAL AVER.
Eastern end of Brawley - Hw. 78	14.55	670	7,600	6,700
Glamis	41.00	75	730	610

This shows a great drop-off of cars between the outskirts of Brawley on Hw. 78 and Glamis, which forms somewhat of the eastern boundary of current dune use in the Algodones Dunes. Thus, it can be shown that most of the cars using Hwy. 78 are dunes users.

CONCLUSIONS

By using highway figures to analyze number of visitor days at the Dumont Dunes, it can be concluded the current ORV use of the dunes is insignificant in comparison with the Algodones (Imperial) Dunes.

It is not possible to extrapolate visitor use days of the Dumont Dunes by a counter placed near the dunes unless it would be placed at the junction of the dunes road and Hwy. 127 and left in position over a period of weeks. Resulting figures should be averaged and analyzed in correlation with Division of Highways figures. As soon as 1971 traffic counts in the area are available, the Pupfish Committee will forward data and analyses to the BLM.

PRESENT USES OF THE STUDY AREA

The study area is used by migrating birds for resting, water, and feeding. It is also a refuge for fauna not only in the study area, but in surrounding areas during years of drought. The study area provides habitat needs for many species of fauna, including several rare species and species highly endangered.

The area is also used for scientific research by scientists from the University of California, Riverside; University of California, Los Angeles; University of California, Berkeley; Stanford University, Pennsylvania State University, University of Nevada, Las Vegas; University of Southern California, California State College, Long Beach; University of Michigan, Ann Arbor; California State Polytechnic College, Pomona; Claremont College, Claremont; Natural History Museum, Los Angeles County, Los Angeles; Valley College, Van Nuys; Scripps Institute of Oceanography. Research is also being done by the Desert Fishes Council on the rare native fishes in the River. Studies are being carried out by the Pacific Coast Archaelogical Society.

The area is used by a very small amount of hikers, sightseers, and for picnicking. Camping is done only in connection with ORV use.

The area is currently used by ORV users, particularly dune buggies for dune recreation. This type of use is increasing. These users do leave the dunes area and race up and down the T & T roadbed in the canyon. They are running their vehicles off the T & T roadbed across the meadows and over the mud hills and benches, and through the river to cross back and forth at several points.

SOCIO-ECONOMIC CONSIDERATIONS: CONCLUSIONS.

From the analysis of available information discussed under Social and Economic Environment several conclusions are indicated.

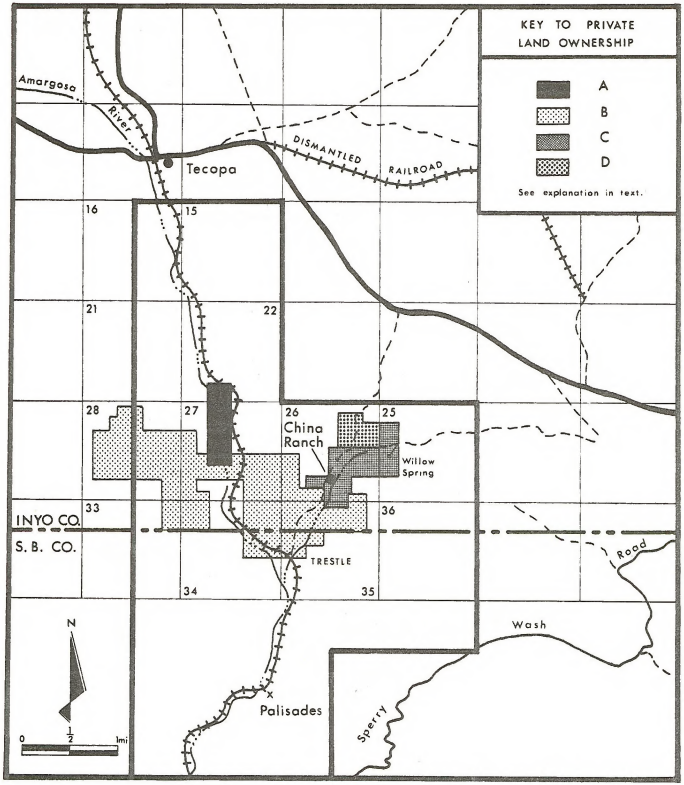
A. The population of the surrounding region is small. Economic activity is limited. Tourism, especially Death Valley Tourists, provide main source of income. It appears that current dunes use does not contribute very much, if any, to the Shoshone-Tecopa area. Most of the economy of Baker results from Las Vegas Tourism.

B. Highway use figures indicate that in comparison with total traffic passing through the area, few of these cars turn off into the dunes. The bulk of the tourists passing through the area are interested in Death Valley. Since ORV's are not permitted to be used for off-road recreation in Death Valley, it would appear that sightseeing, camping, and nature study-oriented activities are the main recreation goals of tourists in the area. Highway use figures for Badwater indicated this, for Badwater is a sightseeing point of interest.

C. In order for the local area to benefit commercially from tourist use of the study area, there would have to be some expansion and diversification of businesses. Most of the visitors are from urban areas. To expand the local economy to meet urban competition would not be successful, however. More tourist-oriented activities would have to be made available.

In this connection, it might be wise to point out that the local residents, in talking with members of the Pupfish Committee who surveyed the local socio-economic considerations, strongly indicated that they would like to be consulted on any plans BLM has for public lands in that area. They expressed concern over the current destruction of aethetic, natural, and cultural values in the area. It was mentioned that they were not interested in uses of public lands which would destroy the land itself, or the values which bring tourists to their area. They also expressed the desire that public hearings be held on any proposed BLM use of the public lands in the local area.

PRIVATE LAND OWNERSHIP



PRIVATE INHOLDINGS

There are several private inholdings in the study area. They are as follows:

(See accompanying Land Ownership Map.)

MAP KEY	ACRES	LOCATION	OWNER(S)
A	160	T. 19 N. R. 7 E. Sec. 22,27 Inyo Cnty.	Mark A. Modine & D. L. Modine Box 97 Orem, Utah 84057
B	440 640	T. 19 N. R. 7 E. Sec. 33, 34, 35 26, 27, 28 Inyo Cnty. 33, 34, 35 San Bernardino Cnty.	Pacific Nitrate Co. c/o Donald D. Hess 2913 Via San Gorgonio San Clemente, California 92672
C	218.24	T. 19 N. R. 7 E. Sec. 26, 35, Inyo Cnty.	(China Ranch) Chas. F. Brown & Bernice B. Sorrells Box 38 Baker, Calif. 92309
D	80	T. 19 N. R. 7 E. Sec. 26 Inyo Cnty.	Bestwall Gypsum Co. c/o Georgia Pacific Corp. 900 S.W. 5th Portland, Oregon 97204

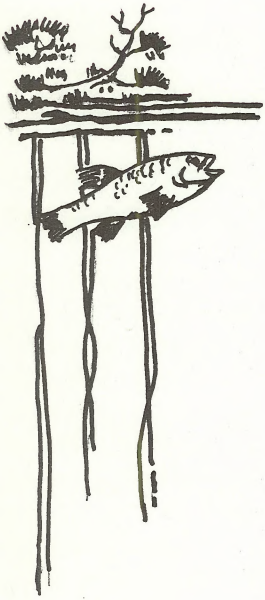
The inholdings cut across the middle of the gorge as can be seen on the map. There is no evidence that Pacific Nitrate has ever closed their property to the public. China Ranch does have a gate at the west end of their property.

No attempts were made to contact owners of the Pacific Nitrate, Modine, or Bestwall inholdings.

The University of California is at present interested in the China Ranch property. However, the present owners of the ranch are very much aware of the scientific and cultural values, of the valued wildlife, of the beauty of the area. They are eager to protect these values, not only on the ranch, but in the canyon. (See Brown letter). Therefore, it does not seem necessary for BLM to purchase this property at this time. There is no need for access to the gorge by the public through the China Ranch property. (See Roads and Trails; Protection of Values in Management Proposals and Recommendations.) The very center of the gorge is the most critical and most delicate part of the canyon. By permitting public access to the gorge through China Ranch would be to invite destruction of fragile values. Only those authorized to do so should be permitted to drive vehicles through the ranch and to camp at the Willow Creek confluence.

It is recommended that if the BLM does not at present have the necessary funds to purchase the Pacific Nitrate, Modine and Bestwall tracts that they immediately contact the Nature Conservancy and make cooperative agreements with them to purchase this property as soon as possible and hold it until such time as BLM has the funds and can then purchase the property from the Nature Conservancy.

Most of the members of the Pupfish Committee are members of the Nature Conservancy. One of the Committee members has worked closely with Nature Conservancy on other projects. If the Pupfish Committee can be of any help to BLM in Nature Conservancy negotiations, it will be happy to do so.



THE FUTURE

BLM INVENTORY AND EVALUATION OF STUDY AREA

The following recreation complex or recreation area inventory and evaluation was prepared by Paul E. Petty, Recreation Resource Specialist, BLM Riverside District Office, and Field examiner for the BLM inventory of the study area. The report is signed by John S. Boyles, District Manager, BLM Riverside District Office, and dated August 6, 1970. The dates of the field examination were May 20-21, 1970. The report was submitted by the field examiner July 16, 1970.

BLM Riverside District office informed The Pupfish Habitat Preservation Committee that this report represents BLM information on the study area.

BLM Bakersfield District Office did not have a report on the portion of the study area under their jurisdiction and no information was submitted by that office.

The Pupfish Habitat Preservation Committee acknowledges the cooperation and courtesy extended by both offices in availing the Pupfish Committee of whatever information on the study area both offices had, either oral or written. On the pages following the BLM report, the Pupfish Committee submits their recommendations and proposals for the study area. These recommendations and proposals are the result of analyzing and correlating the scientific and research data submitted by scientists and specialists and government agencies to the Pupfish Committee after field surveys, studies and research of the study area.

Form 6110–2
(June 1969)
(formerly 4–1643)

UNITED STATES
DEPARTMENT OF THE INTERIOR
BUREAU OF LAND MANAGEMENT

RECREATION COMPLEX OR RECREATION AREA
INVENTORY AND EVALUATION

☐ Complex ☒ Area

District Control No.
C-04-66-55

1. Name: Dumont Dunes
Amargosa River Recreation Area

2. ORRRC Classification

Class	I	II	III	IV	V	VI
Acres			46,280	5,840		320

3. LOCATION

State	County(s)	District(s)
California	San Bernardino	Riverside

Master Unit(s)	Program Area(s)	Townships and Ranges
East Desert Resource Area	Kingston Planning Unit	Ts. 18, 19 N; Rs. 6, 7, 8 E.

4. LAND OWNERSHIP *(acreage)*

BLM	Other Federal	State or Local Governments
50,760		

Private			
Total	Percent over 1,000 acres	Percent less than 1,000 acres	Total *(all land)*
(See I) 2520	0	100%	53,680

5. GENERAL DESCRIPTION

Topographic and geologic features : The northern half of the Area is characterized by rough mountainous country cut in half by the narrow Amargosa River Valley. An outstanding geologic area showing excellent contrasts in color and form exists in this vicinity. The southern portion contains the Dumont Dunes which reach an impressive 450 feet above the surrounding level country. The Amargosa River is a flowing stream through the mountains but goes underground in the sandy soils of the lower valley.

Vegetative cover *(in acres)*

Commercial Forest	Woodland	Brush *(except sage)* 30%
Sage	Grass	Barren 70%

Outstanding Features *(scenery, rock formations, waterfalls, etc.)*

Dumont Dunes
China Ranch Geologic Area
Amargosa River
Abandoned Railroad and towns
Rough terrain suitable for off-road vehicle use

Undesirable Features *(snakes, mosquitos, poison plants, floods, logging, etc.)*

Mining Hazards
Hot summer weather
River Floods

Seasons of Recreation Use	Maximum Use Season
October 15 - May 15	Same

Precipitation *(annual)*	During Maximum Use Season	Humidity – Maximum Use Season
2-3	Same	☐ Moist ☐ Moderate ☒ Dry

Temperature Range *(annual)*	During Maximum Use Season	Winds – Maximum Use Season
40° - 115°	40° - 90°	☐ Heavy ☒ Moderate ☐ Light

6. ACCESS

Roads within boundary *(in miles)*

OWNERSHIP	EXISTING				Needed Additional Roads by 1976 *(miles)*			
	PAVED	GRAVEL	DIRT	TOTAL	PAVED	GRAVEL	DIRT	TOTAL
BLM								
Other Public	11		12	23				
Private	1			1				
TOTAL	12		12	24	Undetermined			

Existing Trails *(miles)*		Needed Additional Trails *(to 1976) (miles)*	
BLM 13	Other *(specify ownership)*	By BLM	By Others *(specify)*

Name of nearest airfield and distance away	Name of nearest airstrip and distance away
Baker 50 mi.	-

BLM acres inaccessible to public because of lack of physical access	BLM acres inaccessible because of closure on private land
10,000	-

7. WATER RESOURCES

Names of lakes, ponds, or reservoirs	Acres	Water characteristics *(silt, weed growth, pollution, temperature, etc.)*

Names of rivers and major streams	Miles	
Amargosa	11	Shallow stream through mountains then disappears into sand. A rare species of Chubs (Cyprinodon Nevadensis Amargosae), is found along this portion of the river.

Shoreline *(in miles)*	Length: Rivers_____ Lakes_____ Ponds_____ Reservoirs_____	Total frontage
	Guaranteed access to public_____ Closed to access_____	BLM frontage

Number of live springs and ownership in arid areas*

None

* *Show location on map*

8. SUITABILITY FOR RECREATION *(existing or potential)*

ACTIVITY	EXCELLENT	GOOD	FAIR	REMARKS
Wildlife and hunting: Big game				
Small game				
Upland birds				
Waterfowl				
Fishing: Cold water species				
Warm water species				Rare chubs are in the river, but they are not fishable.
Anadromus				
Saltwater				
Water sports				
Camping	Potential	Existing		Extensive use occurring in relation to dune activity.
Hiking, riding	Potential	Existing		Interesting rock formations. Abandoned railroad bed.
Picnicking		Potential	Existing	Tourist traffic
Sightseeing and Nature study	Potential	Existing		Dunes, Mtns., River, Rare fish
Winter sports				
Other *(specify)* Dune Buggy Activity	Existing Potential			Use is increasing at an alarming rate.

Suitability as winter range for big game*

Off-road vehicle use is becoming a major activity in the area.
The dunes are being used by buggies and the washes throughout the area are being explored by cyclists and 4-wheel drive enthusiasts.

9. DEMAND

A. Relation of complex or area to population centers *(number of cities and towns)*

DISTANCE FROM CENTER	500–10,000	10,000–50,000	50,000–500,000	OVER 500,000	TOTAL POPULATION
Within 50 miles	3				1,000
50 – 250 miles		Los Angeles Basin			10,000,000

* *Show location on map*

B. User demand classification *(in percentages)*

	LOCAL *(within 50 miles)*	STATE *(except local)*	OUT OF STATE
Present	5%	85%	10%
Potential *(with development)*	Less than 1%	90%	10%

C. Visitation

Current number of yearly recreation visitor days	Number expected in 1976 *(with development)*
10,000 visits	30,000

D. Recreation use

TYPE OF USE	PRESENT			POTENTIAL TO 1976 *(consider optimum development)*		
	HEAVY	MODERATE	LIGHT	HEAVY	MODERATE	LIGHT
Camping		X		X		
Fishing						
Hiking and riding		X		X		
Hunting						
Picnicking			X		X	
Sightseeing and Nature study		X		X		
Water sports						
Winter sports						
Other *(specify)* Dune Play		X		X		

10. LAND USE *(in order of importance)*

Present uses of land		Potential uses of land by year 2000 *(consider optimum development of all resources.)*	
1	Dune Buggy Activity	1	Dune Buggy Activity
2	4-wheel drive Activity	2	Visiting Historic Sites & Natural Areas
3	Motorbike Activity	3	4-wheel drive Activity
4	Camping	4	Motorbike Activity
5	Visiting Historic Sites & Trails	5	Camping
6	Picnicking	6	Picnicking

11. CONCLUSIONS AND RECOMMENDATIONS

A. Existing or recommended buffer zones and scenic strips

ADJACENT TO	MILES		AVERAGE WIDTH	ACREAGE	
	EXISTING	RECOMMENDED		EXISTING	RECOMMENDED
Major highways		10	1 Mi		6,400
Secondary roads		13	1 Mi		8,320
Railroads		13	1 Mi		8,320
Recreation sites					1,280
Rivers or streams					
Lakes or Reservoirs					
Other *(specify)*					
TOTAL		33			24,320

B. Recreation areas within boundary *(leave blank if recreation area evaluation)**

TYPE *(Natural, scenic, etc.)*	NUMBER		ACREAGE	
	EXISTING	POTENTIAL	EXISTING	POTENTIAL
China Ranch Geologic Area				1,360
Dumont Sand Dunes Geologic Area				4,480

C. Recreation sites on BLM land within boundary*

TYPE	NUMBER		ACREAGE	
	DEVELOPED	UNDEVELOPED	DEVELOPED	UNDEVELOPED
BLM recreation sites		2		640
Recreation homesite lease areas				
Joint development sites				
Potential transfer tracts				
Recreation reserve sites				
TOTAL		2		640

* *Show location on map*

D. Recreation sites within boundary, other than BLM* None

DEVELOPING AGENCY	TYPE (campground, historical, etc.)	NUMBER		ACREAGE	
		EXISTING	PROPOSED	EXISTING	PROPOSED

E. Cooperation with other agencies

(1) Cooperative arrangements with other agencies concerning recreation, wildlife, and other uses

Existing

None

Proposed

Arrangements are being made with the Calif. Fish & Game Dept. to study and protect the rare Cyprinodon Nevadensis Amargosae.

(2) Comments of others *(include views of other agencies, State and local governments, etc.)*

F. Major problems to be solved *(surveys, mining claims, trespass, easements, etc.)*

1. Private land blocks legal access to the dunes along existing road. The access road could go around the private land, if necessary. The public has not been restricted to date.
2. The old railroad bed has washed out in several locations. These washouts need to be repaired to permit use as a trail or access into the China Ranch Geologic Area.
3. Mining claims could be a problem in some locations.
4. One time use of the dunes alone have reached well over 1,000 during sports events. Large events of this nature need to be placed under management to assure resource protection, litter removal and public safety.

* *Show location on map*

G. Recommended land acquisition *(show acreages and dates)*

1. Block up the dunes by acquiring S½, Sec. 36, T. 19 N., R. 7 E.
2. Block up the China Ranch Geologic Area by acquiring portions of Secs. 34 and 35, T. 19 N., R. 7 E.,

H. Recommended land tenure arrangements

1. Obtain access easement through Sec. 36, T. 19 N., R. 6 E.,
2. Obtain access easement through China Ranch and along Amargosa River to reach the Geologic Area.
3. Obtain access along abandoned railroad grade, where necessary.
4. -

I. Other recommendations and supplemental remarks
(attach additional sheets if necessary)

4. Land Ownership

Private and State lands were not separated.

9.c Visitation

10,000 visitors include attendance at special events but does not include sightseeing from S.H. 127. Traffic on this road averages 500 vehicles per day. The peak month daily traffic average is 760. Counting this traffic, an additional 182,500 people pass through the area and enjoy the scenery to varrying degrees.

12. REFERENCES *(information and data from other sources)*

Mac Donald, Angus A. The Northern Mohave Desert's Little Sahara. Mineral Information Service, Vol 23, Number One, January 1970.

13. ADDITIONAL REQUIREMENTS

Attach necessary map or maps to illustrate: land status (½" = 1 mile or greater) showing Federal and other major land owners; population centers; roads; trails; lakes; rivers; major streams; proposed land tenure arrangements; proposed land acquisition; existing and proposed recreation sites, transfer tracts, buffer zones, scenic strips, important big game winter range, and any other significant features. Utilize topographic and highway maps, master title plats, etc., as appropriate. Include photos when feasible.

14. ENDORSEMENTS

Date of field examination	Date of report
May 20-21, 1970	July 16, 1970
Field examiner's signature Paul E Petty	Title Recreation Resource Specialist

Comments of District Manager

Extensive development of the area is not recommended at this time. Users prefer the natural aspects of the area and do not mind the lack of elaborate facilities. Use is highly sporatic, ranging from nearly zero use on a summer weekend to 2000 or more people at one location during a sports rally. Sanitation and Protection facilities are needed on a temporary basis for these rallies. The placement of garbage cans and regular pick up of garbage is needed at least weekly during the use season.

District Manager's signature	Date
John L Coughlin	August 6, 1970

Comments of State Director

State Director's signature	Date

GPO 850-905

PROPOSALS AND RECOMMENDATIONS

PROPOSED USES:

THE EVIDENCE PRESENTED AND DISCUSSED IN THE BODY OF THIS REPORT SUPPORTS THE RECOMMENDATION FOR THE FOLLOWING CLASSIFICATIONS OF THE STUDY AREA:

CLASS IV - OUTSTANDING NATURAL AREA

CLASS VI - HISTORIC AND CULTURAL SITES

Proposed uses for the area are as follows:

PRIMARY USES

A. Wildlife Sanctuary
B. Scientific Research

OTHER USES

A. Nature Study
B. Hiking/Walking (Day Use Only)
C. Sightseeing
D. Wildlife Observation
E. Photography
F. Picnicking (in dunes area.).
G. Camping (in dunes area.)

Because of the presence of rare and endemic and highly endangered species such as the native fishes, raptors, mammals, crayfishes, insects and any as yet undiscovered rare, endemic, or endangered species, this area deserves protective withdrawal. This area is also a major migration route for birds of all kinds.

There are several kinds of ecosystems that comprise the total ecosystem of the study area. Disturbance and destruction of any of these will have an effect on the entire ecosystem. It is of prime importance that nothing disturb the flow and quality of the springs, creek, and River. Protection of these natural values is only possible through protective withdrawal.

The area is rich in paleontological, archaeological, and historical values; to continue to permit wheeled vehicles and ORV's in the area would constitute a violation of the Antiquities Act. The area deserves to be given protective withdrawal status

for this reason, also.

Nature study, hiking/walking, sightseeing, wildlife observation, and photography are all uses which would be compatible with the values in the area.

However, it must be emphasized that these uses should be day-use only activity. No camping, except by those authorized to do so, should be permitted in the canyon from Tecopa down to the dunes. A campground and picnic area would be compatible near the dunes. (See Recommendations: Campgrounds.) Overnight camping and backpacking would be an incompatible use of the canyon area. The water flow and quality in the River must be maintained. The ecosystems and paleontological and archaeological values are too fragile. The only logical place to camp in the canyon is at the Willow Creek Confluence. This area is very fragile; archaeological values are located in this same area. These archaeological sites have not yet been disturbed, nor studied. Any camping in the area would destroy these values. People like to explore the immediate area around a campsite. This is part of the enjoyment of camping. The canyon just simply could not maintain ecological and cultural values if camping or overnight backpacking were allowed in the canyon. Primary uses should be that of wildlife sanctuary and scientific research, and nature oriented activities. The presence of too many humans will be detrimental to wildlife. (See Zoology.) It would also be destructive of botanical areas. (See Botany.)

Camping should be permitted near the dune. The dunes provide a wonderful play area for people of all ages who like to hike, climb, slide and just generally enjoy dunes. The success of Great Sand Dunes National Monument in Colorado proves this. People can enjoy dunes without fear of vehicles. The dunes in Death Valley are very small. Opening the Dumont Dunes for dune play (sans vehicles) would take some of the pressure off the dunes areas in Death Valley.

PROPOSED EXCLUDED USES:

In order to maintain the values of the study area, it is recommended that the following uses be excluded from the study area:

A. ORV use of all kinds.
B. Motorized vehicle use in the canyon north of Sperry and south of Tecopa.
C. Overnight backpacking.
D. Camping in the canyon.
E. Fossil, artifact, historical object hunting and collecting, use of R.R. ties in the study area for firewood, and Rock-hounding.

F. Trapping and collecting of any species of fauna without authorization from California Department of Fish & Game; these would be permitted for scientific research only.
G. Hunting, shooting, target-practice.
H. Cattle-grazing.

The above-named exclusions are necessary to maintain the values on the study area. If any of these uses are permitted in the canyon, the primary uses (Wildlife Sanctuary, Scientific Research) would be impossible. This has been documented in scientific data. (See ADDEND ON DUNES, p.118.A.)

DEGREE OF COMPATIBILITY AND INCOMPATIBILITY OF PROPOSED USES AND PROPOSED EXCLUSIONS

The proposed exclusions are totally incompatible with proposed uses.

RESOLUTION OF CONFLICTS: ALTERNATE LOCATIONS FOR CURRENT ORV USERS

It is recommended that current wheeled vehicle-users who would be displaced from the study area could avail themselves of areas currently designated by BLM as ORV areas.

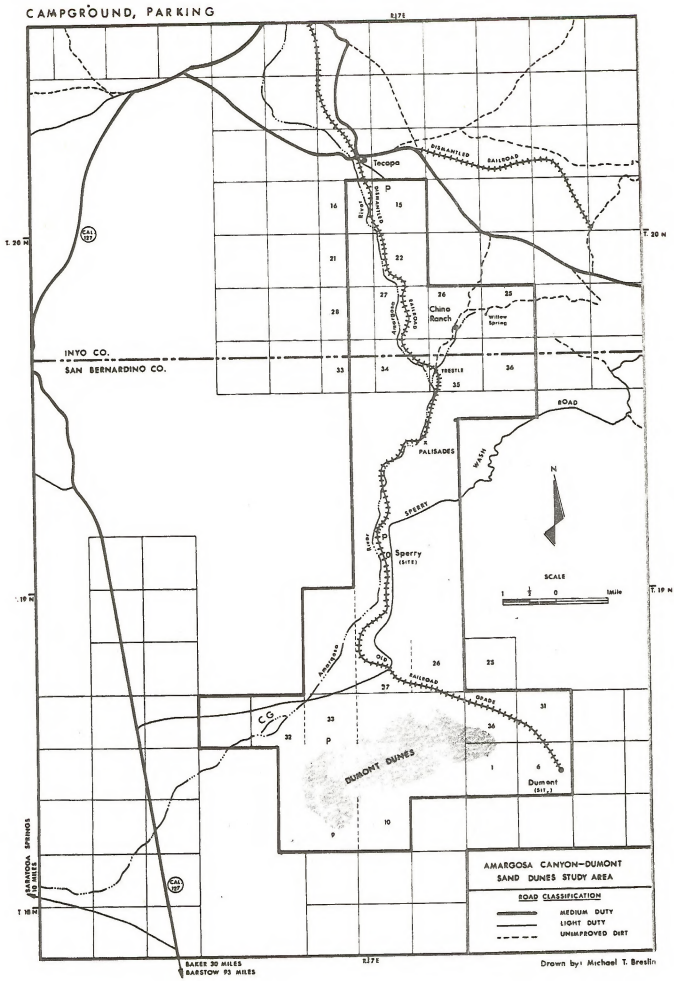
ALTERNATE USE PROPOSALS

In addition to the proposed uses and proposed exclusions, two more alternatives for use of the study area are included in choice of use proposals:

A. Designation of study area as a recreation area open to unrestricted ORV use.

B. Do nothing.

The result of either of these alternatives would be to destroy the values discussed in this report which are inherent in the study area. The cumulative effect of ORV use and misuse in general is alarmingly destructive. The BLM has acknowledged this in published reports and public statements.


CAMPGROUND, PARKING
R17E
Tecopa
DISMANTLED RAILROAD
Old Spanish Trail
T. 20 N
CAL 127
China Ranch
Willow Spring
INYO CO.
SAN BERNARDINO CO.
TRESTLE
ROAD
PALISADES
MAIN
SPERRY
Sperry (Site)
N
SCALE
1 0 1 mile
T. 19 N
OLD RAILROAD
ROADS
CG
DUMONT DUNES
Dumont (Site)
AMARGOSA CANYON—DUMONT SAND DUNES STUDY AREA
ROAD CLASSIFICATION
MEDIUM DUTY
LIGHT DUTY
UNIMPROVED DIRT
BAKER 30 MILES
BARSTOW 93 MILES
R17E
Drawn by: Michael T. Breslin

ADDED BENEFITS OF WITHDRAWAL

A protective withdrawal as proposed by the Pupfish Committee may provide some of the non-camping oriented activities that would bring some economic benefit to Shoshone, Tecopa, and Tecopa Hot Springs.

The general benefit which would be derived from preservation of the various values are discussed in the scientific portion of this report. Protective withdrawal would also preserve the pristine nature of the canyon and allow time to heal the destruction which has already taken place of both the canyon and dunes area.

CAMPGROUNDS, PARKING AREAS

A campground is recommended near the dunes at a site on the north side of the River. (See Map: CG). Visitor day use carrying capacity of the study area should be determined before size of campground is finalized. Parking areas could be provided at Sperry site and at Tecopa at the northern end of the canyon. (See Map: P). A small parking area could be placed near dunes. (P)

ROADS, TRAILS

There may need to be some road improvement from the proposed campground to Sperry site to stabilize sandy sections. The existing road is adequate except for one place where loose sand is a problem. (For Sperry Wash Road, see Addend p.118.)

A dirt road could be maintained from the campground to the dunes parking area.

No other roads would be necessary in the study area. Access to the canyon for special authorized use and for management purposes could be obtained from the owners of China Ranch.

The T & T roadbed should be designated as a trail. Certain areas could be identified as wildlife observation points. Certain areas such as the meadows and marshes and mud hills should be off-limits to hikers. BLM should carefully study the area and mark out designated trails. The Pupfish Committee would volunteer to help with this since the area is so very well known by them. Ecological and cultural values must be preserved and protected from destruction by hikers.

HISTORIC SITES

It is recommended that Sperry site, the T & T R.R. bed, old ties, buildings and artifacts of historical interest remain as they are. No restoration nor improvements should be made. The area should be permitted to revert to a natural situation. In the dry air and low precipitation of this area, these historic sites will be able to be enjoyed for years to come before they disappear.

INTERPRETATION, EDUCATION

Educational and information signs as may be necessary to protect and describe the area should be placed at advantageous locations. Suggested sites are at Tecopa and Sperry Station, at the dunes and where necessary in the canyon to protect ecological and cultural values.

WAY STATION

It is recommended that a way station be situated at Tecopa which would serve as a "Gateway to the Death Valley Region." This would enable BLM to communicate with those tourists using BLM lands in the Baker, Shoshone and Tecopa area plus tourists coming in from Las Vegas via the Kingston Road. It would in the future service visitors to the Kingston area. There is water available in Tecopa and the area is within easy driving distance of Las Vegas to enable BLM employees to have access to an urban area for their needs.

An alternate location would be Shoshone. This, too, would service visitors from the Las Vegas area.

The two choices should be investigated. Either choice would benefit both communities economically.

SEWAGE DISPOSAL FACILITIES

Because the study area is lacking in water for the recommended camp-site location near the dunes and suggested way station in Tecopa, it is suggested that the BLM investigate the following sewage disposal system as an alternative to either the flush toilets with water as a flush medium or primitive toilets.

This is a Chrysler product called AQUA-SANS. A short description follows and additional information may be obtained from either:

Mr. L. J. Van Rossen
Manager, Southeast Office
Defense-Space Group
Box 4126, Farley Station
Huntsville, Alabama 35802
Phone: 205 - 895-1446

or

Chrysler Corporation Space Division
Marketing Department
P. O. Box 29200
New Orleans, Louisiana 70129
Phone: 504 - 255-2189

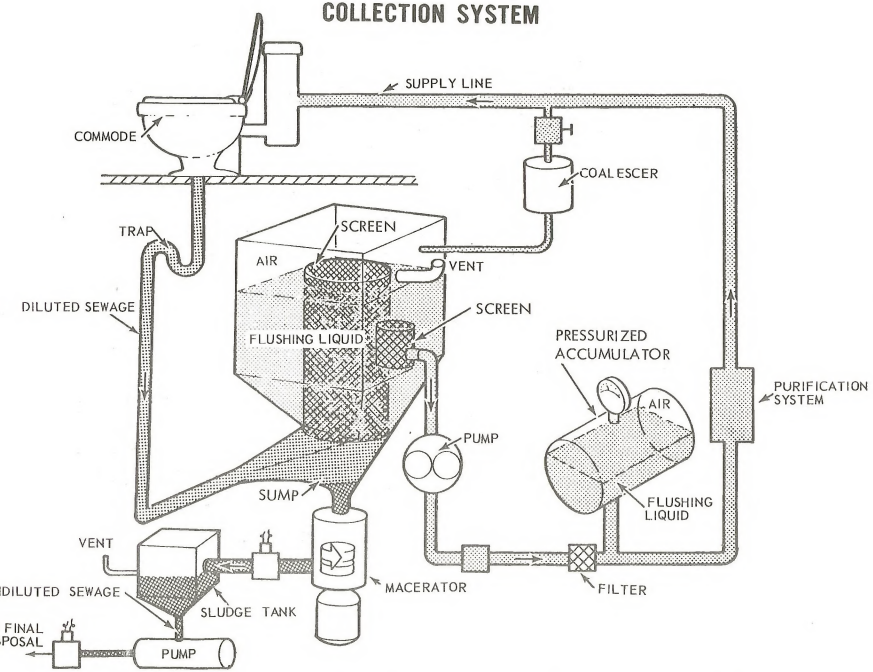
The Pupfish Committee has not been reimbursed in any manner for including recommendations for this particular system. It was brought to their attention by way of a conversation with Mr. Van Rossen. The information is merely offered as a suggestion which might solve the problems of sewage disposal in the campgrounds and interpretive centers in arid regions. There might be other similar systems; however, we believe this one is unique. It is already in use in a national park and on Navy ships; units are being built for the Air Force and a commercial dredging company. It would seem to be capable of solving a sewage disposal problem in water scarce areas.

Aqua-Sans is a unique sewage system developed by Chrysler to provide effective prevention of pollution and to conserve our water resources. This system makes it possible to comply with the National Environmental Policy Act. This system is a development in sewage treatment resulting from spaceage technology.

A key feature of the system is the use of an inexpensive mineral oil to replace water as the flushing fluid. Continually recycled in a closed-loop system, this fluid carries human waste and related materials to a tank where sewage rapidly separates from the flushing fluid. The flushing fluid separates by gravity and is filtered, purified, and recycled.

The undiluted sewage is transported by vacuum lift or liquified in a macerator and then fed into one of several optional disposal systems.

The volume of waste material is reduced 98% from a conventional water flush system. Since the flushing fluid is separated and recovered, only undiluted waste is collected. This results in minimum space and power requirements both in the sewage collection and disposal systems.


COLLECTION SYSTEM
SUPPLY LINE
COMMODE
COALESCER
TRAP
SCREEN
AIR
VENT
DILUTED SEWAGE
SCREEN
FLUSHING LIQUID
PRESSURIZED ACCUMULATOR
PURIFICATION SYSTEM
AIR
PUMP
SUMP
FLUSHING LIQUID
VENT
UNDILUTED SEWAGE
SLUDGE TANK
MACERATOR
FILTER
TO FINAL DISPOSAL
PUMP

AQUA-SANS SPECIFICATION SHEET

MODEL NO.	LENGTH (inches)	WIDTH (inches)	DEPTH SUMP BOTTOM (inches)	DEPTH TANK BOTTOM (inches)	CAPACITY OF TANK (gallons)	CAPACITY OF SUMP (gallons)	INCINERATOR BATCH BURN SIZE (gallons)	POWER REQ'MT. (PEAK) (KW)	CAPACITY EQUIVALENT (GPD)
A					60	5	2-1/2	2	500
B	80	36	41	30	300	8	6	3	4,000
C	95	48	51	34	500	22	10	4	8,000
D	95	60	60	43	900	22	20	5	15,000

NOTES: 1. TOTAL OPERATING AND MAINTENANCE COST: 0.8¢ PER FLUSH

2. FUEL CONSUMPTION: 1 GALLON OF FUEL PER 3.3 GALLONS WASTE

3. INCINERATOR DIMENSIONS:

MODEL NO.	LENGTH (inches)	WIDTH (inches)	HEIGTH (inches)
A	34	25	39
B	TO BE DETERMINED		
C	38	32	44
D	TO BE DETERMINED		

2/28/72

The flushing fluid used in the Aqua-Sans system is an inexpensive mineral oil that is readily available and it can be dyed or scented to preference. Biocide is added to eliminate bacterial from the flush fluid. Tests indicate a fluid life of several years. Research is being conducted to extend this. The flush fluid is non-toxic, non-allergenic, fire resistant and non-corrosive.

Chrysler specialists analyze specific needs to determine which disposal system is most suitable. Three types are available: incinerator, biological decomposition, and bulk storage.

Four models are available. Model A - serves the daily requirements of 12 people or 500 gallons of sewage a day. Model B - 110 people or 4,000 gpd; Model C - 260 people or 8,000 gpd; and Model D- 410 people or 15,000 gpd.

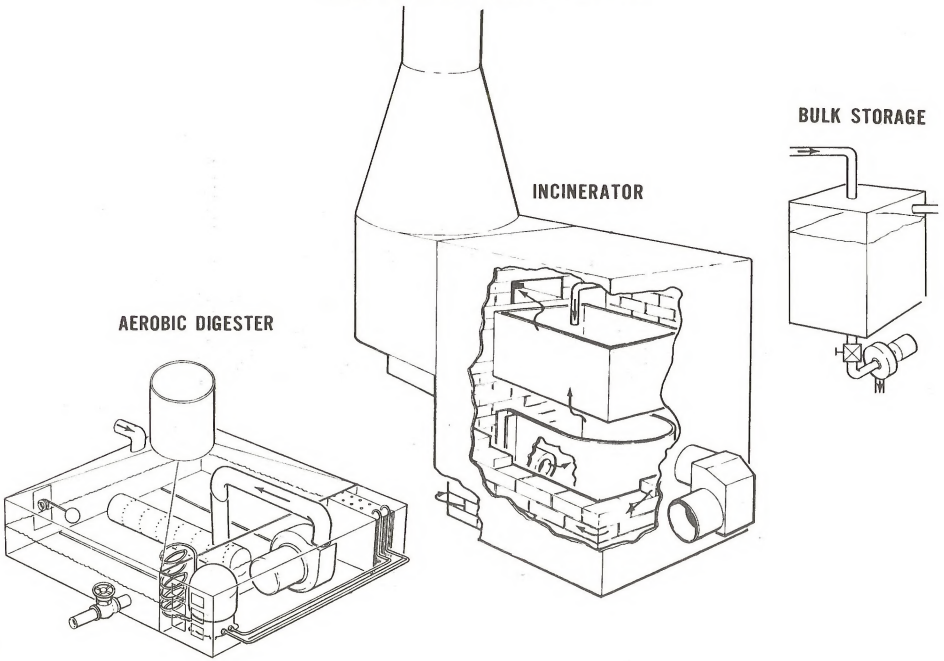
See Aqua-Sans specification sheet for other details. A functional description of one of the models - Model B is described here.

The system operates as follows - waste is transported by the flush fluid from the commodes to the separation system. The waste separates and settles in the sump while the flush fluid rises to the top. Gross solids and floating particles are removed by the inlet screen - the flush fluid then overflows the inlet tank into the main tank, where the coalescer removes any entrained urine or water. Flush fluid is recirculated to the commodes by the pump module, through the primary pump, and the primary filter. The pump is activated by the pressure switch, and an accumulator is provided to prevent surges and meet peak flow conditions.

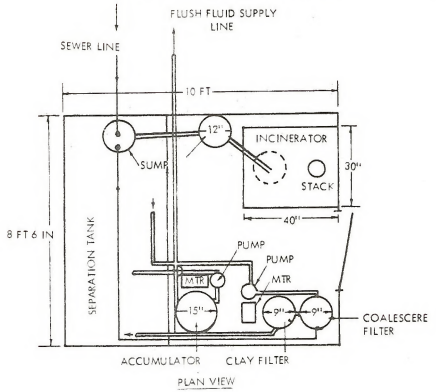
When sufficient waste accumulates in the sump, it is detected by a level sensor. This activates the vacuum blower and transports the waste to the metering tank. Operation of the vacuum blower is timed to transport approximately 6 gal. of undiluted waste into the metering tank. A float valve prevents waste from entering the blower. Upon completion of the waste transfer sequence, the waste valve opens and the waste drains into the crucible of the incinerator. When the waste valve closes, a timed burn cycle is initiated, starting the blowers and fuel pumps, and igniting the two burners.

The system is fully automatic and manual operations are limited to emptying incinerator ashes on a weekly basis and adding biocide to the commodes once a week. Incinerator ash is completely sterile and consists mainly of salts which can be conveniently disposed of.

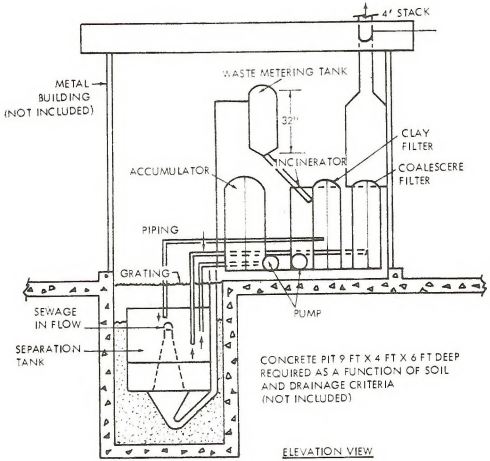
DISPOSAL SYSTEMS AVAILABLE



SEWAGE DISPOSAL SYSTEM



PLAN VIEW



ELEVATION VIEW

Periodic replacement of the primary filter element will be necessary, when the differential pressure gage exceeds 17 psid. Replacement of the flush fluid and coalescer should not be necessary more frequently than on a yearly basis, but operating data is not presently available to substantiate this time period.

Detailed operating and maintenance instructions will be included with the system.

Either this system or an equal alternative might be the answer to sewage disposal problems in the desert areas.

PROTECTION OF VALUES OF THE STUDY AREA

A. BLM should use what authority it now possesses to maintain and protect values of the study area.

B. It is also suggested as an alternate proposal to those already discussed that in order to maintain and protect values in the study area, that BLM could make cooperative arrangements with the California Department of Fish and Game for an ECOLOGICAL RESERVE as described in the Fish and Game Code, Article 4. Ecological Reserves, Added by Stats. 1968, Ch. 1257 and also Fish and Game Commission - Title 14: Register 72, No. 5 - (1-29-72) Chapter 10. Statement of code follows.

ARTICLE 4. ECOLOGICAL RESERVES
(Added by Stats. 1968, Ch. 1257)

1580. For the purpose of protecting rare or endangered wildlife or aquatic organisms or specialized habitat types both terrestrial and aquatic, the department, with the approval of the commission, may obtain by purchase, lease, gift or otherwise, land and water for the purpose of establishing ecological reserves. Such ecological reserves shall not be classed as wildlife management areas pursuant to Section 1504 and shall be exempt from the provisions of Section 1504.

(Added by Stats. 1968, Ch. 1257.)

1581. Any property acquired in fee for ecological reserves shall be acquired in the name of the state, and shall, at

all times, be subject to such rules and regulations as may be prescribed from time to time by the commission for the occupation, use, operation, protection, and administration of such property as ecological reserves.

(Added by Stats. 1968, Ch. 1257.)

1582. The department shall do all things necessary to secure a valid title in the state to the property acquired in fee for ecological reserves but no payment shall be made therefor until the title is vested in and satisfactory to the state. No such land will be acquired by eminent domain.

(Added by Stats. 1968, Ch. 1257.)

1583. Except in accordance with the regulations of the commission it is unlawful to enter upon any ecological reserves established under the provisions of this article, or to take therein any bird or the nest or eggs thereof, or any mammal, fish, mollusks, crustaceans, amphibia, reptiles or any other form of plant or animal life.

(Added by Stats. 1968, Ch. 1257.)

1584. As used in this article, "ecological reserve" refers to land or land and water areas preserved in a natural condition for the benefit of the general public to observe native flora and fauna and for scientific study.

(Added by Stats. 1968, Ch. 1257.)

FISH AND GAME COMMISSION
TITLE 14: (Register 72, No. 5-(1-29-72)
CHAPTER 10. ECOLOGICAL RESERVES

635. Ecological Reserves. The primary purposes of Ecological Reserves are to preserve land or land and water areas so designated in a natural condition and to protect the aquatic organisms and wildlife found thereon for public observation and scientific study. Public entry and use of Ecological Reserves shall be subject to and compatible with the primary purposes.

(a) Taking of Plant and Animal Life. No person shall disturb or take any bird or nest or eggs thereof or any mammal, fish, mollusk, crustacean, amphibia, reptile or any other form of plant or animal life from an Ecological Reserve except as provided in paragraphs (b) and (c) of this section.

(b) Fishing. Fishing shall be allowed in accordance with the general fishing regulations of the commission except that the method of taking fish shall be limited to angling from the shore. No person shall take fish for commercial purposes in any Ecological Reserve except by permit from the Fish and G Game Commission.

(c) Collecting. No person shall shoot, net, trap or otherwise take any bird or mammal or aquatic organism other than fish except by permit from the Fish and Game Commission. Such permit shall specify the number of each species, method of taking, time of taking and such other limitations deemed necessary to minimize conflicts with the primary purposes and orderly operation of the area. Any person applying for a permit to take birds, mammals or aquatic organisms in an Ecological Reserve must possess a valid scientific collector's permit issued pursuant to Part 3 of this Title.

(d) Motor Vehicles. No person shall drive, operate, leave or stop any motor vehicle, bicycle, tractor, or other type of vehicle in an Ecological Reserve except on designated access roads and parking areas.

(e) Swimming. No person shall swim, wade, dive, or use any diving equipment within an Ecological Reserve except as authorized under the terms of a permit issued pursuant to subsection (c).

(f) Boating No person shall launch or operate a boat within Ecological Reserve except by permit from the Fish and Game Commission.

(g) Trails. The department may designate areas within an Ecological Reserve where added protection of plant or animal life is desirable, and may establish hiking or walking trails or paths within such designated areas. No person shall walk or hike in such areas except upon the established trails or paths.

(h) Firearms No person, excluding authorized personnel, shall use, fire or discharge any firearm, bow and arrow, air or gas gun, or any other weapon of any kind within or into an Ecological Reserve.

(i) Ejection. Employees of the department may eject any person from an Ecological Reserve for violation of any of these rules or regulations or for disorderly conduct, intoxication or for any reason when it appears that the general safety or welfare of the Ecological Reserve or persons thereon is endangered. The decision, in such respect, of any department employee assigned management or enforcement responsibilities for the Ecological Reserve shall be final.

(j) Public Entry Public entry for any or all purposes may be restricted on any or all of the area at the discretion of the department to protect the wildlife or habitat of the area.

HAZARDS

There are several mines in the study area which have deep, open shafts which should be covered and/or posted as unsafe.

The mud caves and holes in the study area are unstable. Visitors should be warned not to explore these holes and caves. These are merely the result of erosion in the mud.

The trestle over Willow Creek is not safe for heavy vehicles. The dune buggies are currently driving over the trestle, but the Pupfish Committee noticed general deterioration of the structure between October 1971 and March 1972. If the T & T roadbed is to be the official hiking trail in the canyon, it might be necessary to have some repair work and stabilization work done on the trestle. This would have to be investigated.

Snakes, floods, and intense summer heat cannot be classified as hazards because these are natural phenomena. Desert visitors must be made aware of the presence of natural phenomena which could cause problems if common sense is not used. This is primarily a problem of education. These natural phenomena are an integral part of the ecology of the study area. They are all necessary for the maintenance of the ecosystems in the study area. No tampering must be done to the river; nor should the wildlife be disturbed or killed. Each species is important, even venomous reptiles.

INTERAGENCY COOPERATION

It is recommended that BLM institute an interagency communication procedure in the management of the entire study area. Agencies involved or affected would or could be: California Department of Fish and Game, U. S. National Park Service, U. S. Soil Conservation Service, U. S. Geological Survey, U. S. Bureau of Reclamation, U. S. Bureau of Sports Fisheries and Wildlife.

The Bureau of Reclamation has tentative plans for an Amargosa River Project in Nevada which could spell disaster

for the wildlife in the study area. It is recommended that BLM protect downstream values on public lands under their jurisdiction.

CADASTRAL SURVEYS

Cadastral surveys will have to be completed for the area. However, it is recommended that tentative boundary lines for the natural area be drawn and the surveys completed after protective withdrawal since time is of the essence.

ADDEND TO PROTECTION OF VALUES

Some kind of fence will have to be installed at strategic points on the T & T roadbed in the canyon at the northern end at Tecopa and the southern end at Sperry. This fence could be the type that permits entrance by people, but does not let vehicles through. Besides the fence, signs posting the area as "closed to wheeled vehicles" should be installed.

ADDEND TO ROADS, TRAILS.

It is recommended that motorized vehicle use be permitted on that portion of the Sperry Wash Road which cuts across the Study Area. The current alignment of the road from the Sperry Site turnoff to Tecopa is such that there will be minimal adverse effect on the ecology of the area if the road continues to be used. However, no off-road driving should be permitted on any portion of the Sperry Wash Road within the boundaries of the proposed Natural Area. This would have detrimental effects. The Sperry Wash Road from the dunes to Tecopa provides an interesting route in the back country near the Study Area. It is recommended that theBLM leave the road as it is from Sperry Site to Tecopa. No improvements are necessary. Passenger cars can use the highway from Tecopa to the dunes. There may have to be some improvement of the road between the dunes and Sperry Road. (See Roads, Trails.) The Sperry Wash Road should be posted at several locations as closed to off-road driving.

ADDEND TO SUMMARY, CONCLUSIONS AND RECOMMENDATIONS FOR THE DUMONT DUNES

It is further recommended that the BLM take into consideration the following points regarding classification of the Dumont Dunes.

A. Highway use figures analysis discussed in this report indicate that the current use of the dunes is insignificant in relationship to total dunes use in the Mojave Desert and also insignificant in relationship to use of the Algondones (Imperial) Dunes. Thus this indicates that current users do not necessarily prefer the Dumont Dunes to any other dunes. The fact that so few users utilize the Dumont Dunes would indicate otherwise.

B. Although the use of the Dumont Dunes has probably increased in the last year, there are no figures to state with certainty that this is the case. Analysis of 1971 Highway Department use figures for the area would be necessary to determine this. There is no indication that the population pressures have become so great on dunes use that this dunes system is absolutely necessary to off-road vehicle users at this time.

C. In view of the fact that the BLM is opening a new road in the Imperial Dunes and building several campgrounds in that area which will result in many thousands of acres of available sand riding use in addition to that already being utilized, it would seem premature to classify a very fragile dune system for ORV use until it can be seen whether or not the new areas opened for the ORV users are sufficient for the numbers of current users of dune buggies. The new areas opened in the Imperial Dunes will absorb the current Dumont Dunes users.

The smaller dunes systems which are more fragile should be protected. If numbers of dunes users increase to the point where opening of other dunes systems is necessary, then evaluations of the smaller, more fragile dunes systems can again be made. It would be prudent to keep destruction of small dunes systems to the minimum.

There are currently pressures on the small dunes systems because so little of the Imperial Dunes was accessible to dunes users. However, this will no longer be the case.

In summary, it is recommended that the BLM adopt a "wait and see" attitude on classifying the small, fragile dunes systems for unrestricted ORV use until it can be determined how many visitors the Imperial Dunes can accommodate with new roads and campgrounds opened up.

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APPENDIX

THE APPENDIX

PART I

DATA REFERRED TO IN THE

BODY OF THE REPORT

EXECUTIVE ORDER 11644

Use of Off-Road Vehicles on the Public Lands

An estimated 5 million off-road recreational vehicles—motorcycles, minibikes, trail bikes, snowmobiles, dune-buggies, all-terrain vehicles, and others—are in use in the United States today, and their popularity continues to increase rapidly. The widespread use of such vehicles on the public lands—often for legitimate purposes but also in frequent conflict with wise land and resource management practices, environmental values, and other types of recreational activity—has demonstrated the need for a unified Federal policy toward the use of such vehicles on the public lands.

NOW, THEREFORE, by virtue of the authority vested in me as President of the United States by the Constitution of the United States and in furtherance of the purpose and policy of the National Environmental Policy Act of 1969 (42 U.S.C. 4321), it is hereby ordered as follows:

SECTION 1. *Purpose.* It is the purpose of this order to establish policies and provide for procedures that will ensure that the use of off-road vehicles on public lands will be controlled and directed so as to protect the resources of those lands, to promote the safety of all users of those lands, and to minimize conflicts among the various uses of those lands.

SEC. 2. *Definitions.* As used in this order, the term:

(1) "public lands" means (A) all lands under the custody and control of the Secretary of the Interior and the Secretary of Agriculture, except Indian lands, (B) lands under the custody and control of the Tennessee Valley Authority that are situated in western Kentucky and Tennessee and are designated as "Land Between the Lakes," and (C) lands under the custody and control of the Secretary of Defense;

(2) "respective agency head" means the Secretary of the Interior, the Secretary of Defense, the Secretary of Agriculture, and the Board of Directors of the Tennessee Valley Authority, with respect to public lands under the custody and control of each;

(3) "off-road vehicle" means any motorized vehicle designed for or capable of cross-country travel on or immediately over land, water, sand, snow, ice, marsh, swampland, or other natural terrain; except that such term excludes (A) any registered motorboat, (B) any military, fire, emergency, or law enforcement vehicle when used for emergency purposes, and (C) any vehicle whose use is expressly authorized by the respective agency head under a permit, lease, license, or contract; and

(4) "official use" means use by an employee, agent, or designated representative of the Federal Government or one of its contractors in the course of his employment, agency, or representation.

SEC. 3. *Zones of Use.* (a) Each respective agency head shall develop and issue regulations and administrative instructions, within six months of the date of this order, to provide for administrative designation of the specific areas and trails on public lands on which the use of off-road vehicles may be permitted, and areas in which the use of off-road vehicles may not be permitted, and set a date by which such designation of all public lands shall be completed. Those regulations shall direct that the designation of such areas and trails will be based upon the protection of the resources of the public lands, promotion of the safety of all users of those lands, and minimization of conflicts among the various uses of those lands. The regulations shall further require that the designation of such areas and trails shall be in accordance with the following—

(1) Areas and trails shall be located to minimize damage to soil, watershed, vegetation, or other resources of the public lands.

(2) Areas and trails shall be located to minimize harassment of wildlife or significant disruption of wildlife habitats.

(3) Areas and trails shall be located to minimize conflicts between off-road vehicle use and other existing or proposed recreational uses of the same or neighboring public lands, and to ensure the compatibility of such uses with existing conditions in populated areas, taking into account noise and other factors.

(4) Areas and trails shall not be located in officially designated Wilderness Areas or Primitive Areas. Areas and trails shall be located in areas of the National Park system, Natural Areas, or National Wildlife Refuges and Game Ranges only if the respective agency head determines that off-road vehicle use in such locations will not adversely affect their natural, aesthetic, or scenic values.

(b) The respective agency head shall ensure adequate opportunity for public participation in the promulgation of such regulations and in the designation of areas and trails under this section.

(c) The limitations on off-road vehicle use imposed under this section shall not apply to official use.

SEC. 4. *Operating Conditions.* Each respective agency head shall develop and publish, within one year of the date of this order, regulations prescribing operating conditions for off-road vehicles on the public lands. These regulations shall be directed at protecting resource values, preserving public health, safety, and welfare, and minimizing use conflicts.

SEC. 5. *Public Information.* The respective agency head shall ensure that areas and trails where off-road vehicle use is permitted are well marked and shall provide for the publication and distribution of information, including maps, describing such areas and trails and explaining the conditions on vehicle use. He shall seek cooperation of relevant State agencies in the dissemination of this information.

SEC. 6. *Enforcement.* The respective agency head shall, where authorized by law, prescribe appropriate penalties for violation of regulations adopted pursuant to this order, and shall establish procedures for the enforcement of those regulations. To the extent permitted by law, he may enter into agreements with State or local governmental agencies for cooperative enforcement of laws and regulations relating to off-road vehicle use.

SEC. 7. *Consultation.* Before issuing the regulations or administrative instructions required by this order or designating areas or trails as required by this order and those regulations and administrative instructions, the Secretary of the Interior shall, as appropriate, consult with the Atomic Energy Commission.

SEC. 8. *Monitoring of Effects and Review.* (a) The respective agency head shall monitor the effects of the use of off-road vehicles on lands under their jurisdictions. On the basis of the information gathered, they shall from time to time amend or rescind designations of areas or other actions taken pursuant to this order as necessary to further the policy of this order.

(b) The Council on Environmental Quality shall maintain a continuing review of the implementation of this order.

Richard Nixon

THE WHITE HOUSE,
February 8, 1972.

[FR Doc.72-2031 Filed 2-8-72; 12:29 pm]

FEDERAL REGISTER, VOL. 37, NO. 27—WEDNESDAY, FEBRUARY 9, 1972

CLIMATE - APPENDIX A

AVERAGE TEMPERATURE AND PRECIPITATION
DEATH VALLEY, CALIF. - BAKER, CALIF.
Statistics Obtained: February, 1972 From: U.S. Weather Service, Dept. of Commerce

	DEATH VALLEY			BAKER		
	Average High°F	Average Low°F	Average Precipitation	Average High °F	Average Low°F	Average Precipitation
*						
JANUARY	66	38	.25	32	42	.43
FEBRUARY	72	44	.31	66	37	.49
MARCH	81	51	.18	74	43	.44
APRIL	90	60	.12	85	53	.27
MAY	99	69	.07	94	61	.02
JUNE	109	78	.02	101	69	-
JULY	116	87	.08	109	77	.10
AUGUST	114	84	.12	106	74	.64
SEPTEMBER	106	73	.11	101	66	.31
OCTOBER	91	59	.10	86	53	.22
NOVEMBER	76	46	.14	72	39	.32
DECEMBER	66	39	.19	67	34	.53

*(Degrees-Fahrenheit)

CLIMATE - APPENDIX B

Total Precipitation in inches,
Silver Lake CAA Station.
(1940-1952)

(Dashes indicate missing data)

YEAR	JAN.	FEB.	MAR.	APR.	MAY	JUNE	JULY	AUG.	SEPT.	OCT.	NOV.	DEC.	ANNUAL
1940	1.01	1.30	.31	1.09	.01	.00	.00	.00	2.06	.08	.06	1.11	7.03
1941	1.37	.63	1.97	1.18	.05	T	.07	1.23	.00	.48	.31	.86	8.15
1942	.10	.05	.06	T	.00	.00	T	3.04	.00	.10	.00	T	3.35
1943	.99	.35	.63	.25	.01	.00	T	T	.30	.36	.00	.61	3.50
1944	.22	.97	.27	.03	.03	T	.00	.00	.00	T	1.86	.07	3.45
1945	.10	.90	.91	.10	T	T	.53	1.95	T	.52	T	.29	5.30
1946	T	T	.11	.11	.00	.00	.44	T	.73	.20	1.10	.46	3.15
1947	T	T	.22	.14	T	.00	.00	.05	.00	.41	T	1.74	2.56
1948	.00	.17	T	T	.00	T	.09	T	T	.23	.00	.21	.70
1949	.98	.89	.17	.04	.10	T	T	.15	.00	T	.11	.49	2.93
1950	T	.12	.14	T	.00	.00	,02	–	–	.00	.05	.00	–
1951	.50	T	T	.02	.22	.00	.40	.71	.40	.01	–	–	–
1952	–	.00	–	–	.00	.00	.42	.00	1.20	.00	–	–	–
MEAN	.44	.41	.40	.25	.03	T	.15	.59	.39	.18	.32	.53	3.69
												(TOTAL MEAN)*	

Source: U. S. Department of Commerce, Weather Bureau. Climatic Summary of the United States, Supplement for 1931-1952, California. Climatology of the U.S., No. 11-4 (1952).

This is the sum of the monthly means, some of which are based on less than 13 years. For the first 10 years, observations are complete for all months and yield an average of 4.02 inches.

FROM: MacDonald, Angus: THE DUMONT DUNE SYSTEM, CALIFORNIA, 1966.

CLIMATE - APPENDIX C

Summary of ambient temperature at Saratoga Springs, Death Valley National Monument. Sample intervals represent first and last week in each month -- February, 1967 -- May, 1968. The range is in parenthesis.*

Sample Interval	$\bar{X}$ max. °C	$\bar{X}$ min. °C.	$\bar{X}$ °C.	Sample Interval	$\bar{X}$ max. °C.	$\bar{X}$ min. °C.	$\bar{X}$ °C.
1-7 February 1967	28.4 (26.7-30.0)	7.0 (4.4-8.9)	17.8 (4.4-30.0)	1-7 November 1967	32.9 (29.4-35.0)	17.2 (14.3-20.0)	24.8 (14.3-35.0)
22-28 February 1967[1]	21.6 (20.0-24.0)	4.2 (1.7-7.2)	13.0 (1.7-24.0)	24-30 November 1967	18.3 (12.7-21.1)	7.3 (4.4-10.0)	12.9 (4.4-21.1)
1-7 March 1967[1]	24.3 (16.6-28.9)	5.8 (2.2-9.4)	14.8 (2.2-28.9)	1-7 December 1967	17.0 (14.4-21.1)	5.6 (3.3-17.7)	11.4 (3.3-21.1)
25-31 March 1967[1]	23.4 (17.8-28.4)	8.9 (2.6-12.8)	16.3 (2.6-28.4)	25-31 December 1967[1]	18.3 (15.0-21.1)	1.3 (-2.2-15.6)	9.7 (-2.2-21.1)
1-7 April 1967[1]	21.8 (16.2-26.1)	7.5 (4.0-10.6)	14.7 (4.0-26.1)	1-7 January 1968[1]	14.0 (13.2-15.0)	-2.4 (-5.6-2.8)	5.8 (-5.6-15.0)
21-27 April 1967	34.1 (28.3-41.7)	11.5 (8.3-15.5)	24.4 (8.3-41.7)	25-31 January 1968	22.1 (18.9-24.5)	7.3 (3.4-12.8)	14.6 (3.4-24.5)
28 April-4 May 1967	34.3 (30.0-39.3)	16.1 (11.2-20.0)	25.2 (11.2-39.3)	1-7 February 1968	24.8 (21.6-27.6)	5.8 (4.0-8.3)	15.2 (4.0-27.6)
25-31 May 1967[1]	32.7 (27.3-37.3)	17.6 (11.1-20.0)	25.1 (11.1-37.3)	24-29 February 1968[2]	34.3 (32.2-36.2)	15.0 (10.6-16.6)	25.3 (10.6-36.2)
1-7 June 1967[1]	31.8 (26.0-35.0)	15.7 (11.7-17.8)	23.9 (11.7-35.0)	1-7 March 1968	31.6 (24.4-35.5)	12.7 (9.6-15.5)	21.4 (9.6-35.5)
24-30 June 1967[1]	42.4 (40.5-46.2)	24.0 (21.1-28.3)	33.0 (21.1-46.2)	25-31 March 1968[1]	29.4 (27.8-32.1)	10.8 (7.2-14.4)	20.3 (7.2-32.1)
1-7 July 1967[1]	45.1 (41.1-48.4)	27.9 (23.3-31.6)	36.6 (23.3-48.4)	1-7 April 1968	37.0 (35.0-39.4)	15.2 (13.7-21.1)	26.2 (13.7-39.4)
25-31 July 1967[1]	43.0 (39.3-45.5)	28.6 (26.7-30.6)	35.2 (26.7-45.5)	24-30 April 1968	45.5 (43.2-49.4)	17.6 (15.5-20.4)	31.6 (15.5-49.4)
1-7 August 1967[1]	43.0 (40.6-45.0)	27.5 (24.4-30.6)	35.3 (24.4-45.0)	1-7 May 1968	46.2 (41.6-50.4)	22.0 (18.3-25.0)	34.4 (18.3-50.4)
25-31 August 1967[1]	41.8 (37.8-45.0)	25.5 (23.3-27.8)	32.8 (23.3-45.0)				
2-6 September 1967[2]	44.8 (41.3-48.8)	28.3 (24.5-32.2)	37.5 (24.5-48.8)				
24-30 September 1967	30.3 (16.0-37.3)	26.2 (23.8-28.8)	30.1 (16.0-37.3)				
1-7 October 1967	32.8 (30.4-34.4)	24.3 (21.1-26.7)	28.6 (21.1-34.4)				
25-31 October 1967	34.1 (27.8-37.3)	17.5 (12.8-18.3)	25.6 (12.8-37.3)				

[1] Records from U.S. Weather Bureau station, Baker, San Bernadino County, California.
[2] One day's minimum temperature missing.

Bradley, Wiglen, (June 1, 1970, p. 113)

* Degrees - centigrade

AGRICULTURAL EXTENSION SERVICE
UNIVERSITY OF CALIFORNIA
INYO & MONO COUNTIES

207 WEST SOUTH ST.
TELEPHONE 873-5891
AREA CODE 714
BISHOP, CALIFORNIA
93514

April 7, 1972

Miriam A. Romero, Coordinator
Desert Pupfish Habitat Preservation Committee
P. O. Box 394
Montrose, CA 91020

Dear Ms. Romero:

Enclosed are soil and water samples from the China Ranch.

Notice the water sample out of Willow Springsis of good quality.

Sample 1 to 4 on Soil Analysis II SS-6530/6-R are from cropped fields where there is or has been pasture and alfalfa in the past. Sample #5 is on cleared area as you drive into the ranch from Tecopa looking to your left. No. 5 field would need some gypsum reclamation before it would be agriculturally productive.

Samples #1 on SS6643/3-R is a field that has had grain hay and sudan hay in the past. It is right on China Ranch Road just below the buildings. Samples 2 & 3 are on the north side of the Spring Ranch Road and their locations are self-explanatory.

Whoever interprets these analyses can go to the Farm Advisor in Los Angeles County for explanation if he has questions.

The Soil Conservation Service will be sending you soil maps of the ranch, but it may be a week before you receive them because there is only one man in this office and he is out of town for the next few days.

If you have further questions, please contact me.

Sincerely,

P. Dean Smith

P. DEAN SMITH
County Director & Farm Advisor

AGRICULTURAL EXTENSION LABORATORY

REPORT OF SOIL ANALYSIS
SALINITY AND SODIUM ASSAY

UNIVERSITY OF CALIFORNIA
AGRICULTURAL EXTENSION SERVICE

County: Inyo Mono
Submitted by: P. Dean Smith

Number: SS-6530/6-R
Date sampled: 10/9/70
Date submitted: 10/15/70
Date reported: 12/29/70

Identification: China Ranch (Bernice Sorrells) - Tecopa Crop: alfalfa Soil Type:

Sample No.	Description	SP	pH_s	EC_e	B	Ca + Mg	Na	ESP (est)	GR
		%		millimhos/cm	ppm	me/l	me/l	%	T/A6" e
	Field East of Main house								
1	0" - 12" Bench on west side	29	7.9	1.2	3.7	6.1	5.1	3.	0.4
2	Surface 3 inches - low area middle	27	7.8	1.5	2.0	9.3	6.0	3.	none
3	3" to 6" Low area middle	42	7.6	3.3	3.4	23.0	15.7	5.	1.2
4	0" - 12" Bench on East side	47	7.5	3.4	1.5	37.7	6.4	1.	none
	Field between Spring Rd & China Ranch Rd =#5								
5	0 - 12"	47	8.0	20.7	30.	66.8	200.	33.	1.2
6	County Fill dirt pit at Tecopa road junction and Baker Highway.	26	8.3	9.8	278.	33.4	68.7	19.	0.9

John M Rible
John M. Rible
Extension Technologist
cc: R. Branson

MF-2b

AGRICULTURAL EXTENSION LABORATORY

UNIVERSITY OF CALIFORNIA
AGRICULTURAL EXTENSION SERVICE

REPORT OF SOIL ANALYSIS
SALINITY AND SODIUM ASSAY

County: Inyo-Mono
Submitted by: P. Dean Smith

No. SS-6643/3-R
Date sampled: 1/19/71
Date submitted: 1/25/71
Date reported: 3/1/71

Identification: China Ranch - Tecopa

Crop: Pasture & Alfalfa Soil Type:

Sample No.	Description	SP	pH_s	EC_e	B	Ca + Mg	Na (est)	ESP (est)	GR			
		%		milli-mhos/cm.	ppm	me/l	me/l	%	T/A6"			
1	Field south of Buildings on China Ranch Rd	38	7.8	3.4	4.5	21.8	15.	5.	1.2			
2	Upper end where spring pipe crosses road	33	7.5	8.4	5.5	60.3	41.	9.	0.2			
3	Lower end in disturbed area	29	8.1	15.9	11.4	57.9	144.	28.	1.8			

Isfendiar Ramadan
Lab Tech II
cc: R. Branson

MF-3

SP **Saturation Percentage** -- Grams of water required to saturate 100 grams of soil. Related to soil texture:

Below 20	Sand or loamy sand
20 – 35	Sandy loam
35 – 50	Loam or silt loam
50 -- 65	Clay loam
65 -- 135	Clay (some clays go up to 150)
Above 135	Usually organic (peat or muck)

The water holding capacity of a field soil when irrigated and allowed to drain is approximately half the SP. About half the water holding capacity is available for crop use.

pHs **Degree of Acidity or Alkalinity** – Determined in a soil paste wet to the saturation percentage.

Below 4.2	Too acid for most crops to do well
4.2 – 5.5	Adapted to growth of acid tolerant crops
5.5 -- 8.4	Adapted to growth of most crops
Above 8.4	Indicates a probable sodium problem; however, sodium problems can occur at pH values lower than 8.4

ECe Electrical Conductivity of the saturation extract expressed as millimhos per centimeter at 25° C. An index of the salt content. Salt will restrict crop growth about as follows:

Below 2	No salinity problem
2 – 4	Restricts growth of very salt sensitive crops
4 – 8	Restricts growth of many crops
8 – 16	Restricts growth of all but salt tolerant crops
Above 16	Only a few very salt tolerant crops make satisfactory yields

Note: An asterisk (*) following an EC_e value indicates gypsum is present; therefore, effective salinity levels may not be as serious as indicated, and up to 2 EC_e units may be subtracted from the measured EC_e before using the above table.

B Boron -- expressed as ppm in the saturation extract

Below 0.5	Satisfactory for all crops
1	Sensitive crops may show visible injury
5	Semi-tolerant crops may show visible injury
10	Tolerant crops may show visible injury

Ca+Mg **Calcium plus Magnesium** in the saturation extract expressed as milliequivalents per liter. Used in estimating the exchangeable sodium percentage of the soil [ESP (est)].

Na **Sodium** in the saturation extract expressed as milliequivalents per liter. Used in estimating exchangeable sodium percentage [ESP (est)].

ESP(est) **Exchangeable Sodium Percentage, estimated** – A close approximation of the degree the soil exchange complex is saturated with sodium. Exchangeable sodium has two effects: (1) permeability, (2) toxicity to sensitive crops.

Below 10	Generally no permeability problem due to sodium. However, sodium sensitive crops may show leaf burn at ESP below 10.
10 – 15	Possible permeability problems with clay loams and clays (SP above 50).
Above 15	Permeability problems are likely on all mineral soils with possible exceptions of sands and loamy sands (SP below 20).

GR **Gypsum Requirement** is the amount of gypsum or its equivalent to furnish calcium needed to correct a permeability problem due to sodium. GR is expressed as tons of 100% gypsum per acre for a 6-inch depth of soil. Will be run on samples with ESP 10 and above.

Note: An asterisk (*) following a GR value indicates presence of lime, and acid-forming amendments such as sulfur or sulfuric acid may be used in place of gypsum.

Cooperative Extension work in Agriculture and Home Economics, College of Agriculture, University of California, and United States Department of Agriculture cooperating.
Distributed in furtherance of the Acts of Congress of May 8 and June 30, 1914.
Clarence A. Algert, Director, California Agricultural Extension Service.

AGRICULTURAL EXTENSION LABORATORY

REPORT OF WATER ANALYSIS

County: Inyo
Submitted by: P. Dean Smith

No. W-5999/1-R
Date sampled: 10-29-69
Date submitted: 11-4-69
Date reported: 11-25-69

Identification: China Ranch, Tecopa

Crop: Irrig. Pasture Soil Type:

Sample No.	Description	EC	B	Ca+Mg	Na (est)	Cl	SAR	pH	CO_3+ HCO_3	No_3N
		milli-mhos/cm.	ppm	me/l	me/l	me/l			me/l	ppm
1.	Spring Water	0.96	0.85	5.6	4.0	1.5	2.4	7.7	4.9	<1

John M. Rible
Extension Technologist

MF-2

Electrical Conductivity – An estimate of the concentration of soluble salts, expressed as millimhos per centimeter.

Below 0.5	Depending on soil texture, permeability problems may occur due to low salt content
Below 0.75	Low salinity hazard—can be used for irrigation of most crops
0.75 – 1.5	Medium salinity hazard—can be used for irrigation of moderately salt tolerant crops
1.5 – 3.0	High salinity hazard—can be used for irrigation of highly salt tolerant crops
Above 3.0	Very high salinity hazard—generally not suitable for continual use for irrigation except under most favorable conditions of soil, climate, salt tolerance of crop, and necessary leaching

Note: This interpretation of EC assumes that 10-20% of the total water applied passes through and below the root zone. In most cases deep percolation losses, due to inefficiency of normal irrigation practices, will satisfy this leaching requirement for the usual crops of an area.

B **Boron** – Concentration of boron expressed as ppm.

Below 0.5	Satisfactory for all crops
0.5 – 1.0	Satisfactory for most crops. Sensitive crops may show injury—however, yields may not be affected
1.0 – 2.0	Satisfactory for semi-tolerant crops. Sensitive crops are usually reduced in yield and vigor
2.0 – 4.0	Only tolerant crops produce satisfactory yields
Above 4.0	Generally unsatisfactory for continued use

Ca+Mg **Calcium plus Magnesium** – Expressed as milliequivalents per liter. Used in calculating SAR

Na **Sodium** – Expressed as milliequivalents per liter. Used in calculating SAR.

Cl **Chloride** – Expressed as milliequivalents per liter. Fruit crops in general and many woody ornamentals are chloride sensitive.

Below 2	Satisfactory for all crops
2 – 10	Range associated with leaf burn on chloride sensitive crops
Above 10	Generally unsatisfactory for chloride sensitive crops

CAUTION: Under conditions resulting in high rates of evaporation, sprinkler irrigation of certain sensitive tree crops with water containing 3 me/l or more of sodium or chloride has caused leaf burn or defoliation in that portion of the tree surface wet by sprinklers.

SAR **Sodium Adsorption Ratio** – A calculated value used to estimate the exchangeable sodium percentage, (ESP), of a soil after long-term use of the water. The relationship between the SAR of the irrigation water and probable ESP of the soil, as well as interpretation, follows:

SAR	ESP	Interpretation
Below 6	Below 10	No soil permeability problem expected due to sodium
7 – 9	10 – 15	Possible permeability problems with fine textured soils. (Saturation percentage above 50)
Above 9	Above 15	Permeability problems likely on all mineral soils, with possible exceptions of very coarse textured soils. (Saturation percentage below 20.)

NOTE: Permeability problems are more probable at a given SAR with waters of low salinity than at high salinity.

pH **Degree of Acidity or Alkalinity** – Normal range for western irrigation waters is from pH 6.5 to 8.4.

CO_3+HCO_3 **Carbonate plus Bicarbonate** – expressed as milliequivalents per liter. Waters relatively high in sodium carbonate or bicarbonate may present special problems.

NO_3-N **Nitrate Nitrogen** in the water – expressed as parts per million of nitrogen.

NO_3-N × 2.72 = N in lbs ac.ft. of water
NO_3-N × 4.4 = NO_3 in ppm
NO_3-N × .0714 = N in meq/l

Cooperative Extension—University of California Agriculture and Home Economics, College of Agriculture, University of California, Riverside, and United States Department of Agriculture cooperating. Distribution authorized by the Acts of Congress of May 8, and June 30, 1914. George B. Alcorn, Director, California Agricultural Extension Service.

JANUARY 1968--10M

Interpretation of water analysis as related to crop growth should be made only after consideration of other observations of plant and soil conditions. Soil analysis, as well as [illegible] in addition to water analysis, should be [illegible]

10-2513. AMARGOSA RIVER AT TECOPA, CALIF.

LOCATION.--Lat 35°50'55", long 116°13'45", in NW¼SE¼ sec.9, T.20 N., R.7 E., on right bank 20 ft upstream from county road and 0.2 mile west of Tecopa.

RECORDS AVAILABLE.--October 1961 to September 1968.

GAGE.--Graphic water-stage recorder with rain-gage attachment and concrete-culvert control. Altitude of gage is 1,310 ft (from topographic map).

AVERAGE DISCHARGE.--7 years, 2.21 cfs (1,600 acre-ft per year).

EXTREMES.--Maximum discharge during year, 148 cfs Aug. 5 (gage height, 3.10 ft), from rating curve extended above 8.0 cfs as explained below; no flow for many days.
1961-68: Maximum discharge, 950 cfs Dec. 9, 1965 (gage height, 10.10 ft), from rating curve extended above 8.0 cfs on basis of computation of flow through culvert at gage height 8.1 ft; no flow for many days in each year.
Flood (date unknown) reached a stage of 8.1 ft, from floodmarks (discharge, 790 cfs, based on computation of maximum flow through culvert).

REMARKS.--Records good.

DISCHARGE, IN CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1967 TO SEPTEMBER 1968

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	.20	.40	1.1	.60	.90	1.7	.70	.30	0	0	8.0	
2	.20	.50	.80	.70	.70	1.5	.80	.30	.10	0	.40	
3	.10	.50	.70	.90	.60	1.4	.80	.30	.10	0	59	
4	.10	.50	.70	.50	.80	1.4	.60	.30	0	0	57	
5	.10	.60	.70	.70	.80	1.2	.50	.10	0	0	42	
6	.10	.60	.80	.80	.90	1.2	.50	.20	0	0	8.1	
7	.10	.70	.70	.80	.90	1.3	.40	.20	0	0	2.7	
8	.20	.70	.80	.80	.90	9.4	.50	.20	0	0	.60	
9	.30	.70	.40	1.1	4.2	6.8	.40	.20	.10	8.3	.20	
10	.40	.70	.40	.80	9.5	5.6	.40	.20	.10	36	.10	
11	.40	.80	.60	1.0	11	1.7	.40	.20	.10	6.8	.10	
12	.40	.80	1.0	.60	19	1.3	.40	.10	.10	.60	.10	
13	.40	.80	.10	.70	24	1.1	.30	.10	0	.10	0	
14	.40	.80	.10	.80	24	1.1	.40	.10	0	0	0	
15	.20	.80	.80	1.0	21	1.2	.40	.20	.10	0	0	
16	.70	.90	2.1	1.0	15	1.0	.30	.20	.10	0	0	
17	.20	.90	1.0	1.0	10	.90	.40	.10	0	0	0	
18	.30	.90	1.0	.90	7.5	1.7	.40	.20	0	0	0	
19	.40	1.0	1.3	1.2	5.6	.90	.40	.20	0	0	0	
20	.40	1.1	1.1	1.3	4.2	.80	.40	.10	0	0	0	
21	.40	1.2	.70	1.2	3.6	.60	.60	0	0	0	0	
22	.50	20	.70	1.1	3.0	.80	.40	0	0	0	0	
23	.50	4.0	.70	1.0	3.4	.90	.60	0	0	0	0	
24	.50	5.0	.90	.90	3.7	.90	.50	.10	0	0	0	
25	.50	2.9	.80	.90	3.2	.90	.40	.10	0	0	0	
26	.50	2.1	.80	.80	2.7	.80	.40	.10	0	0	0	
27	.50	.90	.50	.70	2.4	.70	.40	.10	0	0	0	
28	.60	1.1	.60	.90	2.7	.90	.70	.10	0	0	0	
29	.60	1.2	.70	.60	1.5	.80	.60	.10	0	0	0	
30	.40	.80	.60	.70	------	.80	.30	0	0	0	0	
31	.40	------	.50	.45	------	.80	------	0	------	4.3	0	------
TOTAL	10.50	53.90	23.50	26.60	189.90	51.50	13.10	4.40	0.80	56.10	178.30	0
MEAN	.34	1.80	.76	.86	6.74	1.66	.44	.14	.027	1.81	5.75	0
MAX	.60	20	2.1	1.3	24	9.4	.80	.30	.10	36	59	0
MIN	.10	.40	.10	.45	1.5	.80	.20	0	0	0	0	0
AC-FT	21	107	47	53	377	102	26	8.7	1.6	111	354	0
†	0	0	0	.2	.2	.1	0	0	0	0	0	0
CAL YR 1967	TOTAL 311.70		MEAN .85		MAX 21		MIN 0		AC-FT 618			
WTR YR 1968	TOTAL 615.20		MEAN 1.68		MAX 59		MIN 0		AC-FT 1,220			

PEAK DISCHARGE (BASE, 15 CFS)

DATE	TIME	G.HT.	DISCHARGE	DATE	TIME	G.HT.	DISCHARGE
11-22	0200	2.82	82	07-09	2330	2.70	101
02-14	0830	1.83	31	08-05	0300	3.10	148
03-03	1400	1.86	17				

†Precipitation, in inches.

"Water Resources Data for California - Part 1, Surface Water Records", 1968 U. S. Dept. of the Interior, Geological Survey.

APPENDIX B-1 -- WATER QUALITY CRITERIA*

Specific Uses

Domestic Use

Water used for drinking and culinary purposes should be clear, colorless, odorless, pleasant-tasting, and free from toxic salts. It should not contain excessive amounts of dissolved minerals and must be free from pathogenic organisms. In addition to these physical and bacteriological requirements, certain qualifications are generally placed on chemical quality, either as requirements by a regulatory agency or for comparative grading of different waters.

The 1962 Drinking Water Standards of the United States Public Health Service are legally applicable only to drinking water and water supply systems used by interstate carriers and others subject to Federal quarantine regulations. However, they have been adopted by the entire water works profession as minimum standards for control and are widely quoted.

The standards themselves, as promulgated, include discussions of bacteriological, physical, radiological, and chemical aspects. Only the chemical aspects will be discussed here. Table 7A presents the standards; the recommended values are those which should not be exceeded in a water supply if other more suitable supplies are or can be made available. The mandatory values are those which, if exceeded, constitute grounds for rejection of the supply.

The standards for fluoride are related to the annual average of maximum daily air temperatures (based on a minimum five-year record) and are presented in Table 7B. The average concentration should not exceed the appropriate upper limit in the table. The presence of fluoride in average concentrations greater than twice the optimum values in Table constitutes grounds for rejection of the supply. The standards further state that where fluoridation is practiced, the average fluoride concentration shall be kept within the upper and lower control limits in Table 7B.

In California, the State Board of Public Health issues water supply permits in accordance with its "Interim Policy on Mineral Quality of Drinking Water", as adopted September 4, 1959, and in accordance with

"Policy Statement and Resolutions" by the State Board of Public Health with Respect to Fluoride.

* From Department of Water Resources Bulletin No. 143-7 "Geothermal Wastes and the Water Resources of the Salton Sea Area". Feb. 1970.

TABLE 7A

UNITED STATES PUBLIC HEALTH SERVICE
DRINKING WATER STANDARDS, 1962

Substance	Recommended limits of concentrations, in mg/l	Mandatory limits of concentrations, in mg/l
Methylene blue active substance (MBAS) as ABS	0.5	--
Arsenic (As)	0.01	0.05
Barium (Ba)	--	1.0
Cadmium (Cd)	--	0.01
Carbon chloroform extract (CCE)	0.2	--
Chloride (Cl)	250	--
Chromium (hexavalent) (Cr^{+6})	--	0.05
Copper (Cu)	1.0	--
Cyanide (CN)	0.01	0.2
Fluoride (F)	**	**
Iron (Fe)	0.3	--
Lead (Pb)	--	0.05
Manganese (Mn)	0.05	--
Nitrate (NO_3)*	45	--
Phenols	0.001	--
Selenium (Se)	--	0.01
Silver (Ag)	--	0.05
Sulfate (SO_4)	250	--
Total dissolved solids (TDS)	500	--
Zinc (Zn)	5	--

*In areas in which the nitrate content of water is known to be in excess of the listed concentration, the public should be warned of the potential dangers of using the water for infant feeding.
**See Table 7B. Standards in Tables 7A and 7B were adopted in 1962.

TABLE 7B

UNITED STATES PUBLIC HEALTH SERVICE
DRINKING WATER STANDARDS, 1962 -- FLUORIDE

Annual average of maximum daily air temperatures, in degrees Fahrenheit	Recommended control limits -- fluoride concentrations, in mg/l		
	Lower	Optimum	Upper
50.0 - 53.7	0.9	1.2	1.7
53.8 - 58.3	0.8	1.1	1.5
58.4 - 63.8	0.8	1.0	1.3
63.9 - 70.6	0.7	0.9	1.2
70.7 - 79.2	0.7	0.8	1.0
79.3 - 90.5	0.6	0.7	0.8

Ion Concentrations in Public Water Supplies", as approved August 22, 1958. The interim policy on mineral quality is presented as follows:

1. Water supply permits may be issued for drinking and culinary purposes only when the Public Health Service Drinking Water Standards of 1946[1] and the State Board of Public Health policy on fluorides are fully met.

2. In view of the wide variation in opinion in this field, the uncertainty as to the long-time health effects, the uncertainty of public attitude concerning various mineral levels, and the obvious need for further study, temporary permits may be issued for drinking water supplies failing to meet the Drinking Water Standards if the mineral constituents do not exceed those listed under the heading "Temporary Permit" in Table 8 .

TABLE 8*

UPPER LIMITS OF TOTAL SOLIDS AND SELECTED MINERALS IN DRINKING WATER AS DELIVERED TO THE CONSUMER

	Permit	Temporary Permit
Total Solids	500 (1,000)**	1,500 milligrams per liter
Sulphates	250 (500)**	600 " " "
Chlorides	250 (500)**	600 " " "
Magnesium	125 (125)	150 " " "

*This interim policy relates to potable water and is not intended to apply to a secondary mineralized water supply intended for domestic uses other than drinking and culinary purposes.

**Numbers in parentheses are maximum permissible, to be used only where no other more suitable waters are available in sufficient quantity for use in the system.

3. Exception: No temporary permit for drinking water supplies in which the mineral constituents exceed those listed under the heading "Temporary Permit" as set forth in #2 above may be issued unless the Board determines after public hearing:

   (a) The water to be supplied will not endanger the lives or health of human beings; and

1/ Author's Note: It is assumed in the absence of any later standards, that the 1962 edition of the Drinking Water Standards now applies.

(b) No other solution to meet the local situation is practicable and feasible; and

(c) The applicant is making diligent effort to develop, and has reasonable prospect of developing a supply of water which will warrant a regular permit within an acceptable period of time.

The burden of presenting evidence to fulfill the requirements as set forth in (a), (b), and (c) above is upon the applicant.

With respect to fluoride concentration, the State Board of Public Health has defined the maximum safe amounts of fluoride ion in relation to mean annual temperature as shown in Table

TABLE 9

CALIFORNIA STATE BOARD OF PUBLIC HEALTH,
MAXIMUM FLUORIDE ION CONCENTRATIONS

Mean annual temperature, in degrees Fahrenheit*	Mean monthly fluoride concentration, in milligrams per liter
50	1.5
60	1.0
70 - above	0.7

*For temperature values between those shown in the table, the fluoride ion concentrations may be obtained by interpolation.

The State Board of Public Health's policy on fluoride ion further states that:

1. The concentration of the fluoride ion in public water systems, whether added or naturally occurring, should not exceed the fluoride ion concentrations stated in the above table.

2. In the development of new public water systems used for drinking and culinary purposes the above fluoride ion concentrations shall not be exceeded.

3. In existing public water systems used for drinking and culinary purposes in which the above fluoride ion concentrations are exceeded, the fluoride ion concentration shall be reduced to a safe level by the use of methods acceptable to the State Department of Public Health. Exception: In cases where the Department determines

after investigation that it is not practicable and feasible to reduce the fluoride ion concentration in the entire supply to a safe level, special methods, acceptable to the State Department of Public Health, shall be provided by the applicant to furnish water of suitable fluoride ion concentration to all children 10 years of age or under.

Agricultural Use. The major criteria for judging the suitability of water for irrigation are chloride concentration, specific electrical conductance (presented as EC x 10^{6} at 25° C), boron concentration, and percent sodium.

Chlorides are present in nearly all waters. They are not necessary to plant growth, and in high concentrations cause subnormal growing rates and burning of leaves.

Electrical conductance indicates the total dissolved solids, and furnishes an approximate indication of the overall mineral quality of the water. For most waters, the total dissolved solids, measured in milligrams per liter (mg/l) may be approximated by multiplying the electrical conductance by 0.7. As the amount of dissolved salts in irrigation water increases, the crop yields are reduced until at high concentrations (the value depending on the plant, type of soil, climatological condition, and amount of water applied) plants cannot survive.

Boron is never found in the free state but occurs as borates or boric acid. This element is essential in minor amounts for the growth of many but not all plants. It is, however, extremely toxic to most plants in higher concentrations. Limits of tolerance for most irrigated crops vary from 0.5 to 2.0 mg/l. Citrus crops, particularly lemons, are sensitive to boron in concentrations exceeding 0.5 mg/l.

The percent sodium, as reported in analyses, is 100 times the proportion of the sodium cation to the sum of all cations, all expressed in milliequivalents per liter (meq/l). Water containing a high percent sodium has an adverse effect upon the physical structure of soils that contain clay by dispersing the soil colloids. This, in turn, retards the movement of water and the leaching of salts, and makes the soils difficult to work. The effect of potassium in water is similar to that of sodium.

Because of the diverse climatological conditions, crops, soils, and irrigation practices in California, criteria which may be set up to establish the suitability of water for irrigation must necessarily be of a general nature, and judgment must be used in applying these criteria to individual cases.

TABLE 5-3

RANGES OF PROMULGATED STANDARDS FOR RAW WATER SOURCES OF DOMESTIC WATER SUPPLY

Constituent	Excellent source of water supply, requiring disinfection only, as treatment	Good source of water supply, requiring usual treatment such as filtration and disinfection	Poor source of water supply, requiring special or auxiliary treatment and disinfection
BOD (5-day) mg/l			
Monthly average:	0.75-1.5	1.5-2.5	Over 2.5
Maximum day, or sample:	1.0-3.0	3.0-4.0	Over 4.0
Coliform MPN per 100 ml			
Monthly average:	50-100	50-5,000	Over 5,000
Maximum day, or sample:	Less than 5% over 100	Less than 20% over 5,000	Less than 5% over 20,000
Dissolved Oxygen			
mg/l average:	4.0-7.5	4.0-6.5	4.0
% saturation:	75% or better	60% or better	--
pH			
Average:	6.0-8.5	5.0-9.0	3.8-10.5
Chlorides, max. mg/l	50 or less	50-250	Over 250
Fluorides, mg/l	Less than 1.5	1.5-3.0	Over 3.0
Phenolic compounds, max. mg/l	None	0.005	Over 0.005
Color, units	0-20	20-150	Over 150
Turbidity, units	0-10	10-250	Over 250

FROM CALIFORNIA STATE WATER RESOURCES CONTROL BOARD "WATER QUALITY CRITERIA" SECOND EDITION, DECEMBER 1971.

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A REPORT ON THE CHINA RANCH AREA

INTRODUCTION

In the fall of 1961 with the permission of Ben and Maurine Robinson, the owners of China Ranch, several members of the Pacific Coast Archaeological Society began an archaeological survey of China Ranch, which included the China Ranch oasis and the surrounding basin area. This survey continued on several weekends over a period of three years. China Ranch is located five miles southeast of the town of Tecopa in Inyo County, California. The area has long been known as a region of extended aboriginal occupation, but no comprehensive survey had ever been made of this particular oasis area. Although surface collecting and some excavation had been conducted by various individuals, no reports or published records are known of the sites worked or the material collected there. Reports exist for nearby areas, Shepard (1965), Wallace (1962), Hunt (1960), and Rogers (1966).

Having an active interest in the history and prehistory of her property, Mrs. Robinson had located a rock shelter site in the canyon wall about one half mile to the north of the ranch house. At her suggestion PCAS planned a Thanksgiving weekend visit in November 1963 to begin test excavation of the rock shelter deposit and the apron of midden covering the talus below. Agreements were made with the Robinsons that all rare or unusual artifacts found would remain in Mrs. Robinson's own collection from her property, and that a full report would be written on this China Ranch project. This report is intended to fulfill that responsibility and to acknowledge publicly appreciation to the Robinsons for their cooperation and helpful assistance throughout the project.

Because of the nature of the project, the responsibilities for field notes and information necessary for this report were assigned to various participants in the work. Although each person involved did some work towards the report and added some information to the records, the present author has now assumed the task of presenting the report.

Because of the distance, about 250 miles, from the homes of PCAS members in Orange and Los Angeles Counties, not many consecutive days were spent on the project. The work was conducted during five visits over a three year period. Two four day weekends were spent in the area, Thanksgiving holidays of both 1961 and 1962, when surveying was done. Work on the shelter began in May 1963, when the Hafners and Mrs. Robinson did the preliminary surveying. In November of 1963 twenty PCAS members and guests camped at the ranch, and four days were spent testing the shelter apron, a task which was not completed due to lack of time. During the Christmas holiday that year the Hardmans returned and finished the project.

ACKNOWLEDGMENTS

Pacific Coast Archaeological Society members and guests who participated in either the survey and/or excavation were: Jane and Stuart Gothold; Myrtle and Ernest Soderberg; Helen and Mel Fritsche; Duane and Ruth Hafner; Tom and Pauline Wood; Einar and Margit Loftesnes; Jessie and Harvey Hardman; Al Hoogeveen; Helen, Steven, and Tommy Andersen; Margaret and Martin Murray; Eugene, Carlock, and Gayle Shepard; Irene and Millis Oakes; Manford and Honora Willoughby; Clifford Maltby; Orval Yost; Jack, Aileen, and Joel McKinney; and the ranch owners, Maurine and Ben Robinson.

We wish to thank the Robinsons for their fine cooperation in this study, and the many members and guests who traveled to the site and helped with gathering information for this report. Special thanks go to Jessie Hardman who coordinated information on the shelter excavation; to Martin Murray for his drawings of the cave and his study of the geology of the area; to Duane Hafner who made the contour maps and wrote the artifact description for this report; to Paul Burleigh who photographed the artifacts; to Eugene Shepard for his historical study of the region and an exacting survey of sites in the entire Amargosa Basin; to Ernest Soderberg and Jack McKinney for their photographs of the site; to Jane Gothold for her reconstruction and study of the ceramics; to W. Donald Smith for his drawings and maps; and to Paul Chace and Paul Long of the Bowers Museum staff for their criticism and help in arranging this report.

HISTORY

The ranch proper was first developed as a desert homestead around 1900 by a Chinaman. According to Carruthers (1951: 80) one Quon Sing, who had been a cook at Death Valley's Harmony Borax works, quit that job to serve a Mr. Osborn, wealthy Tecopa miner. On retiring, after many years of service, Quon Sing was located on China Ranch as a reward for long and faithful service. This land, in the raw stage, eroded and desolate, had no appeal but water. The Chinaman developed the spring and converted the place into a profitable ranch, planting figs, dates, and shade trees. He had cows and chickens and hogs, and also planted vegetables, and soon was selling produce to settlers and wayfaring guests. Legend has it that Quon Sing was chased away from his property with a shotgun by a greedy white man who made his own laws of property confiscation.

Since this time the ranch has had many owners. The first recorded owner was a Mr. Morrison, whose name is engraved in concrete on the

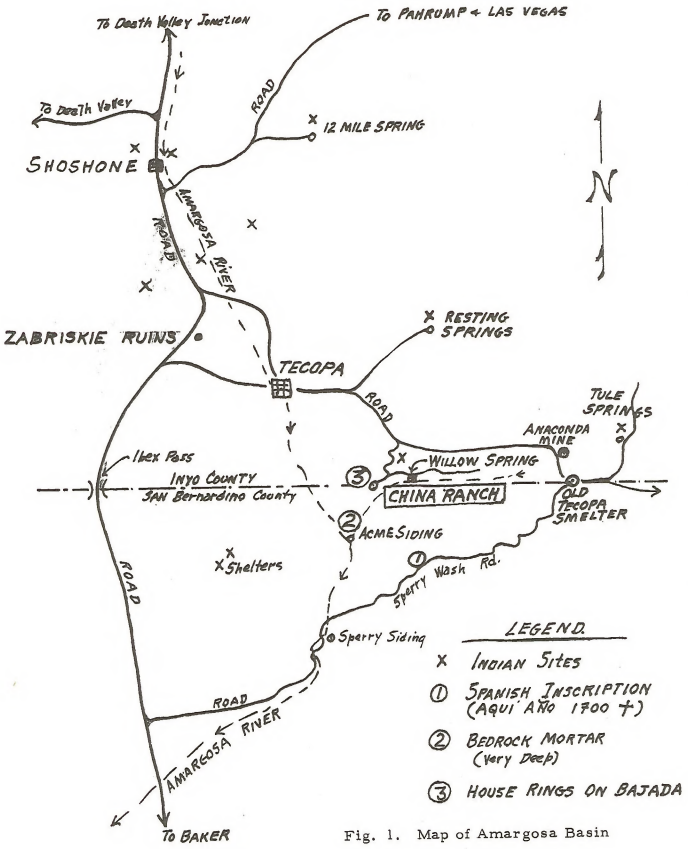

Fig. 1. Map of Amargosa Basin

1906 small stone house, which was perhaps the first permanent building on the property. Mr. and Mrs. Robinson purchased the ranch in 1955. They conduct a small farming operation and also maintain a small herd of cattle. The China Ranch property, which includes 214.24 acres, is located in the northwestern part of the Alexander Hills at an elevation of 1,040 feet in the southeastern part of the Amargosa Basin (Fig. 1.). It includes parts of section 25, 26, and 35 of Township 20 North, Range 7 East, in Inyo County, California, approximately one mile north of the San Bernardino County line. (USGS Topographic map, Tecopa Quad. 15' series, 1950 edition.)

In 1964 the ranch was sold by the Robinsons, who moved to Lone Pine, and the new owners refused permission for any further archaeological work on the property. In February 1967, the Robinsons again owned the ranch, having repossessed it, and are currently residing there.

ENVIRONMENT

Physiography

The Alexander Hills which surround China Ranch are a "badlands" type of topography caused by the extreme erosion of the Tertiary clay hills and the rugged intrusive volcanism of the vicinity. Rainbow Mountain, at an elevation of 1,836 feet, is the highest peak in the Alexander Hills, and lies south of the ranch basin. To the west and north the desert floor lies at an elevation of 1,700 to 1,800 feet. It is composed of Quaternary alluvium formed around the shore of Pleistocene Lake Tecopa which at one time filled the Amargosa Basin. North of the Alexander Hills is the north-south trending Resting Springs Range with its southern end at Resting Springs, directly north of China Ranch. To the northeast is the Nopah Range while to the west are the Ibex Mountains and the Death Valley trough.

China Creek drains the western slopes of the Kingston Mountains, which lie to the east of the Alexander Hills and reach an elevation of 7,320 feet. It also drains the California Valley, which lies between the Kingston and the Nopah ranges. Beginning at Tecopa Pass, four miles east of China Ranch, the creek bed has cut a deep canyon through the alluvial floor of the desert. The canyon widens and forms a flat valley of about 160 acres immediately south of a bend in the canyon, which takes the drainage on south where it joins the Amargosa River at Acme Siding on the old Tonopah and Tidewater Railroad. This junction of China Creek and the Amargosa River is about one mile south of China Ranch.

The Amargosa River, just below its junction with China Creek, passes through a highly colored and rugged gorge on its way to Salt Spring and on

into the southern end of Death Valley. The Amargosa gorge was part of the route used by Indians, Spanish explorers, fur trappers, and Mormon pioneers. It was part of the Old Spanish Trail from Salt Lake City to Los Angeles.

Hydrography

The major feature of China Ranch is abundant water. Willow Spring flows all year into China Creek which crosses the wide canyon floor of the ranch. The water flow makes the canyon basin a veritable oasis, as it no doubt did during aboriginal times. A dense growth of mesquite and other trees and plants surrounds the spring and extends across the canyon floor along China Creek. This lush plant growth and the available water attracted the plentiful small game, and combined, these provided food for the prehistoric Indian population. There are evidences of ancient man in many parts of the canyon bottom and hills of the basin.

No doubt the Indians of the China Ranch area availed themselves of the hot springs at Tecopa about five miles to the northwest. According to Carruthers (1951: 78) the pool was originally a round waterhole 8 feet in diameter and three feet deep, surrounded by tules, and was highly esteemed by the Indians. After discovery by the Caucasians, the springs were abandoned by the Indians. Tecopa Hot Springs continue today to be a popular health spa.

Rainfall in the area is minimal, averaging less than 2 inches a year. Occasionally the desert gets winter rains, and in the summertime cloudbursts may occur. Many evidences of cloudburst action are apparent in the extremely eroded China Ranch basin and adjacent cliffs and hills.

This is an area of great extremes in weather. Temperatures in the winter months go lower than 20° at times, while summer heat is measured at 125° on occasions. Snow seldom falls here, however, it occasionally may cover the surrounding mountain ranges. Winds of gale proportions sometimes sweep this desert. Due to its location in a hollow below the Amargosa Plain, the China Ranch basin provided a protected oasis for the aboriginal inhabitants as well as for the present day occupants.

Flora and Fauna

Today the vegetation appears too scarce to support human life. However, it may have been more dense hundreds or thousands of years ago when men first came to this spot. According to Hunt (1960) for the last 200 years the climate has been much the same as today in this Great Basin area near Death Valley. Prior to that, but since Pleistocene time, there have been climatic changes sufficient to greatly affect the environment and suitability of this area for human occupancy.

Primary food source was, no doubt, the mesquites, both the screwbean and honeypod. Other important food plants occurring in the vicinity are pickleweed, burro-weed, common reed, beavertail cactus, gourds, chia, sand grass, and squaw tea. In addition to these mentioned for food, useful plants included: creosote, arrow weed, desert holly, incienso, willow, cottonwood, cattle spinach, common sage brush, sunflower, and catclaw. Chia grows extensively in the basin. It is an extremely rich, energy producing protein food. Ethnographically, chia seeds were either toasted and ground into a meal which was mixed with water, or it was made into small dried cakes. As a gruel or soup it was thirst quenching as well as nourishing. (See Appendix 1 for present vegetation at China Ranch.)

Faunal resources available included tortoise, chuckawalla, sidewinder and desert rattlesnakes, desert wood rat, kangaroo rat, mice, ground squirrels, cottontails, jackrabbits, and several varieties of lizards. There were also coyotes, kit foxes, and wild cats. Now rare, in the past large mammals such as deer and desert sheep were available. A few bones of animals of this size were found in the cave midden.

Many birds such as crows, ravens, owls, hawks, quail, and doves are seen in this area and no doubt were used for food in prehistoric times.

Ethnographically the Indians snared rabbits and birds, or shot them with arrows. When larger game was available stone blinds were constructed near waterholes or trails, presumably to hide the hunter. None of these have been found near Willow Spring; however, one may be seen today at Resting Springs to the north of China Ranch.

Surficial Deposits

An abundance of lithic material, a resource of great importance, was available to the prehistoric residents of the China Ranch basin. A study of material used in the artifacts and the chipping waste from the cave midden shows the Indians used locally found materials with two exceptions, obsidian and green slate. (See Appendix 2.) A walk of from one to five miles from the shelter would produce the necessary fine silica materials such as agate, jasper, chalcedony, and chert from which to fashion tools. The western Alexander Hills and the Ibex Mountains across the Amargosa River had a wealth of petrified palm wood, palm roots, and bog bottom (matted fossilized reeds), all replaced with the hard and durable silica. If the aborigines had an eye for bright colors, they were pleased with this highly colored raw material. Obsidian, found sparingly at China Ranch, was probably imported from the Coso area on the west side of Death Valley. The green slate material used in pendants may have come from the Slate Range to the southwest of Death Valley. (Rogers 1939:64). However, there is a deposit of this material in the south side of Ibex Pass (Shepard 1970, personal communication). Cobbles

of granite and quartzite are available in the basin and were used for manos and other hand tools. There is also schist and volcanic material for milling stones. While no remains of a wooden mortar made of a mesquite stump have been found here, they are known from Resting Springs and Death Valley sites.

SURFACE FEATURES

Trails and Stone Circles

Among the surface features observed during the survey of the China Ranch area was a network of Indian trails coming into the China Creek basin from the east and west (Fig. 2). These trails, still visible on mesas and canyon ridges, apparently connect distant waterholes and springs, such as Resting Springs, China Creek, Willow Spring, and the Amargosa River to the west of China Creek. These trails are associated with stone lined circles in places, rather than with trail shrines or piles of rock as are sometimes found in the lower Colorado River valley.

Thirteen rock rimmed house rings or sleeping circles were located and mapped on the mesa and gravel ridges of the wedge of land between China Creek and the Amargosa River (Fig. 2). The elevation of this mesa varies from 1,300 feet to 1,600 feet at the upper, or northern end, and is about 200 feet above the ranch buildings and the basin floor. This entire area is approximately one half mile wide by one and one half miles long. One group of four rings were close to the Amargosa River. The others were on the eastern side of the mesa, closer to the China River basin. One half-circle enclosure of Rogers type I (1966:44) was noted between two complete stone circles.

One Amargosa dart point, heavily patinated, was found near the first stone circle above the ranch. However, artifacts are not commonly associated with the stone circles.

A network of trails is visible in this same area. The most prominent trail connects China Ranch with the Amargosa River to the southwest and visibly extends about two miles, with short sections eroded away in gullies over the years. Where this trail nears the river, in the mouth of a small canyon, one unusually deep bedrock mortar hole was found in a large volcanic boulder. The mortar hole is 16 inches deep. Just across China Creek from this mortar rock a long gray schist pestle (Fig. 8 d) was found on the bank of a low arroyo. This may be the pestle used in the deep bedrock mortar, or it could have been used in a wooden mortar, which was common in this area of the desert.

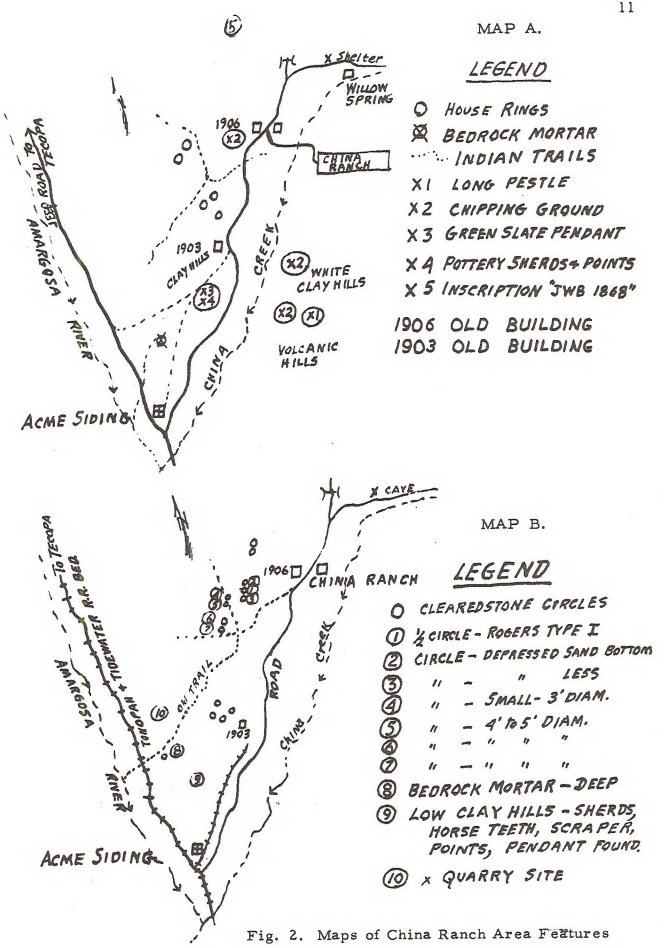

Fig. 2. Maps of China Ranch Area Features

Other traces of trails lead to the north and west and presumably cross the low hills to Tecopa and Resting Springs to the north of China Ranch. A side canyon entering China Ranch basin east of the ranch buildings has an ancient trail coming down from the mesa to the west of Western Talc Mine at the head of the canyon. This trail probably extended eastward to the Kingston Mountains where piñon, a source of food for the Indians, grows. It also would connect with the Tule Springs trail in the southern end of California Valley to the east and north.

Down the canyon about one half mile south of the ranch house stands an old stone ruin with the date "1903" over the door. One of the trails, of the network on the mesa and hills previously mentioned, comes to China Creek back of this house. Along the trail, on the low clay hill tops about 20 to 30 feet above the basin floor, another site was located. Here some small points, chipping waste, pottery sherds, scrapers of green schistose slate, and a drilled green slate pendant, in two sections, was found. This area also produced bone fragments, tooth fragments, and a whole tooth from a horse. Several fireplace features were noted, groupings of stones on the clay flats on either side of the trail within an area 400 feet square.

Quarries

Six quarry sites were located in the survey.

(1) Lower Amargosa Canyon, north side of Rainbow Mountain. The material is jasperized and agatized palm wood and bog.

(2) West side of the Amargosa Canyon, just below the junction with China Creek. The material is red agate and jasper, some petrified palm and bog. A hammerstone was found here, as well as scrapers and flakes.

(3) South slope of Ibex Hills, west of the Amargosa Canyon and east of Ibex Pass, west of location #2, over the ridge. This quarry site is similar to the Manix-Basin-Yermo workshops with similar crude man-made artifacts, scrapers, choppers, cores, and large flakes. The material is a pink-orange, fine grained, rhyolitic chert with inclusions of colorless chalcedony and quartz. This particular material does not occur in the chipping waste found at China Ranch or the other springs. No evidence was found that the Amargosa people visited this quarry, although two small shelters, about a half-mile to the north, apparently do date to Amargosa times. With these shelters are house rings, Pueblo-type remains, and game blinds. This area of the Ibex hills should be more thoroughly surveyed and reported.

(4) Between the clay hills southwest of China Ranch and adjacent to the Amargosa River. This quarry consists of dark colored agatized petrified palm wood and bog bottom. The flakes, cores and crude tools are heavily

patinated, and appear to belong to the earliest desert culture. Flakes of this material do occur at the China Ranch shelter, but were not found at the nearby clay hills site.

(5) Sperry Wash, over the clay hills about three miles to the southeast of China Ranch and covering a large area of the Alexander Hills. Points, scrapers, and flaking waste of petrified palm, jasper, agate and bog bottom were found on the survey. A boulder about 18" in diameter with a circle grooved into one side and the circle marked with a cross through the middle was found here by Eugene Shepard in 1963. This possible ceremonial stone is now in the San Bernardino County Museum in Bloomington. The Sperry Wash petrified wood area was discovered by rock collectors in 1961 and depleted in a few years. It is difficult to imagine a tropical forest growing at one time in such an arid and desolate area as this southern Death Valley region of the Great Basin is today.

(6) One half mile up a side canyon that enters China Ranch basin east of the ranch buildings. This area has gray, black,and clear agatized and jasperized bog. An ancient trail comes down this canyon from the mesa.

Two areas with a concentration of chipping waste were observed. The first was the clay mound a short distance to the south of the ranch buildings and on the east bank of China Creek. The same local materials used by the shelter inhabitants were found here. The flake waste was small in size and probably belonged to the late culture. The second area was the field to the to the southeast of the ranch house. Small flakes of waste lithic material were found here, and, after plowing, the field produced occasional points, manos, and milling stones, which Mrs. Robinson has in her collection.

These are sites with a concentration of flaking waste adjacent to available lithic material sources. However, all through these hills, over many square miles, this same material for stone tools was available and is the same type as was used by the cave inhabitants. One may come on scattered artifacts or smaller quantities of chipping waste almost anywhere in the Alexander Hills-Ibex Mountains area. The survey crew visited each of the springs mentioned earlier in this report and found that they all have areas with flakes on the surface nearby. In every case the chipping waste included materials similar to those found on the China Ranch sites.

AN ANNOTATED CHECKLIST OF THE MAMMALS OCCURRING IN THE TECOPA-DUMONT SAND DUNES STUDY AREA

by Vernon C. Bleich[1]

March, 1972

[1]Department of Biology, California State College, Long Beach, California 90801.

PART ONE- SPECIES OCCURRING IN THE STUDY AREA

Black-tailed hare (Lepus californicus deserticola). Although not observed in the study area, evidence for the presence of the black-tailed hare was present in the form of scats.. In addition, a specimen that had been killed by an automobile was noted 7.5 miles (airline) southwest of Tecopa on March 17. This species is quite common throughout the Mojave Desert.

Audubon cottontail (Sylvilagus audubonii arizonae). One individual was seen on the China Ranch on March 18. In addition, the skeletal remains of a second Audubon cottontail were found one mile south of the China Ranch on the same day. A specimen from 2 miles east of Horsethief Springs, in the Kingston Mountains, is on deposit in the Bird and Mammal Museum. This species is common in southeastern California, and may occur throughout the study area.

Antelope ground squirrel (Ammospermophilus leucurus leucurus). A single individual was sighted by a member of the survey party, south of the China Ranch, on March 18. Seven individuals from Horsethief Springs are on deposit in the Bird and Mammal Museum. The antelope ground squirrel is quite common throughout the Mojave Desert, and is probably found throughout the study area.

Valley pocket gopher (Thomomys bottae providentialis). A single specimen was found dead on the China Ranch on March 18. Several mandibles probably belonging to this species were removed from owl pellets collected on the China Ranch the same day. A specimen from 6 miles southeast of Horsethief Springs is on deposit in the Bird and Mammal Museum. This species is probably not common in the study area.

Merriam kangaroo rat (Dipodomys merriami merriami). Four specimens, from the following localities, were collected during the study: one from a point 0.2 miles west of Tecopa, and three from a point one mile south of the China Ranch. D. m. merriami occurs over a large portion of the Mojave Desert, and is very common. It no doubt is found throughout the study area, except in very rocky or damp places.

Desert kangaroo rat (Dipodomys deserti deserti). One specimen was collected one mile south of the China Ranch on March 19. It prefers areas of wind-drifted sand (Ingles, 1965) and is probably common in the Dumont Dunes region of the study area.

Western harvest mouse (Reithrodontomys megalotis megalotis). Two specimens were collected March 18 from a point 0.2 miles west of Tecopa. They were taken from a marshy area along the Amargosa River. Grinnell (1937) found these mice associated only with areas of permanent water in Death Valley. This species is found throughout California, and is no doubt common in the marshy parts of the study area.

Cactus mouse (Peromyscus eremicus eremicus). Six cactus mice, from the following localities, were collected during the study: one from a point 0.2 miles west of Tecopa, and five from a point one mile south of the China Ranch. These specimens were collected from several different habitats, including a streamside area (1 specimen), rocky talus slope (1), and flat alkalai plain (4). These are apparently very common in the study area, and appear to inhabit several different areas.

House mouse (Mus musculus ssp.). A single specimen was collected from a point 0.2 miles west of Tecopa on March 18. It is probably not common in the study area, and will be found principally around areas of human habitation.

Kit fox (Vulpes macrotis arsipus). A badly damaged kit fox skull was found two miles south-southwest of the China Ranch on March 18. In addition, a kit fox was observed in our camp at a point 4 miles west of Tecopa, on the evening of March 17. Rich Wood, of Tecopa, has seen kit foxes quite often in the Kingston Mountains. They may be found throughout the study area, although probably not common. Protected by law in California.

Coyote (Canis latrans mearnsi). The coyote was reported to be common in the Amargosa Canyon by a member of the study team who is familiar with the area. Numerous coyote tracks were found at a point one mile south of the China Ranch, on March 18.

Bobcat (Lynx rufus baileyi). Rich Wood, of Tecopa, reported that the Bobcat is quite common in the Amargosa Valley and surrounding area. One specimen, from Shoshone, is on deposit in the Bird and Mammal Museum.

PART TWO- SPECIES THAT MAY OCCUR IN THE STUDY AREA

California myotis (Myotis californicus stephensi). This small bat is rather common throughout the state. A large number of bats observed during the survey may have been of this species. One specimen from Junction Ranch, China Lake Naval Weapons Center, Inyo County, is on deposit in the Bird and Mammal Museum.

Hoary bat (Lasiurus cinereus cinereus). This large, migratory bat is found over a great deal of the state, and probably occurs in the study area. Several individuals resembling this species were observed March 18 on the China Ranch.

Big brown bat (Eptesicus fuscus pallidus). This species is native throughout California, and its range certainly encompasses the area under consideration. Whether it occurs in the study area is not certain, but chances are good that it is found there.

Western pipistrelle (Pipistrellus hesperus hesperus). The western pipistrelle is common throughout the desert regions of southern California, and probably occurs in the study area. Seven specimens from areas near the study area are on deposit in the Bird and Mammal Museum. Localities for these specimens are as follows : 3 from Clark Co., Nevada; 3 from 3 miles east of Horsethief Springs, and 1 from a point 3 miles south of Horsethief Springs.

Pallid bat (Antrozous pallidus pallidus). This fairly large bat occurs throughout most of California, and is often abundant in desert regions. It is migratory in habit..

Lump-nosed bat (Plecotus townsendii pallescens). One specimen from a point one mile west of Horsethief Springs is on deposit in the Bird and Mammal Museum.

Brazilian free-tailed bat (Tadarida brasiliensis mexicana). This large bat occurs throughout the southern California desert regions. It may be found in the study area, particularly in the regions with large numbers of rock or mud caves. Members of this species congregate together in tremendous numbers. Three specimens from the Providence Mountains, San Bernardino Co., California, are on deposit in the Bird and Mammal Museum.

Amargosa pocket gopher (Thomomys bottae amargosae). Although originally collected near Shoshone, Grinnell (1921) believes it occurs about permanent springs in the valley of the Amargosa River, which leads into Death Valley. This rodent has an extremely limited range, but is probably found in the study area. It is one of two subspecies mentioned in this report that are endemic to the Amargosa Valley.

Little pocket mouse (Perognathus longimembris panamintinus). This tiny rodent occurs in the desert regions of central and eastern California. It prefers fine, firm gravelly soil in these regions (Ingles, 1965). Three specimens from 6 miles east of Horsethief Springs are on deposit in the Bird and Mammal Museum.

Long-tailed pocket mouse (Perognathus formosus mohavensis). The long-tailed pocket mouse occurs in the southeastern part of California, and the study area is certainly included within its range. Pocket mouse remains, probably of this species were removed from owl pellets collected on the China Ranch. Six specimens from Horsethief Springs are on deposit in the Bird and Mammal Museum.

Great Basin kangaroo rat (Dipodomys microps occidentalis). This species occurs in restricted regions of northeastern and east-central California. It may occur in the study area, as 17 specimens from the vicinity of Horsethief Springs are on deposit in the Bird and Mammal Museum.

Canyon mouse (Peromyscus crinitus stephensi). Numerous specimens from the Kingston Mountains are on deposit in the Bird and Mammal Museum. Grinnell (1937) found that these mice are normally associated with rocky cliffs and canyon walls in Death Valley. They are probably found in the more rocky regions of the study area.

Deer mouse (Peromyscus maniculatus sonoriensis). The deer mouse has a range that encompasses the entire state of California. Although none were collected during the study, it most probably occurs within the area under consideration.

Southern grasshopper mouse (Onychomys torridus longicaudus). The range of the southern grasshopper mouse includes most of the inland portions of southern California. One specimen from 5 miles east of Horsethief Springs is on deposit in the Bird and Mammal Museum, and I trapped one specimen 3 miles west of Horsethief Springs on February 14, 1970.

Desert wood rat (Neotoma lepida lepida). The desert wood rat is common throughout the Lower and Upper Sonoran Life Zones of California, particularly in the desert regions of the southern part of the state. Although none were captured during the study, scats thought to belong to this species were observed in several caves on the China Ranch on March 18. Five specimens from Horsethief Springs are on deposit in the Bird and Mammal Museum, and this species most probably occurs in the study area, particularly in the more rocky regions.

Amargosa meadow mouse (Microtus californicus scirpensis). This small mammal is of particular interest, since its distribution is restricted to the Amargosa Valley. It was originally described from seven specimens collected near the town of Shoshone, Inyo County, but Kellogg (1918) believes it is probably extinct in that area. Bailey (1900)described the habitat occupied by M. c. scirpensis as the wet ground under the tall tules (Scirpus Olneyi) growing along the Amargosa River, with runways extending through mud and water. Kellogg (1918) believes there is a possibility that M. c. scirpensis may still exist near Tecopa, where there is permanent water and tule marshes.

Gray fox (Urocyon cinereoargenteus scottii). Rich Wood, of Tecopa,reported that the gray fox was quite common aroound Shoshone until several years ago. It may occur in the study area, probably in limited numbers.

Ringtail (Bassariscus astutus nevadensis). The ringtail may be found in the study area, and most likely would inhabit the rocky cliffs surrounding the valley. It prefers rocky and brushy places, frequently near streams (Ingles, 1965). Protected by law in California.

Badger (Taxidea taxus berlandieri). The badger occurs throughout the state of California, and is quite common in desert areas. It may occur in limited numbers within the study area.

Spotted skunk (Spilogale putorius saxatilis). The spotted skunk generally prefers brushy, rocky places throughout most of the state. It is not found in the hottest parts of the desert, but may occur in the study area, especially since permanent water is found there.

THE APPENDIX

PART II

SUPPORTING STATEMENTS & LETTERS

ADDITIONAL SCIENTIFIC &

GENERAL INFORMATION

SUBMITTED BY INTERESTED PARTIES

NATIONAL AUDUBON SOCIETY

WESTERN REGIONAL OFFICE

555 AUDUBON PLACE (Fulton near Fair Oaks), SACRAMENTO, CALIFORNIA 95825 (916) 481-5332

May 2, 1972

As more and more Americans find the pleasures of recreation on public lands, pressures of land use must be evaluated. Good planning now can help preserve those environmental qualities we enjoy now yet through overuse can be lost.

Some ecosystems are overproductive and in a relatively short time heal scars of misuse while others have extremely slow recovery periods. Similarly, some species of plants and animals have wide distribution and are found in favorable habitats for high productive capabilities. Other species are considered endangered, their populations small and in some instances isolated in harsh climatic areas and limited biotic communities.

This report has been carefully documented by a team of competent researchers and focuses our attention on the Amargosa Canyon-Dumont Dunes area - an arid region containing unique and endangered species which must be given immediate protective care or they will forever be lost.

The qualified recommendations speak for themselves and stand on the integrity of man's wisdom to preserve those entities of the environment which he can never recreate.

We commend those who have given of their time to prepare this study and support their recommendations.

PAUL M. HOWARD
Representative

5800 FULTON AVENUE • VAN NUYS, CALIFORNIA 91401
781-1200 or 873-4010 • PRESIDENT: ROBERT E. HORTON

LOS ANGELES VALLEY COLLEGE

April 5, 1972

To the United States Bureau of Land Management:

When the author of this paper first began research in the vicinity of the Amargosa River Canyon and the Dumont Dune System in the year 1964, the region was close to being a pristine wilderness. Research was carried on with ease. It was a rare surprise to encounter more than one camping party at the dune system or in the Amargosa River Canyon during many excursions to the area. These persons that were encountered were interested in nature study and the solitude of the desert. We exchanged greetings and went about our mutual interests in an unobtrusive way. Upon looking back to those days, I was lucky to capture the pristine geological beauty of this area when it was yet untrammeled. I carried out very meaningful research in this area until the spring of 1966. At about that time, persons with off-road vehicles began disrupting the natural science of the area; my sand-traps were destroyed, dune measurement stakes uprooted, so that today nothing remains of my attempts to conduct meaningful geological research in the area.

In addition to the loss of this primitive area as a research area, the very alluvial surface upon which the dune system rests is being progressively "chewed up" by the wheels of thousands of "dune buggies" and other off-road vehicles. The abundant wildflower displays are sadly, in my opinion, a thing of the past; slopes are being systematically eroded away by man's machines. Canyons in this area, due to the sanitation problem, are being converted into vast community out-houses.

Contrary to popular opinion, sand dune fields usually cannot heal themselves overnight. Perhaps under exceptional conditions of high wind velocities, dunes may have the scars of use erased in a single 24-hour period, but certainly the tin cans and other debris left behind by thoughtless persons cannot completely decompose for hundreds of years under normal weathering processes. In addition to the destruction of the delicate desert environment surrounding the dunes, there is evidence that the constant movement by dune buggy erosion is fundamentally altering the shape of the Dumont

field which will result in a probable removal of sand from the field by the wind. At the present, the Dumont field is located in a small protective wind-shadow zone. As the dunes are lowered in height by dune buggy erosion, it is probable that more and more sand enters the wind stream to be carried from the region. The writer is presently researching this question.

Concerning the Amargosa River Canyon, many of the giological formations there are so fragile that they will be most certainly destroyed if subjected to use by off-road vehicles. The China Ranch Beds and fanglomerates, of which the canyon is particularly carved in, are extremely poorly cemented (indurated), which means that off-road vehicles in any numbers traveling on these undistrubed surfaces will leave marks several inches in depth. These will persist as scars on the landscape for decades, even hundreds of years.

As things now stand, the Dumont Dune System demands protection, as it is an active dune system unfettered by any appreciable vegetation, and free to evolve in a natural manner, presenting the scientist a natural laboratory and the beholder a tenuous pristine beauty. The Amargosa River Canyon is a geological "treasure trove" of beautiful rock formations. Future students of the natural sciences and earth should be allowed the privilege of studying this area in its natural state.

Afton Canyon, west of Crucere on the Union Pacific Railraod, is almost a virtual "carbon copy" of the Amargosa River Canyon. A Bureau of Land Management campground has been established in this canyon near Afton siding on the Union Pacific Railroad. It is the author's strong feeling that the Amargosa River Canyon should be preserved as a natural area. Those wishing to exploit Badland topography should be encouraged to go to Afton Canyon where a railroad and "buggy" tracks already dominate the terrain.

Sincerely

Angus A. MacDonald

Angus A. MacDonald
Assistant Professor,
Earth Science
Department,
Los Angeles Valley
College,
Van Nuys, California

March 19, 1972

Pupfish Habitat Preservation Committee
P. O. Box 394
Montrose, California 91020

To Whom It May Concern:

As it is impossible for me to prepare a more formal report at this time, I thought that this informal note could serve equally well. Please feel free to extract whatever would be helpful for your crusade to restrict off-road vehicles from the China Ranch area.

The problem of "ORV's" intruding in natural areas is primarily the effect on the fragile ecosystems, as you well know. The geologist is primarily concerned with ancient physical and life systems, but relies heavily on modern processes and ecosystems to interpret the ancient. He therefore is concerned (or should be) about their possible destruction by thoughtless individuals.

ORV's do little damage to the hard rocks of the region and do not seriously damage the soft rocks as far as their geological interpretation is concerned. The myriad tire gouges and tracks are chiefly an eyesore and the problem seems more aesthetic to the geologist concerned with the ancient hard rocks of the region. However, branches of the geological sciences concerned with sedimentation, erosion and other geomorphic processes which are presently active are closer to the problem of ORV's. Any serious study of erosion rates for example would be seriously disrupted or ruined by ORV intrusion. The near-surface deposits of the area can be (and are) churned up and rendered useless to interpretation by heavy ORV traffic.

Most active geological research in the region (that I am familiar with) is concerned with interpretation of paleoenvironments, paleogeography, and regional structure. The China Ranch area contains spectacular exposures of Tertiary to Recent soft rocks as well as very ancient (Precambrian) sediments and igneous rocks. Both detailed sedimentary structures and complex fault patterns are exposed in the area.

Several geologists at the Pennsylvania State University are presently involved in Death Valley Region research. We have worked closely with geologists from Berkely, Stanford, California Division (or Bureau) of Mines, and several other schools. All of these people have expressed concern over the marauding off-road vehicle traffic.

Respectfully yours,

Michael T. Roberts

Michael T. Roberts
Dept. of Geosciences
The Pennsylvania State Univ.
University Park, PA. 16802

Natural History Museum

April 11, 1972

Desert Pupfish Habitat
Preservation Committee
P.O. Box 394
Montrose, California 91020

Dear Sir:

Enclosed is a preliminary report on the paleontological investigations being undertaken in the Tecopa Basin, Inyo County, California. Preliminary work during the last two years by three institutions, the University of California at Riverside, San Bernardino County Museum and the Natural History Museum of Los Angeles County has shown that the deposits contain an extremely important fossil fauna.

This fossil fauna is the first good record of Middle Pleistocene life from the Mojave Desert area. Collecting thus far has yielded at least one entirely new animal. Fossils are widely scattered throughout much of the basin. Two local concentrations have also been discovered. Although well preserved, the fossils are extremely fragile and require specialized collecting techniques.

Erosion within the badland lake deposits in the Tecopa Basin is extremely slow. Most of the low hills are covered with a 3-18 inch thick, extremely soft weathered zone. This zone or "soil" required hundreds of years to develop and serves to protect the underlying soft sediments from rapid weathering from either water or wind.

Because of the extremely important fossil fauna and the delicate nature of the sediments, I was very encouraged to hear of your efforts to restrict ORV's from this area. Even in the two years we have been working in the Tecopa Basin we have noticed a disturbing increase in the denudation of the low hills by ORV's. The trackways left by a single vehicle not only disturb the delicate erosional balance, but will require 50-100 years to disappear.

In applying for our collecting permit from the Department of the Interior, we voluntarily pledged to restrict our ORV travel to stream bottoms. The delicate soil balance in the Tecopa Basin simply cannot survive excessive

Giles W. Mead, *Director*
C. F. Gehring, *Assistant Director*

Los Angeles County Museum of Naturel History
Exposition Park • 900 Exposition Boulevard • Los Angeles, California 90007 • telephone 746 0410

ORV travel without triggering denudation which might never be repaired by present, natural environmental conditions.

If users of ORV's feel they must have dry lake basins to run around in, there are other such basins in the Mojave Desert which still periodically flood and thus much of the damage caused by the traffic is temporarily repaired. The Tecopa Lake Basin is a fragile relic of the Middle and Late Pleistocene and it will not survive modern technology unless all efforts are made to preserve it now!

Sincerely yours,

David P. Whistler

David P. Whistler
Senior Curator
Vertebrate Paleontology

DPW:lw

UNIVERSITY OF CALIFORNIA

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SANTA BARBARA • SANTA CRUZ

DEPARTMENT OF GEOLOGICAL SCIENCES

RIVERSIDE, CALIFORNIA 92502

March 10, 1972

Mr. Ben Romero
P. O. Box 394
Montrose, California 91020

Dear Mr. Romero:

I join Art Ballard in supporting your concern for the Amargosa Canyon-Dumont Dunes area. The area is of critical scientific importance in that the alluvial and lake deposits in the region contain important evidence as to its geologic growth and development over the past few million years.

In the vicinity of the Tecopa Hot Springs, deposits contain ash beds that have been dated at about 700,000 years and in association with this are sediments that yield the only major assemblage of fossil mammals that pertain to this segment of time in the greater Death Valley region. The fossils are of interest not only for their stratigraphic value, but also give an important glimpse into the nature of the climate during this time. Among the fossils are remains of a camel that is totally unknown anywhere else in North America. As you can see, these and other small mammal fossils, are so important to our understanding of the development of the land life of this region that it would be criminal if the beds, and their fossils, were destroyed by dune-buggys, motorcycles and the like.

Although we will be unable to join you on your forthcoming trip to the area, please feel free to convey these statements to officials of the Bureau of Land Management or other concerned agency.

Sincerely yours,

Arthur L. Ballard
Graduate Student

M. O. Woodburne
Associate Professor

MOW:ALB:ns

cc: Dr. Sylvia Broadbent
Department of Anthropology, UCR

UNIVERSITY OF CALIFORNIA, RIVERSIDE

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DEPARTMENT OF ANTHROPOLOGY RIVERSIDE, CALIFORNIA 92502

April 19, 1972

Pupfish Habitat Preservation Committee
P.O. Box 394
Montrose, Calif. 91020

Gentlemen:

I am writing to inform you that the proposal to withdraw the Amargosa River area and make it a natural area would be very advantageous from the point of view of protection for important archaeological sites. This area, because of its unusual ecological characteristics, especially the abundant water there in the midst of an extensive area of extreme aridity, has obviously always been highly attractive for human settlement, especially to hunting and gathering peoples, and in consequence there is an abundance of archaeological sites there. It appears to have been a focus of prehistoric activity from the earliest times; some of the material there may date from before 6,000 B.C. Very early archaeological sites are naturally extremely scarce, because (1) the farther back in time, the fewer people there were, and hence fewer sites, and (2) the older sites are, the more hazards and vicissitudes they have had to survive with the passage of time, and hence a smaller proportion survive. It is therefore extremely urgent to protect early sites as much as possible.

Many of the remains in the area, especially those likely to be most ancient, are extremely fragile, particularly with respect to damage by off-road vehicle use. Ancient trails and house circles are very easily destroyed by driving over them; a trail becomes unrecognizeable as such if even one vehicle track runs along it. There is as yet no adequate inventory of remains, no detailed mapping of trails and house circles, not to speak of further studies at a professional level. I believe that allowing off-road vehicle riding in this area would cause irremediable damage to archaeological resources which the Bureau of Land Management is committed to protecting, according to their Manual of Regulations (Sects. 6231, 9251), and to do so without first having a thorough, professional-level archaeological study of the area to record all possible information prior to the destruction consequent on off-road vehicle recreation would, I believe, constitute a serious violation of the Federal Antiquities Act (34 Stat. L., 225) and other legislation and statements of public policy.

I trust that the Bureau of Land Management will make every possible effort to preserve and protect the archaeological resources of this area as well as its other unique natural values.

Yours sincerely,

Sylvia M. Broadbent

Sylvia M. Broadbent, Ph.D.
Associate Professor

Pacific Coast Archaeological Society, Inc.
P. O. BOX 926 • COSTA MESA, CALIF. 92627

April 12, 1972

To Whom It May Concern:

The Pacific Coast Archaeological Society strongly protests the possible opening of the Amargosa Gorge to the use of dune buggies and motorcycles.

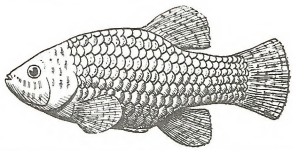
The area south of Tecopa, including China Ranch oasis, the Amargosa Meadows and the Amargosa Gorge holds a tremendous archaeological potential which has been only partially studied. The first written report on the area was published by PCAS in Vol. 7, No. 2, the QUARTERLY. A perusal of this report will demonstrate how much more work needs to be done here and how much more information it can yield in the way of prehistoric utilization of natural resources, ancient trade routes and migration patterns.

Unfortunately the only present access to Amargosa Gorge is directly through the picturesque and historic China Ranch. Opening such an access route would effectively destroy all archaeological evidence. It would also obliterate the almost undisturbed China Ranch oasis which is not only beautiful and peaceful in itself but is a live example of the plant and animal resources that drew prehistoric man to settle there.

Jane Gothold, President

Jane Gothold

Desert Fishes Council



"Dedicated to the Preservation of America's Desert Fishes"

407 West Line Street
Bishop, California 93514
April 5, 1972

Mrs. Ben Romero
P.O. Box 394
Montrose, California 91020

Dear Mrs. Romero:

This is in reference to your recent request for an opinion concerning the probable effect on the aquatic environment and endemic fish populations if significant vehicular use were to occur within the Amargosa River gorge below Tecopa, Inyo County.

As you are probably aware, the Desert Fishes Council is a nationwide organization comprising over 100 state, federal and university scientists and resource specialists, supplemented by representatives of several national conservation organizations. The purpose of the Council, as stated in its constitution, is: "To provide for the exchange and transmittal of information on the status, protection and management of desert fishes and their habitats. For the purpose of this Council, the term 'desert fishes' is intended to include any endemic fish, be it species, subspecies, or race, that inhabits drainages of the North American deserts. . . . "

When this question was initially presented to me, I referred it to several members of the Council's Technical Advisory Committee who are familiar with the Amargosa River gorge. Included within this group was Dr. Robert R. Miller of the University of Michigan at Ann Arbor. Dr. Miller is especially well acquainted with the area in question and is probably the world's foremost authority on North America's desert fishes and their habitats. Following is a consensus of thought presented by the Technical Advisory Committee.

The Amargosa River within the gorge is the type locality for the Amargosa pupfish (Cyprinodon nevadensis amargosae) and a yet undescribed subspecies of dace (Rhinichthys osculus ssp.). In addition, the distinct possibility exists that certain spring areas in and adjacent to the Amargosa gorge may harbor populations of the highly endangered Tecopa pupfish (Cyprinodon nevadensis calidae).

Because of a generally lowering water table within the Amargosa drainage system, habitat for the endemic fish fauna is decreasing. Consequently, we may expect the more permanent habitat areas to become increasingly important in the matter of species preservation.

Consequently, the Desert Fishes Council expresses its objection to increased vehicular use in the Amargosa gorge area on the basis of almost inevitable habitat destruction resulting from the following factors:

1. Soils within the gorge are of an easily eroded type. Modification of the existing railroad bed to accommodate regular vehicular travel would unquestionably create a siltation problem which, in turn, would seriously degrade the stream habitat. This condition would, of course, be aggravated by flood flows which must be expected in desert areas.

2. If the general gorge area were made readily available for vehicular use, it is unlikely that this use could be restricted to any specific roadway. This would result in destruction of riparian vegetation, and flood plain vegetation is notoriously slow to recover from mechanical injury.

3. Human use and littering of the streambed would result in a deterioration of water quality and a dispersal of endemic faunal populations.

4. Increased human use (particularly from vehicles) increases the very real danger of the introduction of exotic species. Competition and predation by exotic species has been one of the major factors in the decimation of endemic fishes.

5. Increased use (again particularly from vehicles) will increase fire hazards. Also, inasmuch as "new" territory for vehicular use often tempts the overly enthusiastic motorist to use these areas as "proving grounds," there would be increased danger from gasoline and oil spills which, if they were to enter the river, would result in a heavy loss of aquatic life and would exert an enduring detrimental effect on the aquatic and riparian environments.

The above points form the basis for the Council's opposition to significant vehicular use in the Amargosa River gorge. Furthermore, the Council supports the establishment of a sufficiently large buffer zone around the gorge to assure its protection, and recommends that this include the Dumont Sand Dunes on the south and extend northward to the mouth of the gorge near Tecopa. This area should also include such lands adjacent the gorge as are necessary to accomplish the basic purposes of the restriction.

As time goes on it becomes apparent that the establishment of natural museums, especially where rare and endangered animals are concerned, will become increasingly important in land use planning. We have learned that the Inyo County Planning Commission is sympathetic with this basic philosophy. The Desert Fishes Council is hopeful that such a classification will be adopted for the Amargosa River gorge.

Sincerely,

Edwin P. Pister

Edwin P. Pister
Chairman

EPP:th

STATEMENT REGARDING THE PROPOSED CLASSIFICATION
OF AMARGOSA CANYON, IN INYO AND SAN BERNARDINO COUNTIES,
CALIFORNIA, AS A NATURAL AREA

The Amargosa Canyon represents a segment of the Amargosa River drainage that has survived with relatively little modification by the hand of man. In striking contrast, the headwater part of this river, at and above Beatty, Nevada, has been severely damaged by man's activities, and the tributary basin in Ash Meadows, Nevada, has suffered greatly in recent years and continues to be altered by pumping and irrigation. Because of the possibility that additional pumping will occur in the Amargosa River between Beatty and Shoshone, the terminal flow of the Amargosa River in the southeastern part of Death Valley may well disappear. For these reasons it is urgent that the Amargosa Canyon remain as little disturbed as possible in order to preserve a segment of the original river, along with its biota.

This segment of the river also contains the type locality of the Amargosa pupfish, Cyprinodon nevadensis amargosae, which lives elsewhere in the terminal flow of the Amargosa River in Death Valley. Since that population may well be threatened with extermination in the near future, and since the populations just north of Tecopa (between that town and Shoshone) have already been seriously affected by man, it is urgent that a refuge be set aside for this subspecies. The best site lies within Amargosa Canyon, which begins just south of Tecopa.

The canyon also contains a local race of the speckled dace, Rhinichthys osculus, which is distinct from other populations of this dace that are barely surviving in Ash Meadows and above Beatty, Nevada.

The canyon possesses scenic values that cannot be replaced once they are destroyed. There are geological formations of interest. Near the head of the canyon, exposures of Pleistocene lake beds may well contain fossil evidence of the life that occurred in this region during a period that goes back perhaps a million years or so.

I urge that the Bureau of Land Management set aside this area as a natural reserve so that the above values will not be lost. Once lost they can never be regained.

Robert Rush Miller

Robert Rush Miller
Chairman, Committee on
Environmental Quality,
American Society of
Ichthyologists and
Herpetologists
Professor of Zoology
Curator of Fishes

April 5, 1972

UNIVERSITY OF CALIFORNIA, SAN DIEGO

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SANTA BARBARA · SANTA CRUZ

SCRIPPS INSTITUTION OF OCEANOGRAPHY

POST OFFICE BOX 109
LA JOLLA, CALIFORNIA 92037

April 4, 1972

Mrs. Mirian A. Romero
Coordinator, Desert Pupfish
Habitat Preservation Committee
P.O. Box 394
Montrose, Calif. 91020

Dear Mrs. Romero:

I have and am much interested in your letter of March 28, and I have just had a long talk with Dr. Miller at Ann Arbor, with chief attention to the matter that you raise in your letter to me of March 28. I am passing along some of the information regarding the area of your proposed natural area (Amargosa Canyon-Dumont Dunes).

During my term of membership, now ended, on the University of California statewide Natural Land and Water Reserve System, I have heard a number of times about the high desirability of maintaining in a natural condition the Amargosa Canyon and the China Ranch property. On the way to the last pupfish conference in Death Valley Bob Miller and I and our families dropped into the area, and checked over the William Willow Creek Canyon up to the Willow Spring, and then went down to the canyon and looked at it for some distance above.

I was very much impressed with the desirability of maintaining this area, including not only China Ranch and the Willow Spring, but also a considerable stretch of the Amargosa Canyon. I was thinking in terms of the possibility of the acquisition of the area for inclusion in the University of California Natural Land and Water Reserve System, and I know that the chairman of the statewide committee, Dr. Mildred E. Mathias of the Botany Department at UCLA has also indicated a very considerable interest in the area. We found a considerable profusion of bird life, natural vegetation, and extraordinary interesting geological formations in the area that we covered. Your concept of having a reserve covering the entire canyon down to and also including the Dumont Dunes, strikes me as an A-1 proposal.

One item that impressed me was the historical interest in the area, with the old stone stage station below China Ranch, the remains of the old mining railroad, and other features.

Dr. Miller particularly checked the stream, and I know that he is making a strong recommendation for the preservation of the stream in the canyon, as this may very well remain the only really active part of the Amargosa River if or when the new pumping project farther upstream in the same river bed may be effected.

Sincerely,

Carl L. Hubbs
ds

Carl L. Hubbs

UNIVERSITY OF CALIFORNIA, LOS ANGELES

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SANTA BARBARA • SANTA CRUZ

DEPARTMENT OF ZOOLOGY
LOS ANGELES, CALIFORNIA 90024

17 April, 1972

Ms. Miriam Romero
P. O. Box 394
Montrose, California 91020

Dear Miriam:

Enclosed is my report on the mammals of the Amargosa River and Dumont Dunes. I am also sending slides of the two kangaroo rats from there, and hope they will be useful to you.

I was impressed by the beauty of this small region and am also interested in studying some of the mammals there more closely.

I hope to see this area set aside as a nature preserve, as you know. The Dumont Dunes should be protected not only for its animal life, but also for its geologic beauty, as have other unusual lands, as the Black Canyon of the Gunnisson and White Sands National Monument, which are enjoyed every year by people who greatly benefit from their visit. The River and Dunes support a great variety of life, and are of great esthetic value. Although those who are irresponsibly destroying the area get a kick out of their ORVs, their enjoyment is no compensation for the loss to others and future generations.

Sincerely yours,

Kathryn Bezy

Kathryn Bezy
Staff Research Associate

SOCIETY FOR THE PRESERVATION OF
BIRDS OF PREY
POST OFFICE BOX 293
PACIFIC PALISADES, CALIF.

J. RICHARD HILTON, PRESIDENT
STILES THOMAS, DIRECTOR
BOX 168, ALLENDALE, N.J.

April 19, 1972

Pupfish Habitat Preservation Committee
P.O. Box 394
Montrose, Calif. 91020

To Whom It May Concern:

Of all groups of wildlife, birds of prey are in most serious trouble. The California condor, Everglade kite, prairie falcon, peregrine falcon, and southern bald eagle are endangered species. The status of at least 40 other raptors has been similarly recognized.

One of the greatest problems facing birds of prey is habitat encroachment, for birds of prey forage and nest in areas which are unspoiled--target areas for those with recreational pursuits and real estate dreams. The need for recognizing valuable wilderness areas for birds of prey is critical to their preservation.

Such an area in Southern California is Amargosa Canyon and Dumont Dunes near Death Valley. Both regions are exceptionally rich in all forms of wildlife, including such predatory bird species as the marsh hawk, Cooper's hawk, sparrow hawk, prairie falcon, red-tail hawk, and sharp-shinned hawk. The tragedy of the Amargosa Canyon-Dumont Dunes region is that it is threatened by offroad vehicles and weekend visitors.

Past experience has shown the need for preserving valuable wildlife haunts before they are ruined. Hawks and owls are especially shy creatures; they require areas free of the motorcycle's roar and the rifle's aim. Few such areas in Southern California remain.

The Society for the Preservation of Birds of Prey supports efforts of the Pupfish Habitat Preservation Committee to save the Amargosa Canyon-Dumont Dunes area as a wildlife preserve, a place where man can study nature and where wildlife can live in peace. The entire predator-prey ecosystem will be destroyed if this most unique wilderness area is not preserved.

Sincerely,

J. Richard Hilton,
President

Natural History Museum
Los Angeles County

April 19, 1972

The Pupfish Habitat Preservation Committee
P.O. Box 394
Montrose, California

To Whom It May Concern:

I strongly support the proposal for a "Natural and Historical/Cultural Area" classification for the Amargosa Canyon - Dumont Dunes area as proposed by the Pupfish Babitat Preservation Committee.

There is widespread destruction of reptile habitats due to the indiscriminate activities of ORV users. Much of this is unintentional due to lack of education and knowledge about reptiles. Nonetheless, it is happening. There is an increasing loss of reptile life due to collecting activities by desert visitors. More important there is increasing loss of reptile life due to killing and shooting.

The shooting of larger lizards and especially snakes has long been both a favorite sport and a cherished duty of many individuals who seem to have misdirected certain aspects of the American pioneer spirit. The Chuckwalla and Rattlesnakes are frequently shot by visitors to the desert either "for fun" or from the misguided notion that they are thus in some way protecting themselves and their families from the "dangers of the wilderness." Although I lack substantial evidence of this kind of activity in the study area, my experiences in other areas would make it difficult for me to believe that users of ORV's in the area do not kill Rattlesnakes whenever they encounter them. Naturalists, on the other hand, usually have an appreciation for all organisms, even venomous reptiles, and in my experience are not inclinded to needlessly kill or molest animals.

In addition to mentioning the impact of ORV usage on the amphibians and reptiles, it would be hypocritical of me not to mention the effect of such activity on biologists wishing to answer the several questions pointed out in this report. It is no less than impossible to try to conduct biological investigations in an area which is continually disrupted by ORV usage.

Los Angeles County Museum of Natural History
Exposition Park • 900 Exposition Boulevard • Los Angeles, California 90007 • telephone 746 0410

The Pupfish Babitat Preservation Committee

I would hope that the BLM will concur in the proposal submitted by The Pupfish Habitat Preservation Committee at the earliest date possible. Any delay will have detrimental effects on the ecosystem if current ORV use in the area continues.

Respectfully yours,

Robert L. Bezy

Robert L. Bezy
Associate Curator,
Herpetology

Charles F. Brown

STANDARD PRODUCTS—RICHFIELD PRODUCTS—TEXACO PRODUCTS—FOOD MART

Box 38 Baker, California Phone 733-4300

April 3, 1972

Mrs. Miriam Romero
P.O. Box 394
Montrose, Calif.

Dear Mr. Romero:

I was sorry to learn that the Bureau of Land Management is considering opening up the Amargosa River Gorge to Off-the-Road vehicles. As an owner of the China Ranch which is on a tributary to the Amargosa River I have explored the Gorge both by hiking and on horseback. It certainly is a beautiful area and in a relatively natural state. I have observed numerous birds and animals in the Gorge area. These animals and birds are apparently native to the area. The rock formations in the Gorge are also very colorful and interesting.

It is my opinion that the Gorge should be left in its natural state and this would be impossible if the Gorge is opened to ORV's. I can show you many places in the Shoshone-Tecopa-Baker area where indiscriminate use by ORV's has torn up the desert and made an ugly sight out of land which was once beautiful. I do not think that people should be excluded from the area but I do think that it should be reserved for people on horseback and hikers.

At the present time the main entrance to the Gorge is through the China Ranch. We have never closed this road as we like to have people enjoy the beauty of the area. However if the Gorge is opened up to ORV's from the South I am sure they would cause such a nuisance and a hazard that this road would have to be closed.

In my opinion the Dumont Dunes are in a different category and ORV's should not be excluded the dunes. The Dunes regenerate themselves after each windstorm to erase the tracks made by ORV's. If I can be of help in dissuading the BLM from opening up the Amargosa Gorge please let me know.

Sincerely yours,

Charles F. Brown

A STATEMENT ABOUT THE AMARGOSA CANYON AREA FROM THE VIEWPOINT OF BIOLOGY TEACHER

John N. Horn, William Workman High School

To the teacher of biology wild places are unique laboratories where all facets of his discipline are on display for his students. Utilization of these areas to enhance a biology program presents a fascinating challenge to the teacher. Historically, Southern California has been considered to be an ideal part of the United States in which to teach biological science because of the ready availability of numerous biologically rich environments. Within a frighteningly short time - about ten to fifteen years - many of these areas have disappeared or have become unavailable. Some have been so altered through missuse that they are no longer useable to the teacher.

The Amargosa River Canyon area is at present a relatively unspoiled portion of California. I recently visited the canyon with four of my students, and the value of this area to the teacher was immediately apparent. Deserts by their very nature are dry; thus when on encounters an abundance of water in a desert - with a unique community of plants and animals supported by the water, the value of such an area to the study of biological relationships is enormous. The delicate balance between water and plants is dramatically illustrated between barren hillsides and the more lush river canyon. The pup-fish provide a living laboratory of evolution - examples of which are difficult to find, particularly examples which are readily interpreted by the beginning student. The adaptability of the pup-fish to enormous variations in water conditions makes them unique among living things, thus their importance to the understanding of basic biological principles is beyond measure.

My students were struck by the beauty of this canyon. Esthetic value is difficult to measure, yet I feel it is of immense importance to a complete understanding of the living world. Areas such as the Amargosa River Canyon need to be preserved in their natural state to provide the opportunity for the full beauty of wildness to be seen and appreciated by students. Any area which has been altered by man looses much of its teaching value by the inherent artificialness which man brings. The ultimate in man's artificial works can be beautifically enjoyed at Walt Disney's Disneyland; but the Disneyland philosophy has no place in natural areas. If teachers are to continue to be able to take students into areas which they know are natural and undisturbed, these areas must be given maximum protection.

The Gilfillan Psychiatric Medical Clinic

3907 NORTH ROSEMEAD BOULEVARD-ROSEMEAD,CALIFORNIA 91770-(213) 288-7353

psychiatry and counseling

John T. Gilfillan, Jr. M.D.
Director

REFERENCE

The Pupfish Habitat Preservation committee
Post Office Box 394
Montrose, California 91020

Dear Sirs:

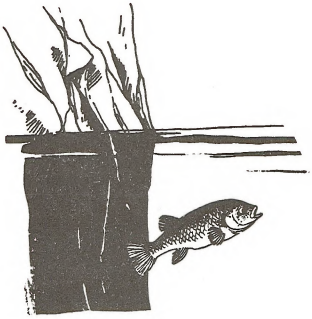
There is a great deal of evidence that the pressures of urban living contribute to the high incidence of neurotic problems in modern society. Further, many recent studies have indicated that neurotic manifestations were lacking in many native cultures which did not possess mechanization. That people need to have adequate recreation and escape from cities is a well established fact. Our desert areas are ideal for recreation. However, recreation need not mean mechanized destruction of desert areas. There are people who need to "blow-off steam" by driving all over desert areas. There are people who find their recreation in aggressive pasttimes. It is essential to recognize that there is a large segment of the population who find inner peace through solitude and quiet and thereby re-creat themselves. Those persons who appreciate abstract values such as the observation of unique species of animal and plant life, desert quiet and beauty, and being away from people should not be over-looked.

Many of my patients find strength in quiet places and not in aggressive and competitive sports. Peace and quiet is a positive good especially in our culture and it must be protected.

Sincerely,

Thomas C. Keedy Ph.D.

Thomas C. Keedy, Ph.D.
Licensed Psychologist



THIS REPORT IS SUBMITTED TO
BLM BY THE PUPFISH HABITAT
PRESERVATION COMMITTEE ON
MAY 10, 1972.

THIS REPORT HAS BEEN

EDITED BY

MIRIAM A. ROMERO

AUTHORED BY

JOHN M. SULLY, MIRIAM A. ROMERO, ROBERT D. SMITH

ACKNOWLEDGEMENTS

THIS STUDY IS THE PRODUCT OF THE DEDICATED EFFORTS AND COOPERATION OF MANY PEOPLE WHO VOLUNTEERED THEIR TIME, SERVICES, OPINIONS, ADVICE, AND FINANCIAL HELP. THE PUPFISH HABITAT PRESERVATION COMMITTEE GRATEFULLY ACKNOWLEDGES THEIR CONTRIBUTIONS.

***** ***** ***** ***** *****

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***** ***** ***** ***** *****

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Michael T. Breslin - Cartography
E. Angus - Graphics
Roger Mitchell - Land Ownership Title Search
George Anderson - Publicity
Andre Pack and
Robert Emirhanian - Planners, Community Analysis & Planning Associates, Los Angeles - For Advice and Help.

Mr. L. J. Van Rossen, Chrysler Corp. - For Data on Sewage disposal facilities.

Jean Sully- Rough Draft Typing
Joan Kirchhoff - Rough Draft Typing

Photography By: B. Romero, J. Posthumus, S. Wells, M. Romero, C. Galloway, J. Horn, E. P. Pister, M. Brenner, L. Mouri, H. Freeman, J. Sully, A. MacDonald.

Bird Censuses Aided By: San Fernando Valley Audubon Society, Los Angeles Audubon Society, & Peg Pollock, Ireland.

ADDITIONAL ASSISTANCE: (CONTINUED)

Generous Assistance & Permission to Survey & Camp on their Property: Owners of China Ranch: Chas. F. Brown, Baker, Calif., & Bernice Sorrells, Shoshone, Calif.

Mary Bergan, Lee Goff, Suzanne Bailey, Diann Baldwin, Don Lund, - For Help During Field Surveys.

BLM Staff in Riverside & Bakersfield; Especially Lou Jurs, Biologist, Riverside; Paul Petty, Recreation Specialist, Riverside; and G. "Bill" Flint, I & E, Riverside. BLM Staffs were most cooperative.

Special Acknowledgement must be given to the Audubon Societies for the many ways in which they helped the Pupfish Committee on this project. Paul Howard, National Audubon Society Western Representative, has been most helpful with cooperative efforts and advice.

Above all, Special gratitude to Phil Pister, (Calif. Dept. of Fish & Game) and Peter Sanchez (National Park Service, Death Valley N. M.), both of the Desert Fishes Council, whose dedication in saving the desert pupfish has been an inspiration to us all. Without this inspiration this study would not have become a reality.

***** ***** ***** ***** *****

THE PUPFISH HABITAT PRESERVATION COMMITTEE

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Merritt Brenner, La Puente
Wm. & Kathryn Buransky, Northridge
Richard Cocke, Los Angeles
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W. A. Dale, San Pedro
Harvey & Wilma Freeman, Sepulveda
Cynthia Galloway, La Puente
M. Hartley, Sylmar
John Horn, Walnut
Dr. Thomas & Avis Keedy, La Crescenta
Brian Kinsbursky, Burbank
Joan Kirchhoff, LaCrescenta
Larry Mouri, La Puente

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Alan Osumi, La Puente
James & Carolyn Posthumus
Ben & Miriam Romero, Montrose
Fran Smith, Burbank
Robert D. Smith, Tujunga
John & Jean Sully, Tujunga
Jan Tarble, Los Angeles
Wm. Warner, Arleta

***** ***** ***** ***** *****

BESIDES ALL THE ABOVE NAMED PEOPLE WHO HAVE WORKED SO HARD ON THIS PROJECT, SPECIAL GRATITUDE IS DUE TO THOSE GENEROUS PEOPLE WHO FINANCED THE PRINTING OF THIS STUDY. WITHOUT THEIR GOOD-WILL, THE HARD WORK WOULD HAVE BEEN TO NO AVAIL. DONORS LISTED (TO 4-24-72)

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UNITED STATES
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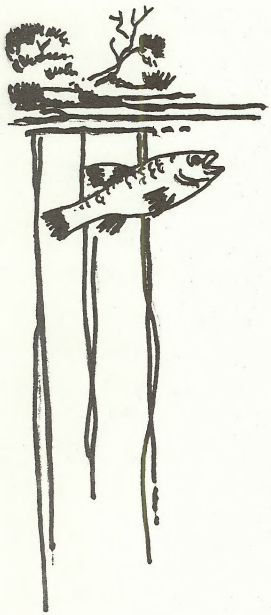

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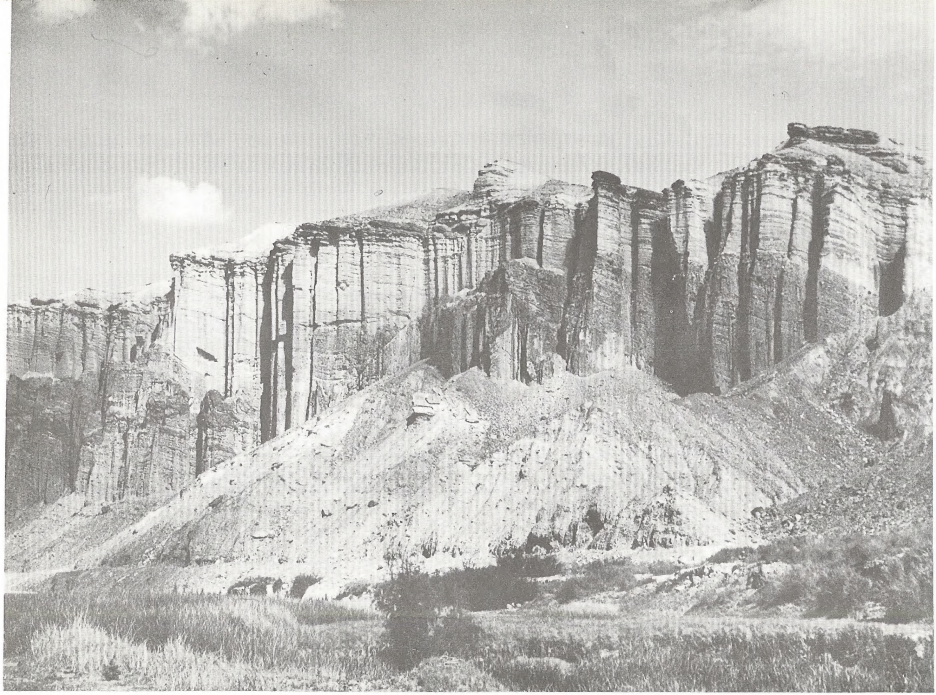

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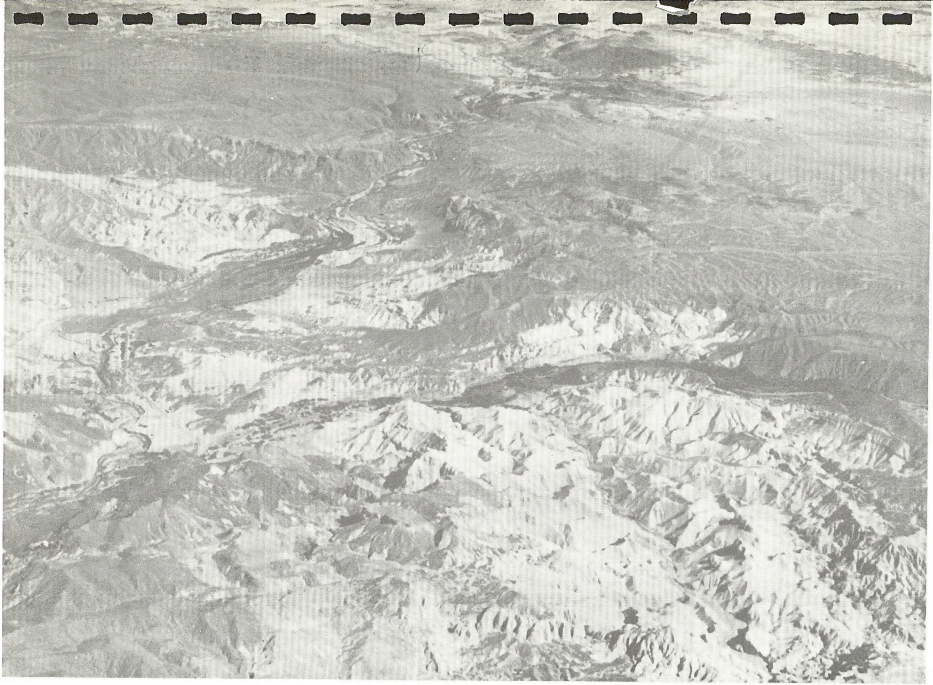

AERIAL VIEW – AMARGOSA RIVER WITH WILLOW CREEK TRIBUTARY. TECOPA AT TOP OF PHOTO.

E. P. PISTER