

JOTR

**environmental assessment**

**NATURAL RESOURCES  
MANAGEMENT PLAN**

**JOSHUA TREE**



**NATIONAL MONUMENT / CALIFORNIA**



Department of the Interior

National Park Service

NEGATIVE DECLARATION

JOSHUA TREE NATIONAL MONUMENT, CALIFORNIA

Western Region

In compliance with the National Environmental Policy Act of 1969, the National Park Service has prepared an environmental assessment on the following proposed project:

Natural Resources Management Plan  
Joshua Tree National Monument

The assessment process did not indicate a significant environmental impact from the proposed action. Consequently, an environmental statement will not be prepared.

An environmental assessment, which summarizes the planning considerations of the proposed project, is on file at the above office and will be available for public review upon request.

8-27-74

Date

*Homer T. Rouse*


Superintendent

10/22/74

Date

*John H. Davis*  
ACTING

Regional Director, Western Region



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## ENVIRONMENTAL REVIEW

### Natural Resources Management Plan Joshua Tree National Monument

The Natural Resources Management Plan (NRMP) for Joshua Tree National Monument has been completed, and an environmental assessment has been prepared to document the environmental impacts of the proposed actions.

The NRMP proposes a broad range of research and management actions, summarized under a few broad headings. The natural history survey will include intensive plant and animal inventory and ecology studies. A special study of Joshua tree ecology is proposed. California fan palm oases will be studied and the Oasis of Mara will be restored to a natural condition by manual clearing, periodic prescribed burning, and possibly irrigation. Desert bighorn ecology will be studied, and artificial watering devices for wildlife will be constructed in areas of wilderness to restore natural water supplies disturbed by man.

Environmental impacts of the NRMP are intended to restore natural conditions to the ecosystems of the monument. None of the studies will entail significant impacts. The restoration of the Oasis of Mara will involve the removal of mesquite, resulting in short-term noise impacts and stumps that will remain visible until herbaceous growth covers them. Prescribed burning will maintain the open understory of the oasis, while short-term smoke impacts will be present. Watering devices for wildlife will be placed only in areas of historical water supply that have been altered or depleted by human activities, and will be constructed to blend with the natural landscape.

Alternatives considered in the NRMP are no action, which would result in no research or management action, trying to restore natural processes to the Oasis of Mara without prior restoration of natural conditions, and the creation of more or less artificial watering devices for wildlife. All of these alternatives were considered and rejected in favor of the proposed action plan for reasons discussed in the assessment.

Because none of the proposed actions entail significant environmental impacts, it is recommended that the Joshua Tree NRMP be assigned a negative declaration. This classification will negate the need for a full environmental statement; the natural resources management planning effort at Joshua Tree National Monument will be translated into an action program thirty days after public review of this environmental assessment.



DEPARTMENT OF THE INTERIOR

## ENVIRONMENTAL ASSESSMENT

Proposed

NATURAL RESOURCES MANAGEMENT PLAN

# JOSHUA TREE

NATIONAL MONUMENT

CALIFORNIA

PREPARED BY  
JOSHUA TREE NATIONAL MONUMENT  
NATIONAL PARK SERVICE  
DEPARTMENT OF THE INTERIOR





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## SUMMARY

### ENVIRONMENTAL ASSESSMENT

Department of the Interior, National Park Service, Western Region  
Joshua Tree National Monument

1. Type of Action:            (X) Administrative    ( ) Legislative
2. Description of Action: The Joshua Tree Natural Resources Management Plan proposes research and management actions to restore and maintain natural ecosystems in the monument. Many resource inventory and monitoring projects are proposed. Desert bighorn sheep ecology will be investigated through the use of surveys and studies of individual animals. California fan palm oases will be studied and the Oasis of Mara will be restored to a natural condition by manual clearing, periodic prescribed burning, and possibly irrigation. Artificial watering devices for wildlife will be constructed in areas of wilderness to restore natural water supplies disturbed by man.
3. Environmental Impact and Adverse Environmental Effects: In general, the impacts of the proposal will restore natural conditions in the ecosystems of the monument. There will be very slight disturbance to sheep populations in order to obtain critically needed data, but all captured animals will be immediately released after necessary measurements are made. In the Oasis of Mara, mesquite will be removed, causing short-term noise impacts and stumps that will remain visible until herbaceous growth covers them. Prescribed burning will maintain the oasis with a natural, open understory, and burning will be done under conditions that will confine the fire to a predetermined area and intensity. Watering devices will be placed only in areas of historical water supply, and construction will blend each guzzler with the surrounding landscape.
4. Alternatives Considered: 1. No action. Do not conduct any studies, or any management of bighorn sheep, palm oasis restoration, or restoration of water supplies. 2. Restore natural processes to the Oasis of Mara as feasible without prior restoration of natural conditions. 3. Create fewer water guzzlers. 4. Create more water guzzlers.



5. Informational Copies Have Been Sent to the Following:

Department of Agriculture  
Forest Service  
Soil Conservation Service  
Department of the Interior  
Bureau of Indian Affairs  
Bureau of Land Management  
Bureau of Mines  
Bureau of Outdoor Recreation  
Bureau of Reclamation  
U.S. Fish and Wildlife Service  
Geological Survey  
California Association of Governments  
State Historic Preservation Office  
Joshua Tree Park and Recreation District  
San Bernardino Co. Mountain Desert Planning Agency  
Twentynine Palms Park and Recreation District  
Yucca Valley Park and Recreation District  
Joshua Tree Municipal Advisory Council  
Twentynine Palms Community Council  
California Off-Road Vehicle Association  
Desert Protective Council  
Federation of Western Outdoor Clubs  
Morongo Basin Conservation Association  
National Audubon Society  
Sierra Club  
Southern Pacific Land Company  
Wilderness Society

6. Date Made Available to Public: OCT 22 1974 (first printing)  
DEC 31 1974 (second printing)



## DESCRIPTION OF THE PROPOSAL

Joshua Tree National Monument preserves over one-half million acres of a uniquely representative portion of the vast California desert. It encompasses two large ecosystems determined primarily upon the basis of elevation: the Mojave, or high desert and the Colorado, or low desert. Few areas, if any, illustrate the contrast between high and low desert more vividly.

A large assembly of curious desert plants and animals, complemented by spectacular geologic features, comprise its major resources. The monument is immense and variable, yet fragile. It is a desert land shaped by sudden torrents of rain and by silent freezing and thawing within minute fissures. It is also a land controlled by its lack of water: rainfall is sparse, scattered and unpredictable; streambeds are usually dry; waterholes are few and scattered. Within this parched environment are found intricate living systems, each performing a different function, and each fragment depending upon the whole system for survival.

The purpose of the proposed natural resources management plan is to provide for a documented, systematic approach upon which reliably predictive management decisions can be formulated. The two major ecosystems must be studied as well as the interrelationships of their respective subsystems. Long-term resource management objectives for Joshua Tree National Monument are directed toward preserving as a composite whole the natural ecological processes and unique geographic features for which the monument was originally set aside.

The resource management plan for Joshua Tree National Monument is based on a modified ecosystem approach that is appropriate for the area. The frame of reference is a broad one, for only by investigating the interrelationship of many variables within the ecosystems of the monument can we gain the perspective, and predictive data, needed to effectively manage the systems for posterity.

Figure 1 depicts the basic ecosystem of Joshua Tree National Monument. Energy input into the system is assimilated, in part, and exchanged. This energy flow is affected by climatic considerations and by pollution of the air. Various producer organisms are influenced by the above parameters, as well as by the substrate in which they grow. The producer organisms convert solar energy to forms usable by consumer organisms. The consumers are influenced by the availability of plants, and in turn influence the plants and each other. Food chains probably are fairly short in Joshua Tree, consisting of three to five steps. Each step along the chain results in an incremental loss of energy.

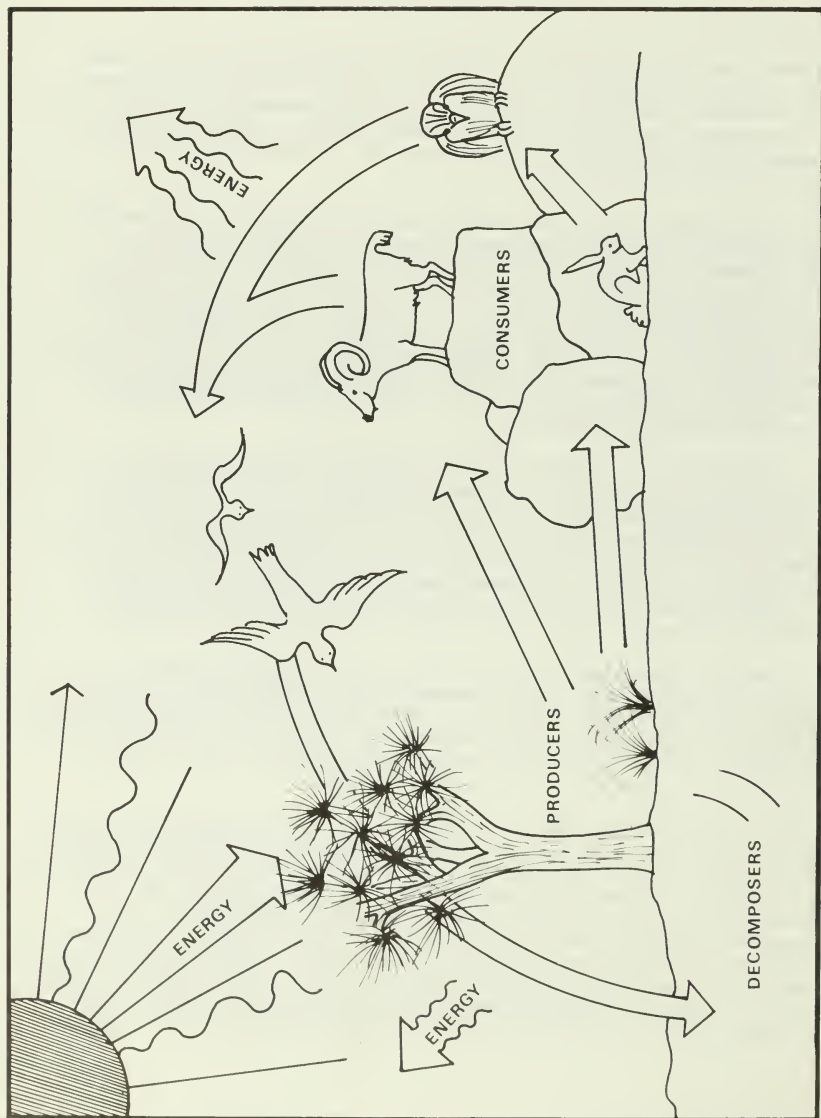


FIGURE 1. SIMPLIFIED ECOSYSTEM DYNAMICS IN JOSHUA TREE NATIONAL MONUMENT.



It takes a broad base of producers-primary consumers and secondary consumers to support one carnivore such as a mountain lion. Thus, our limited ecosystem cannot support many top carnivores. In our ecosystem(s), man is the ultimate disruptive influence. In his aboriginal form, man fit into the system as a primary consumer and as a top carnivore. In his more civilized state, he disrupts the system by destruction of vegetation, alteration of the environment, manipulation of water resources and pollution of the air and water. The living components of the system ultimately provide food and energy for decomposer organisms. Unfortunately, man is excluded from this recycling insofar as Joshua Tree National Monument is concerned.

It is imperative that resource management goals be sufficiently flexible to respond to the naturally occurring changes within the monument's ecosystems. The plan is guided by and concurs with the concepts of resources management presented in the Joshua Tree National Monument Master Plan. Pertinent to the monument's natural history resources, the approved management objectives are stated as follows:

Maintain an optimum population of wildlife within the monument in accordance with ongoing research and appropriate management techniques.

Continue a special research program on the bighorn sheep to develop and monitor appropriate management techniques for the perpetuation of this species.

Initiate a research project on the Joshua tree to develop appropriate management techniques for the perpetuation of the plant species after which the monument is named.

By using research-based techniques, manage the monument's palm oases for the perpetuation of the California fan palm in its natural state, taking into account historical and archeological resources.

Continue an active cooperative research program with various colleges and universities. Provide research study areas where needed.

A complete listing of proposed research projects in the monument is presented below. The list is organized by the component of the ecosystem in which it is found. Owing to the structure of some research projects, their titles may be found under more than one heading. Included in this list is the park's identification number for each project, which is used for administrative purposes only and does not reflect priority.

## ENERGY INPUT AND OUTFLOW

JOTR-N-16 Energy Exchange

## CLIMATIC PARAMETERS AND ASSOCIATED PHENOMENA

JOTR-N-22 Climatology

JOTR-N-23 Smog Study

JOTR-N-28 Spring Flow and Tree Rings (part)

## GEOLOGICAL SUBSTRATE

JOTR-N-18 Soil Inventory

JOTR-N-19 Study of Erosion

JOTR-N-20 Physical Geology

JOTR-N-21 Historical Geology

## PRODUCER ORGANISMS

### Distribution

JOTR-N-8 Natural History Inventory (part)

JOTR-N-2a Mojave-Colorado Desert Survey

Outside Research

JOTR-N-16 Energy Exchange (part)

### Succession

JOTR-N-3 Fan Palm Oasis Study

JOTR-N-6 Plant Succession in Pinto Basin

JOTR-N-24 Fire Ecology

### Ecology

JOTR-N-10 Joshua Tree Ecology

JOTR-N-11 Ecology of Pinyon-Juniper Woodland

JOTR-N-12 Ecological Relationships in Creosote Bush Community

JOTR-N-26 Paleocology of JOTR I: Vegetation

JOTR-N-27 Paleocology of JOTR II: Pollen

JOTR-N-28 Interrelationships of Tree Rings and Spring Flow (part)

## PRIMARY CONSUMERS

JOTR-N-1a Bighorn Ecology

JOTR-N-17 Ecology of Mule Deer

JOTR-N-14 Analysis of Vertebrate Populations (part)

JOTR-N-15 Analysis of Invertebrate Populations (part)

JOTR-N-8 Natural History Inventory (part)

JOTR-N-4 Kangaroo Rat Study (part)

Outside Research

JOTR-N-5 Study of Three Ground Squirrels (part)

Outside Research

JOTR-N-7 Woodrat and Cholla Relationship

Outside Research

## SECONDARY AND TERTIARY CONSUMERS

- JOTR-N-8 Natural History Inventory (part)
- JOTR-N-14 Analysis of Vertebrate Populations (part)
- JOTR-N-15 Analysis of Invertebrate Populations (part)
- JOTR-N-4 Kangaroo Rat Study (part)
- JOTR-N-5 Study of Three Ground Squirrels (part)

## MAN - HIGHEST LEVEL CONSUMER

- JOTR-N-25 Analysis of the Impact of Man

## DECOMPOSERS

- JOTR-N-13 Inventory of Algae, Fungi, and Lichens

Natural resource actions now underway, and those proposed, are summarized under broad headings as follows:

### I. Natural History Survey of Joshua Tree National Monument

It is critical that detailed information be obtained about distribution of flora and fauna in the monument. A detailed vegetational map for the monument does not exist. Although the major kinds of plant communities have been identified, the extent of their ranges within the monument is not accurately known. Likewise, vegetational and faunal associations characteristic of each major plant community are poorly known. An inventory, or base map, is of critical importance in helping determine carrying capacity of various habitats for animals such as the endangered desert bighorn, and in helping to protect the habitat of important plants such as the Joshua tree.

1. A detailed vegetational map will be prepared utilizing aerial photographs, aerial surveys and ground verification studies. Color and infra-red photographs are especially desirable in such a study.
2. Quantitative analyses of ground cover plants will be conducted in each of the major plant communities. Any unique or relict communities will be carefully evaluated.
3. Vertebrate and invertebrate fauna of each major plant community will be collected, identified and evaluated to the extent practical.

4. Owing to the seasonality of some plants and animals, the study will be structured to encompass all seasons and will be of sufficient duration to allow adequate sampling and analysis.

## II. Joshua Tree Ecology

Very little is known of the general ecology of this species. In order to protect and manage this valuable resource, park managers need to know more about Joshua trees and their ecological requirements. Research into the ecology of Yucca brevifolia will be structured so as to provide managers with information needed to better interpret and perpetuate this native species. Research will concern itself with, but will not be limited to, the following items:

1. The present distribution of Joshua trees in Joshua Tree National Monument as determined from aerial photographs, aerial flights, and ground surveys.
2. Relative age/size structure of Joshua trees in various parts of the monument.
3. Stand densities of Joshua trees and vegetational associations in the understory.
4. Climatic and edaphic parameters that may regulate distribution and vigor of Joshua trees.
  - a) Soil analyses for texture, pH, humus content, moisture holding capabilities and actual soil moisture.
  - b) Measure precipitation and temperature at various elevations within Joshua tree habitats.
5. Reproduction and growth.
6. Preparation of a final report concerning the findings and recommendations resulting from this study.

## III. Fan Palm Oasis

### A. Research

Since the 1940's there has been a slow but steady fall in the level of the water table beneath the Oasis of Mara. Prior to 1946, water flowed out onto the ground in the oasis

to form open pools. At present, the water table is estimated to be about 10 feet below the surface. This may endanger the shallow-rooted palm trees which are an important resource of the monument. Data on other oases in the area are limited but indicate that the condition of the Oasis of Mara is the most critical.

1. Each of the oases will be mapped and inventoried for baseline data from which vegetational succession can be measured.
2. Permanent vegetational transects and sample plots will be established, recorded and photographed.
3. Dominance and percentage composition of species will be determined as these may be expected to change as a result of recommended management actions, such as prescribed burning and/or irrigation. The rapidity of plant succession will determine future management practices.

#### B. Management

Historic accounts and photographs document the periodic burning of the Oasis of Mara by Indians and natural causes, and the subsequent decline of water levels at the oasis after European man inhabited the area. The following actions are proposed after the above baseline research has been established:

1. The dense mesquite surrounding the fan palms will be manually cleared to restore natural conditions to the oasis, as any fire in the present vegetative tangle would be very intense.
2. After clearing, the oasis will be maintained with an open understory by periodic prescribed burning (approximately 30-year intervals). These fires will be of sufficient intensity to protect the fire tolerant fan palms, yet clear the understory of unnatural fuel buildups.
3. Water levels in the test wells at the oasis will be monitored as the clearing proceeds. The removal of the deep-rooted mesquite should partially restore the water table, but further restoration may be needed due to groundwater pumping by the town of Twentynine Palms. All artificial structures restricting periodic flood

waters from penetrating the oasis will be removed, and irrigation of the oasis through a system of pipes will be implemented if necessary.

#### IV. Bighorn Ecology

Some information is known about the desert bighorn in and around Joshua Tree National Monument, but this limited knowledge only points to a need for more data about numbers, movements and life history. Once widespread throughout the desert ranges, the bighorn is now confined by civilization to scattered bands in remote and isolated areas. Potentially serious problems exist in the monument's desert bighorn population. Low lamb-ewe ratios in the past years and a lopsided pyramid of age structure indicates poor lamb survival. The research will attempt to determine factors possibly limiting the health and vigor of the Joshua Tree herd, and whether the existing population structure essentially reflects historical situations and cyclic characteristics.

1. Ground and aerial surveys will be conducted to determine seasonal distribution and usage of water sources.
2. Preferred ranges and major forage species will be determined on a seasonal basis.
3. Sex and age data will be gathered, as will data on population numbers, reproduction and mortality.
4. Transmitters will be attached to some individuals in order that seasonal and individual movements can be determined. Data from trapped animals will include weight, body measurements, age, parasites, blood samples, and other parameters as warranted.

#### V. Watering Devices and Water Resources

Water has always been a limiting factor for biological growth in the desert, and the 4 to 5 inches of annual precipitation at the monument is not conducive to abundant plant and animal populations. However, the naturally low water supply has been restricted even further by the influence of man.

Water supply has been reduced by the nearby placement of mine shafts, by restricting fires that periodically cleared phreatophytic vegetation, and by the diversion of water for various uses. Springs adjacent to the monument and

within the range of monument wildlife are no longer available to these animals, and many springs within the monument no longer flow due to the recent effects of man. The reduction in natural spring flow by the influence of man will be rectified and studied as follows:

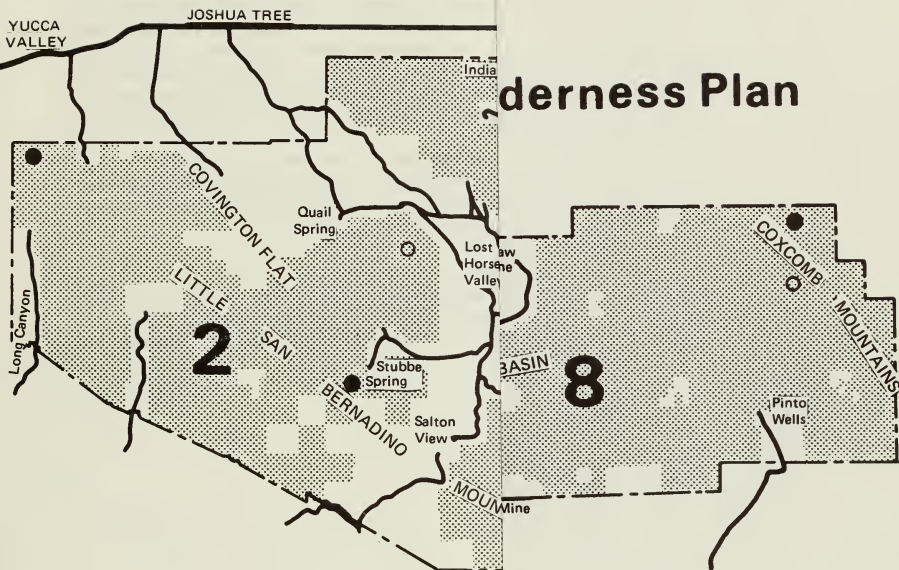
1. Several watering devices will be placed in units of the Joshua Tree Wilderness Area, at or near historical watering sites (Table 1, Figure 2). A specific provision is included in the proposed wilderness legislation to allow the construction and maintenance of guzzlers and adits in the wilderness area. The guzzlers will be constructed with a 2000-gallon minimum capacity and will be designed to blend with the landscape as much as possible. Where burial of storage tanks is not possible, tanks will be walled in by native rock and mortar to remain as inconspicuous as possible.
2. Hydrological testing has occurred and is proposed for several areas of the monument. At the Oasis of Mara, several test wells have been completed, and these will be monitored as the oasis vegetation is restored to a natural condition. Test wells are proposed in the Hidden Valley area to monitor the water levels in this area.

Proposed and Existing Watering Devices in Wilderness Area

Name	Status	Township/Range	Wilderness Unit Number
Stubbe Spring	E	T2S, R7E, Sec. 27	2
Rattlesnake Springs	E	T1S, R5E, Sec. 2	2
Coxcomb (adit)	E	T1S, R15E, Sec. 2	8
Pine Springs	E	T1S, R9E, Sec. 32	1
Eagle Mountain (Lost Palm)	P	T5S, R12E, Sec. 16	7
Pinyon Wells	P	T3S, R8E, Sec. 26	3
Quail Mountain	P	T2S, R7E, Sec. 11	2
Coxcomb	P	T2S, R15E, Sec. 11	8







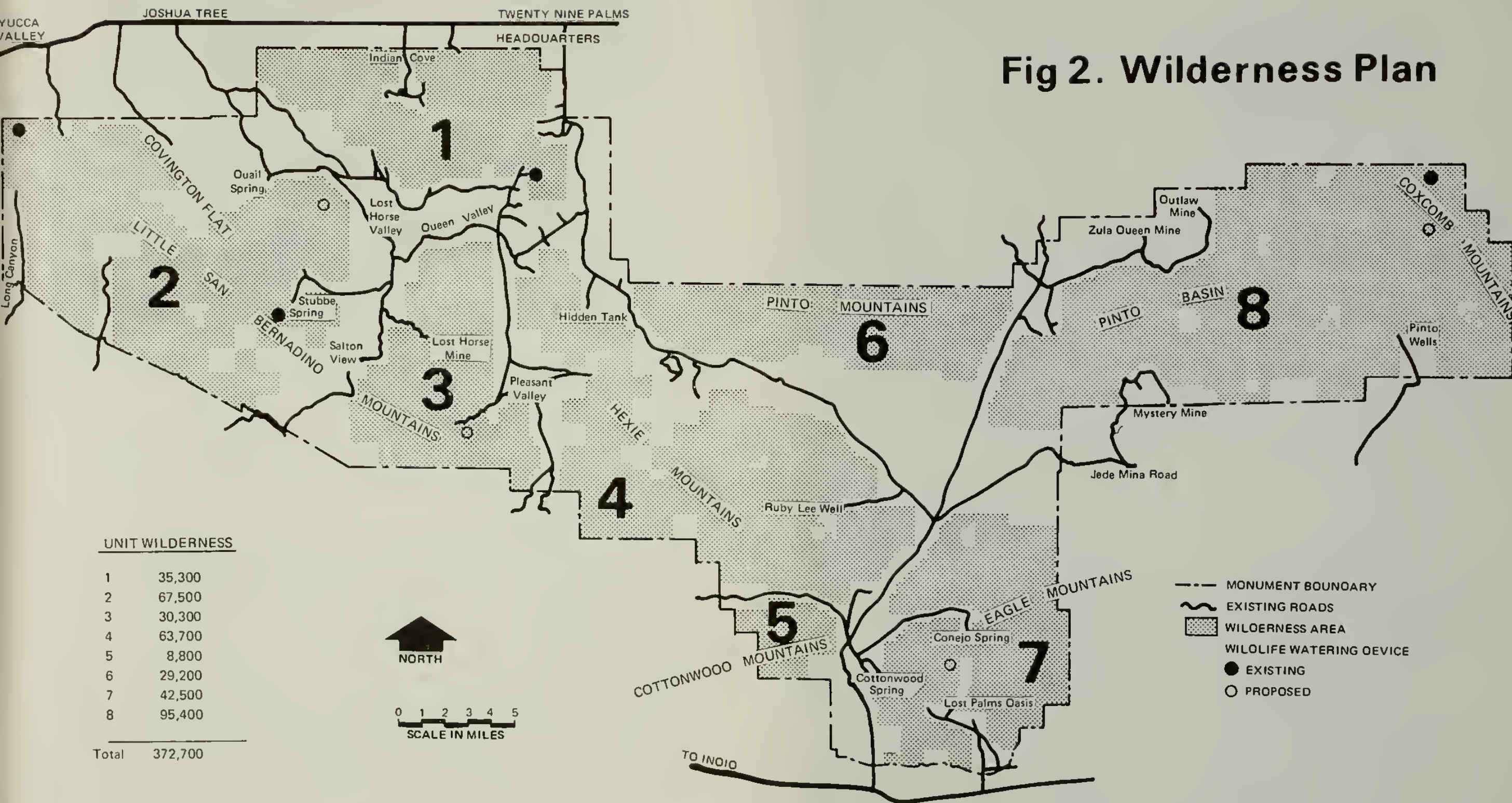
#### UNIT WILDERNESS

1	35,300
2	67,500
3	30,300
4	63,700
5	8,800
6	29,200
7	42,500
8	95,400

Total 372,700

- MONUMENT BOUNDARY
- ~ EXISTING ROADS
- ▨ WILDERNESS AREA
- WILDLIFE WATERING DEVICE
- EXISTING
- PROPOSED

# Fig 2. Wilderness Plan



## RELATIONSHIP OF THE PROPOSAL TO OTHER PROJECTS AND PLANS

A master plan for Joshua Tree National Monument proposes to establish new day-use areas and to expand camping areas on its periphery. It provides for a pattern of visitor use which includes motor vehicles, picnicking, camping, and backpacking. The proposed resource management actions were derived from the master plan's management objectives. The master plan is a statement of planning information and alternatives which has neither been approved or disapproved.

The Joshua Tree Wilderness Plan proposes that 372,700 acres of the monument be designated as wilderness. It is further recommended that a special provision be included in the proposed legislation to provide for the continuance of wildlife watering devices.

A plan entitled Fire Management in the Western Region is currently in preparation. It proposes a program of fire suppression, prescribed fire, and natural fire in certain zones under certain conditions for natural category parks in the Western Region of the National Park System.

## DESCRIPTION OF THE ENVIRONMENT

### REGIONAL AND LOCAL ENVIRONMENT

**Access.** Joshua Tree National Monument lies between two major east-west transcontinental arteries, U.S. Interstate 10 to the south, and U.S. Interstate 40 (Route 66) to the north. Visitors may enter the monument directly from Interstate 10 through the Cottonwood entrance by using the freeway interchange 26 miles east of Indio, and travel north one mile to reach the monument's south boundary.

Travelers from the west on Interstate 10 leave the freeway at the State Route 62 interchange, 16 miles east of Banning, and travel north and east to the Joshua Tree, Indian Cove, and Twentynine Palms entrances 26, 36 and 42 miles, respectively. Travel is over two- and four-lane paved highways.

The monument is linked to U.S. 66 at Amboy, 50 miles to the north, by paved highway from Twentynine Palms. Travel from the metropolitan Los Angeles area, 150 miles to the west, is over Interstate 10 and State Route 62. This latter route extends eastward to Parker, Arizona area on the Colorado River.

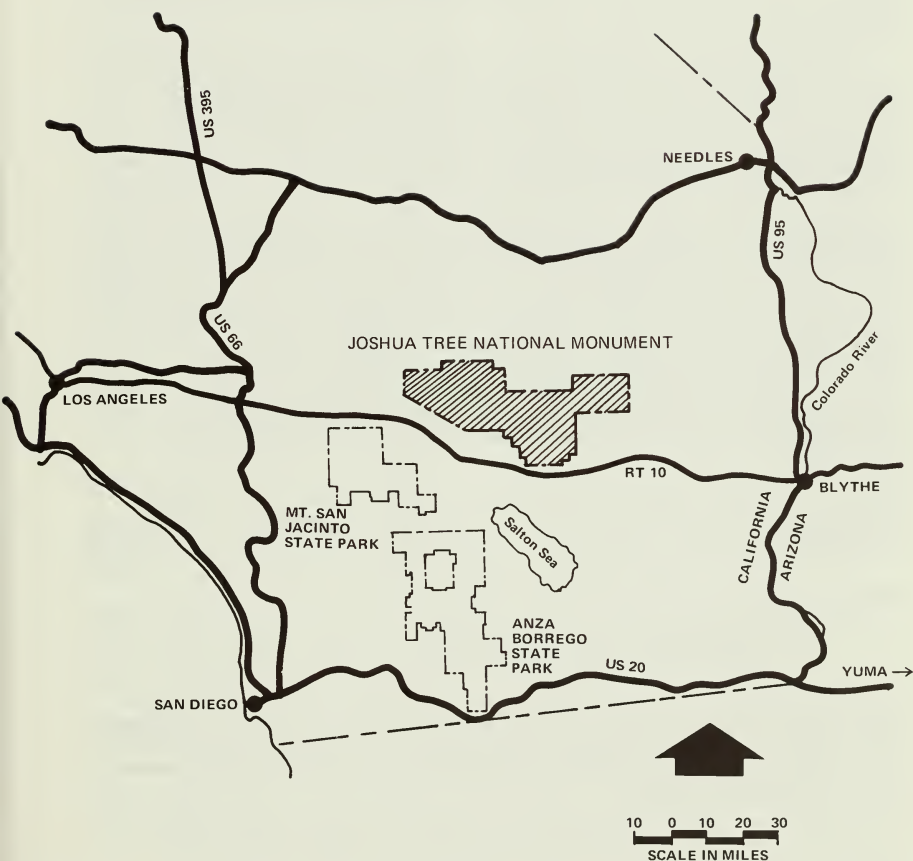
In addition, visitors occasionally enter the monument through one of several dirt road entrances, some of which connect with the paved roads within the monument's interior. The four paved road entrances account for over 90 percent of the monument's total visitation with about 70 percent using the Joshua Tree and Twentynine Palms entrances.

There are approximately 80 miles of unimproved, former truck and wagon trails within the monument. Many of these trails have had little or no use in the past 20 years. Washouts from summer cloud-bursts have obliterated much of the former roads. Management practices in the past five years have already closed over 70 miles.

The main line of the Southern Pacific Railroad runs east and west on the south side of the monument, providing passenger and freight services at Indio and Palm Springs. The main line of the Santa Fe Railroad runs east and west about 35 miles north of the monument, providing passenger and freight services at San Bernardino.

Nearly all transcontinental buslines provide services to Indio, Palm Springs, and Banning. There is local bus service between Palm Springs, Banning, and Twentynine Palms.





**Fig 3. Regional Map**

Palm Springs Airport has the nearest commercial passenger service, being served directly or by connecting service with all major airlines. Private and charter planes can land at the Yucca Valley or Twentynine Palms airports.

Circulation through the monument for public use is over 252 miles of roads; 80 miles of paved and 172 miles of unimproved dirt roads lead the visitor away from the developed areas into the primitive desert environs. With the exception of about five miles in the Indian Cove and Twentynine Palms area on the north edge of the monument, all paved roads in the monument are connected.

Population. Counties within a 100-mile radius of Joshua Tree National Monument are Los Angeles, Orange, Riverside, San Bernardino, and San Diego. These counties contain the major population centers of Southern California. Over 10 million acres of public lands in these counties are available for recreation. The majority are Bureau of Land Management desertlands. By Bureau of Census 1970 census data, this zone contained a population totaling more than 10,990,000. Within its western half there are 33 cities of more than 50,000 population. U.S. Office of Business Economics and Commerce 1980 projections for the five Standard Metropolitan Statistical Areas (Los Angeles, Long Beach, Santa Ana, San Diego and San Bernardino-Riverside) indicate a total population of more than 13,370,000. Within the zone's sparsely populated east half, there are no cities of more than 20,000 population, and the 1980 population may reach 1,709,000.

Visitor use at the monument is increasing steadily:

1960 total visits - 320,000  
1972 total visits - 605,000

The growth rate in visitation over the past decade has averaged about eight percent a year. It is anticipated that this rate would continue in the near future under current management policies. Based on these standards, the National Park Service estimates that 1980 visitor use will exceed one million.

The major proportion, 80 percent, of visitors come from the zone's heavily populated portion. A small percentage comes from residents within a 25-mile radius and the remaining visits originate from elsewhere in the state, from outside the state, and from foreign countries. Weekend use accounts for approximately 80 percent of visitation due to the regional nature of the park.

Surrounding land use. The country to the west and north is "high desert," consisting of valleys and low mountain ranges. High sandy valleys and barren granitic mountains lie to the east. The south boundary is bordered by low sandy valleys and hills.

Some lands adjacent to the monument, formerly public domain, are now homesite tracts or have been subdivided into small desert communities. The Morongo Valley, which parallels most of the north boundary, is almost completely subdivided into homesteads or desert homesites. Other desert homesites extend along the southwestern boundary along the foot of the Little San Bernardino Mountains. Farther to the south lies the sea level Coachella Valley, an irrigated agricultural area of date palms, vineyards, and citrus groves. The mountainous portions touching the boundary are largely public domain. These lands' primary uses are vehicle-oriented recreation activities. Along the eastern boundary in the Eagle, Coxcomb, and Sheephole Mountains, there are numerous gold and silver mining claims. The largest group of active mining claims is the Eagle Mountain Mine, owned and operated by the Kaiser Steel Company, at the southeast corner of the monument, which mines iron ore. The buildings and clearings of small acreage homesteads along the northern boundary of the area are unsightly, and there is always a threat of trespass from prospecting and mining activity. Southern Pacific Railroad lands adjacent to the southern boundary are entirely undeveloped and are unused except for occasional recreation use.

#### VISITOR USE

Trails. For short hikes, a number of outstanding nature trails are available to the visitor: Jumbo Rocks, Cholla Cactus Garden, Caprock, Twentynine Palms Oasis, Hidden Valley, and Barker Dam.

Three medium-distance trails provide access to some of the monument's most interesting features: a 2-mile trail to the shady Fortynine Palms Oasis on the north boundary; a 5-mile trail to the remote Lost Palm Canyon; and a 2-mile trail to the Lost Horse Mine Stamp Mill.

Campgrounds. Two existing developed areas in the monument provide the public with a variety of camping environments. They are Indian Cove, which at present contains a ranger station, campground (115 sites), group campground, and an environmental study area; and Cottonwood Spring (65 sites), which at present contains a campground, ranger and manned information station, housing, and utility area.

## PHYSICAL SETTING

Geology. The monument consists of low, generally northwest-trending mountains interspersed with intermontane valleys, a setting characteristic of much of the western Mojave region. It is dominantly a crystalline rock terrain, although its valleys are largely mantled by unconsolidated or poorly consolidated Quaternary surficial deposits. Rocks in the monument comprise metamorphic assemblages that include Paleozoic and Precambrian rocks, widespread Mesozoic plutonic rocks that range from gabbro to quartz monzonite, and some local Cenozoic basalt. Some Precambrian rocks are about 800 million years old. At places, aplite and pegmatite dikes are associated with the granitic plutons. High seismic activity in the monument area is largely attributable to the proximity of the San Andreas fault zone to the west and to elements of the Transverse Range fault within the monument.

The potential mineral resources within the monument are not completely known, as mineral surveys using modern techniques have not been made. Mines in the monument have produced about 12,000 troy ounces of gold, about 4,000 troy ounces of silver, 33,800 pounds of byproduct lead, and about 20 tons of bismuth ore. Most mines ceased production prior to World War II, and there has been little mining activity during recent years.

Small-scale gold mining in the future will probably yield one part silver to three parts gold, with some lead, silver, and bismuth as byproducts. The iron deposits in the monument constitute a potential resource when compared with similar deposits in similar geologic terrains.

Nearby areas with similar geology contain minor deposits of tungsten and manganese, and some occurrences of uranium and thorium-bearing minerals. It is possible that similar deposits are in the monument.

Hydrology. The hydrological nature of the area is simply that of groundwater following the zones of least resistance along the deeply fractured rock masses and deep loose gravels. Lacking well-developed, consolidated layers impervious to water, there are very few known water tables near the surface. The sparse rainfall fails to change underground water sources. Surface water flows off readily and little seems to soak deeply to form a water table.

Long-established old springs have, within recent years, become dry. Their water source has either diminished or dropped so low as to not be available even to the well-established cottonwood trees along the course of their discharges.



Perennially flowing streams are nonexistent in and surrounding the monument. Occasional surface water flow of several hours duration does occur which is both sporadic and unpredictable. The average annual precipitation (mostly in winter) ranges from one to five inches a year for the various stations within the monument boundary. Only two gauging stations are known to exist on any drainage basins associated with the monument, both of which are operated by the U.S. Geological Survey.

U.S.G.S. Station #10-2533.50 located on Fortynine Palms Creek just inside the north monument boundary near Twentynine Palms has a period of record beginning in 1962 and discontinued in 1971. U.S.G.S. Station #10-2536.00 has a record beginning in 1960 and discontinued in 1966. It was located on Eagle Creek within the monument along its eastern boundary. The only form of surface water diversion is for precipitation collection from rain catchment aprons for use in providing water for game. These structures are limited in number and have no significant effect on the surface water regime.

Groundwater occurs in three types of aquifers within the monument. The first of these are the valleys found at higher elevations in the western end of the monument and are floored with material composed of the deeply weathered igneous and metamorphic basement complex. The second consists of several small shallow valleys filled with alluvium. The above two types are small and generally have not yielded much water. The third type is composed of large valleys filled with thick sequences of alluvial material. An extensive U.S.G.S. open file report (Ground Water and Related Geology of Joshua Tree National Monument, California, 1963) was prepared at the request of the National Park Service, and more fully describes the groundwater regime.

By far the largest occurrence of groundwater is in the Pinto Basin, one of the extensively alluviated valleys underlying the eastern portion of the monument. It has been estimated by the Geological Survey that this basin could yield 300,000 acre feet of water from the upper 100 feet of the saturated zone. An important factor concerning pumpage from this basin and all others like it within the monument is that very little recharge to the aquifers exists because of little precipitation and high evapotranspiration.

There are numerous wells within the monument, many of which are dry or no longer in use. The United States Geological Survey at the request of the National Park Service has measured water levels semi-annually in eight selected wells for ten years or longer.

Wells leased by Kaiser Steel Corporation from the Metropolitan Water District of Los Angeles are located at the east end of Pinto Basin, near the point of groundwater discharge from the basin. The water is used outside of the monument at their Eagle Mountain Mine. Data from the U.S. Geological Survey indicates that the pumpage of these wells is resulting in mining of water from the basin, i.e., pumpage volumes are in excess of natural recharge to the basin. Continued withdrawal, over periods of years from Kaiser's well will result in decreased water levels which eventually will affect wells within the entire basin. Excessive pumpage above the amount of natural recharge should be curtailed by appropriate action.

Commercial water supplies are utilized in the Indian Cove area from the town of Joshua Tree and at the monument headquarters from the town of Twentynine Palms. Lost Horse Well serves the Lost Horse Ranger Station and residence and Smoke Tree Well supplies water needs for the Cottonwood Springs complex. The latter two wells are considered adequate to present needs.

There are over 120 known water sources, including springs, wells, and seeps, in the area. The spring discharges range from seeps to a few gallons per minute. The great majority of the springs are the result of flow from fractures and joints in the igneous and metamorphic basement complex as the result of intersecting dikes or sills. In recent years the spring discharge has been decreasing. The most probable cause for this decrease is reduced recharge as the result of decreased precipitation during this time span.

The general decline in available water has led to the disappearance of several historical water sources and brought about a need for management action with respect to the survival of native wildlife in this area. The provision of artificial watering devices, or guzzlers, in locations of historical water sources has been the response.

Temperatures. Air temperatures range from the teens at the higher (4,200 feet and up) altitudes in January to 120° or more in the Pinto Basin (1,300 feet average elevation) in midsummer. Ground temperatures are 20° to 70° higher.

Midwinter temperatures at the Pinto Well are mild and encourage camping when it is too cold in the rest of the monument.

Flora. The diversity of the flora of the area is indicative of the monument's location in a transition zone between the Colorado Desert, generally at elevations below 2,000 feet, and the cooler and wetter Mojave Desert at elevations from 2,000 to 5,000 feet. It is this

diversity of plant life which, in part, contributed to the preservation of this area and which provides its continued attractiveness. A 1957 checklist of the plants of the monument compiled by Charles F. Adams identified 569 species. Conservatively, considering the expanse of monument land, an estimated 250 species remain to be added to this list.

The Colorado or low desert is floristically associated with the Sonoran Desert. Creosote bush is the dominant plant of this community and is often found in pure stands over large areas. Other species include paloverde, mesquite, yucca, and cacti of several species. Generally, it is the easternmost section of the monument, encompassing primarily the Pinto Basin, which shows a flora typical of the lower Colorado Desert. In the flats, the dominant plants are creosote bush, white burroweed (Franseria), and several species of grasses and cacti (16 species of cactus, almost half the number native to California, occur within the monument). Bigelow cholla is dominant at one major site within the basin, and ocotillo, although rare, is found within the area. Occasional sand dunes or basins of loose sand provide another habitat and are areas which may be carpeted with annuals when there are sufficient rains.

Extending through the basin are washes from the low hills which contain desert willow, paloverde, and smoke tree, plants which require the underground moisture and occasional runoff water available in the wash. Catclaw acacia becomes an element of the wash at greater elevation.

At intermediate elevations, conditions typifying the Mojave Desert prevail and Mojave yucca and Joshua tree appear. These two yuccas are not only known well by monument visitors but were also an important food source and fiber source for earlier Indian inhabitants. The yuccas remain important as food and residence for various small rodents, birds, and reptiles. Common shrubs of the transition zone include Mormon tea, cottonthorn, blackbrush, paper bag bush, peach bush, and salt bush. Conspicuous herbs are jimsonweed and coyote melon and short-lived annuals when adequate rains allow seed germination.

With increasing elevation, the yuccas are replaced by California juniper and pinyon pine at altitudes between 4,500 and 6,000 feet. Both species extend up the rocky slopes of the low mountains of the western portion of the monument. Both juniper berries and pinyon nuts were gathered by Indian inhabitants and are important to today's resident wildlife. The total acreage dominated by the higher elevation types is, however, small in relation to the high desert as a whole.

A report of monument flora cannot be separated from a report of desert wildlife. The vast majority of plants are essential to some desert inhabitant whether the use be as food, water, cover, or residence.

Two upland areas, lower and upper Covington Flat and the Pinyon Wells upland region, have been pinpointed as scientifically unique in that several plant species of the Coast Chaparral Zone reach their easternmost limit there.

In contrast with surrounding vegetation are the monument's oases and springs. Although small in area, they are significant in relative numbers of plant species and in the amount of wildlife which they support. The California fan palm reaches its northernmost natural limit at the Twentynine Palms Oasis. Tree species also include cottonwood, mesquite, and willow which, in combination with reeds, grasses, and smaller water plants, contribute to the greenness of the oases.

The Oasis of Mara has undergone significant ecological change since its first visit by European man. An 1855 surveyor's description noted an oasis with fine springs, large palm trees, cultivated land, and in the spring environs, some mesquite, cane, and greasewood. By 1879, mining and grazing activities had resulted in the complete clearing of understory vegetation from the oasis, which is documented by an 1889 photograph hanging in a nearby motel. A 1925 photograph shows the beginning of the present vegetative tangle - shrub and tree seedlings dot the understory. As they grew, the decline of the springs began, augmented by groundwater pumping and natural drought. The Oasis of Mara today has a very dense, tall mesquite understory beneath the still dominant California fan palms. Most of the mesquite is large, old, and heavily infested with mistletoe, and contributes to the known decline in the water table.

Periodic fires once kept the fan palm oases free from a choking understory. Indians reportedly touched off the dried palm skirts as part of a ritual, and lightning has historically been present in desert palm oases. Lightning and fires occurred in 1972 at the west end of the oasis and at the Fortynine Palms Oasis in a nearby canyon. In 1964 a wildfire probably of human origin burned the west end of the Oasis of Mara, and even though it severely scorched all the palms, only one was killed from the intense fire. The remaining stand has recovered completely, and slightly charred bark on some palms is the only evidence left of the fire.

All evidence points to periodic natural and Indian-caused fires in the fan palm oases, and the need to reintroduce fire to these natural ecosystems to the degree compatible with surrounding land uses.

Fauna. Although the density of animal populations in a desert area is less than in an area with abundant water, diverse animal populations

which have adapted to harsh desert environments do exist and thrive. The vertebrate residents of and visitors to Joshua Tree National Monument are fairly well known and their number may be approximated at 350 species. Invertebrates are common, but since they are inconspicuous, they remain relatively unknown. Perhaps the most poisonous invertebrate of the monument is the blackwidow spider. Both the black widow and the brown recluse, a spider with a venom affecting humans, are common within the monument. Another spider is the non-poisonous tarantula. The scorpions of the monument range to approximately four inches and are likewise nonpoisonous; the poisonous Arizona species has not been found here. Surprisingly, fairy shrimp are known from the water of artificial ponds or tanks within the monument. Various centipedes, millipedes, and ticks are found, together with a multitude of insects, the more spectacular including the dragonfly, tarantula hawk, and wood-boring beetle.

Several monument coleoptera have been labeled by a local authority as endangered, together with several swallowtail butterflies and yet unnamed scorpions.

Although several amphibians are known regionally, only the red-spotted toad and the California tree frog have been reported within monument boundaries. The long-lived desert tortoise is the only turtle representative. Of the small lizards, the side-blotched lizard is the most common. The chuckwalla, which may grow as long as 20 inches, is harmless, as are all resident lizards, and when seen is usually basking on rocks. Additionally, there are two horned lizards or "horny toads" and 12 other lizard species. Of the 19 reported snakes, six are poisonous, but are less often encountered as well. Five of the poisonous snakes are rattlesnakes, one being the sidewinder, the sixth is the California lyre snake.

A 1972 revision of the checklist of birds of the monument lists 261 species. Found within the monument have been the southern bald eagle, California brown pelican, and American peregrine falcon, recognized by the Department of Interior in its official list of endangered species. The California yellow-billed cuckoo is listed on the State of California's rare list of life-forms. Commonly seen permanent residents of the monument are the Gambel's quail, scrub jay, phainopepla, common raven, house finch, canyon, rock and cactus wrens, and black-throated house sparrows. Additionally, the monument is host to both summer and winter visitors, with visits varying from nesting to transitory. The oases seem to be important stopping places on the western flyway and are witness to spectacular semiannual visits of turkey vultures.

The nocturnal habit, coloration, and size of the mammals of the monument render most of these 46 desert residents inconspicuous. The small western pipistrelle is the most commonly seen of the nine bats, all of which feed on insects and are instrumental in curbing the insect population. Small desert mammals are also represented by 15 mouse species, a shrew, and three woodrats. The white-tailed antelope ground squirrel, which is visibly active during the hottest days, a pocket gopher, a chipmunk, and two other squirrels complete the rodent group. The rodents in particular are the prey of the surprisingly numerous carnivorous mammals, snakes, and predatory birds of the monument. Two rabbit species, the Audubon cottontail and black-tailed jackrabbit, are the other small herbivorous residents here.

The carnivorous mammals of the monument are an elusive group; the much maligned coyote is the most frequently seen. Sightings of spotted and striped skunks and of raccoons have been few, and it is thought that the latter may have been escapees rather than natives. Both the grey fox and the significantly smaller kit fox reside here. Present also are ringtail cat, long-tailed weasel, and badger. A few mountain lions hunt within the monument but are not definitely known to have dens within the boundaries. Bobcats are believed to be sparse residents of the brushland on the periphery of the monument.

Mule deer reside in the higher elevations, generally above 4,000 feet in the pinyon-juniper zone in the westernmost sections of the monument. Desert bighorn also inhabit this portion of the monument, but at slightly lower elevations in places where browse species such as scrub oak, rabbitbrush, and blackbrush (Coleogyne) are more numerous. Desert bighorn populations are found throughout the monument and their total population is estimated at one hundred.

#### CULTURAL BACKGROUND

History. Colonel Henry Washington's Land Office survey of 1855 made mention of the old road leading from the Twentynine Palms area. Other historic records indicate boys of the Mormon Battalion may have headed home along this same route. Pinto Indians used this old route going to and from Nevada. In 1856, A.P. Green's surveying party ran the interior lines for Washington's township corners, and because Section 33 (T1N, R9E) contained a number of fine springs and large palms, the area was named "Palm Springs" (not to be confused with the present city of Palm Springs some 36 air miles to the southwest). Some of the land appeared to have been cultivated by the Indians.



"Palm Springs," as a name, persisted well into the 1880's. In the meanwhile, the term "Twentynine Palms" came into use in recording mining claims and eventually replaced "Palm Springs."

The first Forty-niners bypassed the region for better goldfields toward the coast. However, unsuccessful ones drifted east again and became interested in the not-so-good gold deposits in this region. The earliest mining claim in the monument area is reported to be the "Jeff Davis," recorded in 1865 by M. Brown.

By 1870, there existed a Cottonwood Station for freighters at Cottonwood Spring. It consisted of an adobe house and an Indian trail passing near it.

M.J. Boshay filed on the Twentynine Palms Oasis area as a homestead on March 17, 1873. Indians and non-Indians found the oasis to be a comfortable stop on their transdesert journeys. Few stayed more than brief periods. For varying periods of time the oasis was railroad land. However, the area was eventually purchased by Mr. Francis Roberts. It was later acquired by the Twentynine Palms Corporation, which on August 16, 1950, donated 57.84 acres of the east end to the National Park Service.

During the last quarter of the 1800's, and first third of the 1900's, there was a steady flow of cattlemen (the first, according to local rancher, Bill Keys, was Oliver Smith in 1870) and miners hoping to find their fortunes in cattle, gold, or both. Only a few earned a reasonable return or profit for their efforts. Although there was a renewed interest in gold mining during the depression years, the gradual rise in labor costs reduced most gold operations to an unprofitable status.

Thanks to her interest and influence in preserving the desert flora, Minerva Lockhart Hamilton (Mrs. Albert Sherman Hoyt) can be largely credited for the establishment of the monument by Presidential proclamation on August 10, 1936. Due to the outside pressure of mining interests, the original 825,340 acres were reduced to about 557,000 in 1950. Private properties within this acreage are being acquired through opportunity purchase and through exchange of other Federal lands.

In December 1971, F. Ross Holland, Jr., a National Park Service historian, conducted a survey of the historical structures and sites in accordance with Executive Order 11593, Protection and Enhancement of the Cultural Environment, May, 13, 1971.

In compliance with Executive Order 11593, the following sites have been nominated to the National Register of Historic Places: Barker Dam, Cottonwood Oasis (Cottonwood Spring), Cow Camp, Desert Queen Mine, Bill Keys Ranch, Lost Horse Mine, Ryan House and Lost Horse Well or Spring, Twentynine Palms Oasis, and Wallstreet Mill.

Archeology. Archeological remains within the monument represent two major periods of aboriginal occupation separated by a period of several thousand years. The oldest, represented by sites in the Pinto Basin, is also one of the first "early man" areas to be located in California, and is purported to be early post-Pleistocene in age. These sites contain implements suggestive of a big game economy (choppers and large projectile points). The exact age of the remains is unknown. Geological studies have tended to confirm the post-Pleistocene date at a time when the area was much more humid with higher annual rainfall and perhaps much colder winters at the higher altitudes.

Perhaps 9,000 B.C. to 2,000 B.C. might be a reasonable date of occupation by Pinto Basin inhabitants. There are no materials suitable for carbon 14 dating. Similar materials have been found 60 miles to the north; no human bones have been found.

Most of the ancient Pinto sites were associated with river deposits. The ancient lake covering the basin area broke through a natural dam (thought to be in the southeastern corner of the basin) and gradually became a meandering river. It is along these shoreline deposits that researchers have found these primitive campsites. They are scattered along some five miles of shoreline, and on both sides of the prehistoric river.

The later period, dated between 1,000 A.D. and the present, is represented by sites in the central and northern portions of the monument. These sites contain seed-grinding tools and pottery, which suggest a change in subsistence orientation, settlement patterns, and ecological adaptations during later times.

Archeological surveys in Joshua Tree National Monument have been, for the most part, only reconnaissance surveys of certain areas.

From 1957 to 1959, William Wallace supervised survey work in the Deep Tank-Squaw Tank area. Fourteen man-days were spent in the field, and a total of 23 sites were recorded. Wallace also surveyed the Sheep Pass region. Two surveys, one in 1959 and the other in 1961, involved 13 man-days in the field and produced 16 sites. A reconnaissance survey of Indian Cove by George Kritzman and Roger Desautels during October of 1965 resulted in the discovery of four sites. Additional work in the area located six more sites; a total of 26



man-days were devoted to field inspection. In the spring of 1968, Dennis O'Neil examined the Barker Dam region of the monument. During nine man-days of field work, 20 sites were discovered. In addition, a number of areas, including sites at Keys Ranch and the Oasis of Mara, were surveyed by George T. Jefferson in 1973. The Oasis of Mara was resurveyed by Keith Anderson in November of 1973.

The types of sites that have been recorded in Joshua Tree National Monument include: shallow middens, rock shelter and cave sites, and petroglyph and pictograph sites.

Wallace excavated a rock shelter at Squaw Tank in 1958. This is the only excavation which has taken place within the monument.

There are presently no archeological sites listed on the National Register of Historic Places for Joshua Tree National Monument. As archeological sites are identified and evaluated in the future, sites which appear to qualify will be nominated to the National Register of Historic Places, in accordance with Executive Order 11593, Section 2(a).

In the interim period, the Service will exercise caution in accordance with Section 2(b), of Executive Order 11593 to insure that archeological resources are not destroyed or altered.

#### PROBABLE FUTURE OF THE ENVIRONMENT WITHOUT THE PROPOSED ACTION

The future of the Joshua Tree National Monument environment without the proposed action will be an ecosystem continuing to trend further from a natural condition.

The natural history of the monument will continue to be poorly understood, and only the dominant elements will even be identified. Two of the most readily identified elements, desert bighorn and Joshua tree, will not be capably managed because their interrelationships with other ecosystem components will continue to be unclear. The ecological requirements of the Joshua trees are critical data necessary to perpetuate this valuable resource after which the monument was named. The desert bighorn is now confined to scattered bands in remote and isolated areas, and may disappear due to man's influence unless mitigating management measures are implemented.

The proposal to provide artificial watering devices for wildlife will remove an unnatural influence of man. Without the proposal, wildlife populations will continue to be affected by unnaturally low water supplies. It is true that natural drought has reduced water supplies, and that this natural restriction of water should not

be alleviated. However, the drought has been aggravated by mining and domestic uses of water inside and surrounding the monument.

Without the restoration of fan palm oases to natural conditions, unnaturally dense understories will continue to provide excessive competition to fan palms. Fire hazards will remain high, and the potential for a disastrous wildfire will continue to plague these oases, and especially the Oasis of Mara.

In general, the future of the Joshua Tree National Monument environment will continue to deteriorate due to the influence of European man. It is the administrative policy for natural category parks to allow natural processes, including drought and fire, to regulate ecosystem functioning, and the proposal is designed to implement these policies as much as possible. Without the proposed action, it will not be possible to preserve the natural ecosystems for the enjoyment of present and future generations.

## ENVIRONMENTAL IMPACT OF THE PROPOSED ACTION

The environmental impacts of the proposed actions are more significant for management actions than for research actions. Most research actions are designed to monitor natural processes within the ecosystem rather than alter these processes. Management actions are specifically designed to alter the state of the ecosystem towards a natural condition, and these actions will entail some environmental impacts.

The restoration of the Oasis of Mara will proceed in two to three stages, depending upon the extent that each successive stage will cause further restoration. The dense, mistletoe-infected mesquite understory will be manually removed by flush-cutting and the stumps will be treated with a Federal-approved herbicide to prevent sprouting. There will be short-term noise impacts from the cutting operation and some visual impact from the low-cut stumps that remain. The removal of the woody understory will encourage a herbaceous understory to grow and largely obscure the disturbed ground in a short time. The increased sight distance will allow observation of the California fan palms in a more natural open setting than at present, with a significantly decreased fire hazard.

Once the Oasis of Mara has been restored to a natural condition of vegetation, further restoration of water supply may be required. At present, the deep-rooted honey mesquite is capable of drawing down the water table, and the removal of mesquite should raise the water table. Several artificial banks which divert occasional flood waters will be removed to allow periodic water recharge of the oasis soil. The result of these actions will be a lush herbaceous understory beneath the large fan palms and a restoration of natural conditions. It is likely that the water table will still remain below natural levels due to adjacent groundwater pumping, and some form of irrigation will be needed. A series of water pipes will be placed through the oasis to augment the artificially lowered water table, if needed. The pipes will be buried and not visible to the eye of the visitor, although short-term impacts from construction will be inevitable.

It is probable that free-flowing water will not be restored to the oasis due to the excessively large deficit (10 feet) that exists between the present water table and the ground surface. Keeping in mind that natural drought has affected the entire area for several years, the proposed partial restoration will be closer to the natural condition than full restoration to the condition of 30 to 50 years ago when precipitation was slightly but significantly greater.

The natural conditions at the oasis will be maintained with the use of prescribed fire. While other oases may be allowed to burn from natural fires, the location of the Oasis of Mara in the midst of developed land dictates closer control of fire. The prescribed fires will be ignited under conditions of fuels and weathers that will allow confinement of the fire to a predetermined area and intensity. These fires will periodically eliminate woody species and favor herbaceous vegetation. The grassy vegetation that burns will produce little heat, and the fan palms will be affected only by the heat of the dried skirts that will occasionally catch fire. Fan palms are extremely tolerant of fire, and the sculptured appearance of the trunk is a result of fire burning off the rough, knobby bases of the broken-off branches. The tops of the palms green out readily when burned and rejuvenate quickly. Burning will be done in accordance with state and local air pollution standards, which restricts burning to conditions when smoke dispersal potential is good.

Studies of the desert bighorn will involve some contact with individual animals. Transmitters will be attached to some in order to determine seasonal and individual movements. Data from the trapped animals will include weight, body measurements, age, parasites, blood samples, and other parameters as warranted. This data will allow the park staff to further understand desert bighorn ecology and adequately plan for the preservation of the species. Desert bighorn are very susceptible to human disturbance and the present herd, while it does not fall into the category of being rare or endangered, could disappear from the monument with a few years of poor reproduction. This research will enable the park to plan visitor activities so that desert bighorn habitat and migration routes will remain as undisturbed as possible.

The construction of artificial watering devices ties in with desert bighorn ecology. In many areas of critical desert bighorn habitat, historical water supplies appear to have been disrupted by man. The proposed guzzlers and adits are to be constructed only in areas where natural water sources have historically existed and were restricted by man for mining or domestic use. These will be located in wilderness areas and have been noted in the legislation authorizing the wilderness area. The presence of this nonconforming use in wilderness will be an intrusion on the natural scene. The rain catchment aprons, and in some cases storage tanks, will be visible to hikers even though they will blend with the landscape as much as possible.

The guzzlers should restore populations of all native wildlife to natural levels by replacing water that should naturally be available. However, there is always the possibility that water levels will be

augmented above what would exist naturally, because the catchment aprons will be designed to provide water even in years with less than average rainfall. It is thought that natural drought in the region has reduced the water flow even from undisturbed springs, and although it is not the purpose of the guzzlers to provide above normal water supplies to wildlife, this may occasionally occur.

Archeological resources at the Oasis of Mara could be adversely affected by activities related to the restoration of natural conditions. The effects of prescribed burning on archeological resources is still uncertain. Therefore, such burning practices are not recommended without monitoring by a professional archeologist. Any plant removal involving ground-disturbing activities could have adverse effects. This also applies to the installation of underground water pipes.

Archeological resources in areas where artificial watering devices are to be installed could also be adversely affected by ground disturbance.

## MITIGATING MEASURES INCLUDED IN THE PROPOSED ACTION

The interdisciplinary research approach set forth in the natural resources management plan itself constitutes a mitigating measure with respect to future resource management actions. The planned, systematic accomplishment of the various studies will, when properly coordinated and monitored, provide a built-in system of checks and balances. Data accumulated in one study may be required in another project and coordination will prevent duplication of effort with resultant reduction of possible adverse impact on the resource.

The restoration of the Oasis of Mara will be flush-cut with care. Any herbicide will be applied to individual stumps to prevent impacts occurring on surrounding vegetation. All burning will be done when conditions for smoke dispersal are good, and when the fire can be safely controlled with predetermined limits of intensity and extent. The proposed irrigation will only be implemented if the clearing and related rehabilitations do not significantly raise water levels.

Watering devices will be placed only at the sites of historical water supplies. They will be designed to blend in with the environment as much as possible, and the storage tanks will be buried where feasible. If it is necessary to build the tanks above ground, it will be walled in with mortar and native rock to blend with the landscape.

The various research proposals, from basic inventory studies to bighorn ecology and oasis studies, will help to monitor the effects of all actions proposed herein and allow periodic evaluation of management direction.

In compliance with E.O. 11593, all proposed development areas involving ground-disturbing activities will be examined by a professional archeologist. Such surveys will be accomplished before projects are given final clearance. If significant archeological resources are identified, they will be described and evaluated for their National Register potential.

No properties nominated to the National Register will be affected by the proposed actions, and consultation with the State Historic Preservation Officer (see Appendix) indicates no probable effects on State Historic Landmarks or California Points of Historical Interest.

ADVERSE EFFECTS WHICH CANNOT BE AVOIDED  
SHOULD THE PROPOSAL BE IMPLEMENTED

Manual manipulative actions initiated in the restoration of oases to a natural condition will have a short-term adverse effect. The present condition of the oases have come to be considered "natural" in the minds of many visitors in that there is an abundance of vegetation in the midst of the desert. The removal of the unnatural mesquite understory will create a cut-over appearance for a short period of time.

The presence of artificial watering devices in wilderness areas will create an adverse effect on a small segment of the visiting public who will hike through these areas. No matter how well camouflaged, these installations constitute an intrusion on the natural scene.

THE RELATIONSHIP BETWEEN LOCAL SHORT-TERM USES OF  
MAN'S ENVIRONMENT AND THE MAINTENANCE  
AND ENHANCEMENT OF LONG-TERM PRODUCTIVITY

The long-term productivity of the area for man's continued use is enhanced and perpetuated through implementation of the natural resources management plan. The proclamation which established the monument recognized its national significance. The implied values of long-term productivity will be realised by the sociological, scientific, educational and cultural benefits. Exploitation and development of the resources would produce maximum economic yields, thereby gaining the short-term local benefits at the expense of long-term productivity. Implementation of the proposed plan ensures that values and resources will continue to be available in conformance with establishing proclamations. The long-term economic benefits could exceed short-term economic benefits through scientific studies, operations related to visitor use, and sociological-cultural values. There would be less alteration of renewable resources under the comprehensive, systematic resource management plan proposed.



ANY IRREVERSIBLE AND IRRETRIEVABLE COMMITMENTS OF RESOURCES  
WHICH WOULD BE INVOLVED IN THE PROPOSED ACTION  
SHOULD IT BE IMPLEMENTED

Ground-disturbing activities related to the installation of guzzlers and irrigation pipes and the removal of exotic plants could result in an irreversible and irretrievable loss of archeological information. Identification of resources through an intensive archeological survey of development areas and the implementation of a well planned mitigation program will minimize such losses.

## ALTERNATIVES TO THE PROPOSED ACTION

Most of the natural resource actions proposed deal directly or indirectly with the water supply at the monument. These proposals deal with the restoration of natural water sources and the subsequent effects. Alternatives to proposed actions deal primarily with alternate water supply proposals and the effects of these actions.

### RESEARCH

Alternatives to the myriad of proposed studies are to omit any such studies. Natural resource management will continue to operate on partial and incomplete information, resulting in only partial fulfillment of management objectives. The proposed studies are an integral part of the natural resources management plan, and their environmental impacts are minimal. Because of this they are certainly preferable over the alternative of no action.

The alternative to desert bighorn and mule deer management and study is no action. This would result in a lack of information on the results of guzzler construction, and would continue the present lack of data on bighorn and deer population dynamics, ranges, and other ecological aspects of these mammals at Joshua Tree. If factors in addition to water supply are causing the health and vigor problems of the herds, these will not be studied. Because of the importance of maintaining the natural population of these mammals, the alternative of no management and monitoring was rejected.

### MANAGEMENT

Alternatives to palm oasis management include no management, and restoration of natural processes without prior restoration of natural conditions. At the Oasis of Mara, the no action alternative will continue the policy of total fire suppression and allow the water table decline to continue without investigating its cause. This will produce additional stress on the shallow-rooted California fan palms, by allowing the deep-rooted honey mesquite to use the limited water supply available at lower soil depths. This condition is not natural, nor is it aesthetically pleasing. A high fire hazard will continue to threaten the fan palms, which are tolerant of low intensity ground fire but not immune to high intensity fires burning in the present dense mesquite. Between the lowered water table and the high fire hazard, there is a definite threat to the continued existence of the California fan palms.

Manual manipulation of the mesquite will be necessary to restore a natural vegetation mosaic at the oasis. This will result in lower fire hazards and should bring the water table closer to the surface. Prescribed fire or natural fires can then help to maintain the oasis, and any irrigation necessary to offset groundwater pumping by the town of Twentynine Palms will be used by the fan palms, not the mesquite. It is necessary to restore natural conditions as well as natural processes to these oases, and the alternative of restoring natural processes only was therefore rejected.

Alternatives to the original proposal to create eight wildlife guzzlers in addition to the existing three guzzlers and one adit include removing all watering devices now in operation and building no more, maintaining only the existing four devices, adding to these a few more but less than eight, and adding more than the eight guzzlers originally proposed. The alternative of the addition of four new guzzlers was chosen for the following reasons:

In May 1974, five days of exhaustive helicopter and ground surveys of historical and existing water sources and wildlife habitat were conducted under the direction of Dr. Charles Douglas. All areas previously identified as suitable for guzzlers and/or adit construction were specifically surveyed and critically evaluated. As a result of this survey which considered existing and historic water availability, quality of existing wildlife, evidence of wildlife populations, degree of visitor use and accessibility for construction, the number of originally proposed sites was reduced to four. On the basis of existing knowledge this number is believed sufficient to offset the reduction in water supply that can be attributed to man and thus satisfy the area's management objective of maintaining an optimum wildlife population. Man's effects include historical mining activities that have diverted spring water into mine shafts, and the elimination or reduction of watering sources outside the monument by fencing or well construction. The alternatives of eliminating existing devices or continuing to maintain only those now in existence would result in restricted water supplies and the continuation of detrimental effects to native wildlife populations.

The alternative to increase watering device numbers above the four now in operation and the additional four proposed would possibly result in an unnaturally abundant water supply. Natural drought has been present at the monument and on surrounding lands for several years, and it is not within the resource management objectives to provide water in excess of that which would support a natural population of wildlife. The present proposal is an educated guess on the number of guzzlers needed to provide this support; in fact, the actual number

needed may be higher. Until such information is available through proposed studies, water supply will be restricted to the eight present or proposed guzzlers.

## CONSULTATION AND COORDINATION

The primary consultant in the preparation of the Joshua Tree National Monument Natural Resources Management Plan was the National Park Service Cooperative Resources Study Unit, University of Nevada (Las Vegas) under the direction of Dr. Charles Douglas, Unit Leader. The unit was instrumental in the formulation and coordination of various aspects of the plan through provision of professional, scientific expertise toward identification of problems and their systematic solution.

The efforts of several cooperators were considered and incorporated into aspects of the plan. Cooperators include the California Institute of Technology and United States Geological Survey in seismic studies; the Geological Survey is engaged in test well monitoring activities; the University of California, Irvine, is utilizing a portion of the monument as a control area in a study designed to assess environmental damage resulting from vehicular use in desert areas.

Informational copies of the plan and environmental assessment will be furnished to the following organizations and their comments will be solicited. All letters of comment received will be reviewed by the Superintendent for implementation. Copies of the assessment and public comments will be available at Joshua Tree National Monument and the National Park Service's Western Regional Office.

Department of Agriculture

Forest Service

Soil Conservation Service

Department of the Interior

Bureau of Indian Affairs

Bureau of Land Management

Bureau of Mines

Bureau of Outdoor Recreation

Bureau of Reclamation

U.S. Fish and Wildlife Service

Geological Survey

California Association of Governments

State Historic Preservation Office

Joshua Tree Park and Recreation District

San Bernardino Co. Mountain Desert Planning Agency

Twentynine Palms Park and Recreation District

Yucca Valley Park and Recreation District

Joshua Tree Municipal Advisory District

Twentynine Palms Community Council

California Off-Road Vehicle Association

Desert Protective Council  
Federation of Western Outdoor Clubs  
Morongo Basin Conservation Association  
National Audubon Society  
Sierra Club  
Southern Pacific Land Company  
Wilderness Society

## APPENDIX

### Comments Received





ARTMENT OF PARKS AND RECREATION

DX 2390

MENTO 95811



August 26, 1974

Mr. Bruce M. Kilgore  
Associate Regional Director  
Professional Services  
National Park Service  
Western Region  
450 Golden Gate Avenue  
Box 36063  
San Francisco, California 94102

Dear Mr. Kilgore:

I have received your letter of August 15, 1974 which requested my review of the draft environmental statement for the Proposed Natural Resources Management Plan, Joshua Tree National Monument.

I was pleased to note that the nine potential National Register sites, which were nominated as a result of your survey of historic resources in compliance with Executive Order 11593, will not be affected by the proposed actions. We also have no records of California Points of Historical Interest or State Historic Landmarks in the area of the project.

With regard to archeological resources, I concur with your proposals to conduct additional archeological surveys prior to watering device construction at each proposed site, and to assess the known archeological site at the Oasis of Mara in relation to protection from disturbance from mesquite removal and prescribed burning.

I appreciate being afforded the opportunity to review this draft environmental statement, and I have no objections with regard to potential impacts on cultural resources.

Sincerely,

William Penn Mott, Jr.  
State Historic Preservation Officer

G-1/5774



## MANAGEMENT PROGRAM

The management program that is appended to the plan is the action document that is designed to implement the plan. The management program consists of:

Natural Resources Project Statements that will serve as "blueprints" for proposed actions.

A Natural Resources Project Programming Sheet on which each project will be listed and shown in relation to park priority, funding, and manpower requirements, and a time sequence for the five-year period.

A List of Natural Resources Projects on which recently completed, currently active, and proposed natural resource activities are summarized.

While the natural resources management plan is concerned with a proposed long-term action program, the management program deals with the next five years only. The program presented here begins with Fiscal Year 1974. Each subsequent year, the management program will be revised and updated for a new five-year period as work is completed and new projects are proposed.



## NATURAL RESOURCES PROJECT STATEMENT

1. PARK AND REGION: Joshua Tree National Monument, WRO
2. PROJECT NAME AND NUMBER: Wildlife Guzzlers, JOTR-RM-1
3. STATEMENT OF PROBLEM:

A major limiting factor to the survival of the desert bighorn sheep in Joshua Tree National Monument is the continuing decline of water sources due in part to drought and in part to man-caused disturbances. The monument has become isolated because of the continuing encroachment of civilization and is no longer free to seek additional water sources. Historical water sources lying within the monument have become dry.

4. WHAT HAS BEEN DONE:

Three guzzlers have been installed and one adit constructed in an effort to maintain bighorn habitat and that of sympatric wildlife. The installation of four additional guzzlers has been proposed to augment this program. A reconnaissance has been conducted which verifies the need for additional sources and recommends locations. Previous recommendations suggested the need for nine additional guzzlers.

5. DESCRIPTION OF THE WORK TO BE UNDERTAKEN:

Each of four guzzlers will be located as near as possible to an original historical water source. Each guzzler will provide for a minimum of 2,000 gallon storage capacity. Rain catchment aprons will be sufficient to maintain water in the storage tank. Apron surface area required will be determined on the basis of 4" annual average rainfall and then doubled to allow for years of less than average rainfall.

Guzzlers will be constructed to conform as nearly as possible to natural terrain and storage tanks will be buried where feasible. Shape and dimensions of drinking basins, designed for bighorn, with an escape ramp for smaller species will be carefully considered. A standard U.S. Forest Service type rain gauge will be installed at each guzzler site and provided with a  $\frac{1}{4}$  inch layer of glycerin. Where burial of storage tanks is not possible, tanks will be walled in by native rock and mortar to blend in with the landscape, and covered to reduce evaporation.

6. LENGTH OF TIME NEEDED: 4 years

7. WHAT WILL HAPPEN IF NOT UNDERTAKEN:

It will not be possible to effectively manage the existing population of desert bighorn in this area and losses of animals could be expected through neglect of watering requirements.

8. WHAT ARE THE ALTERNATIVES:

Make no attempt to replace historical water sources.

9. PERSONNEL:

Work will be accomplished by monument personnel with the cooperation of the Unit Leader, Cooperative NPS Resource Study Unit, University of Nevada and/or contract.

10. ADMINISTRATION AND LOGISTICS:

The program will be extended over a four year period ending in FY 1979. Data gathered from the Bighorn Management project (JOTR-RM-2) and the Bighorn Ecology study (JOTR-N-1a) will provide information useful for placement of water guzzlers. Locations, in order of priority, are Eagle Mountain, Pinyon Well, Quail Mountain and Coxcomb.

<u>Funding</u>	<u>Year in Program Sequence</u>				
	1st	2nd	3rd	4th	5th
Personal Services	0	2,000	2,000	2,100	2,100
Other Than Personal Services	0	9,000	9,000	10,000	10,000
	-	_____	_____	_____	_____
Grand Total	0	11,000	11,000	12,100	12,100
Funds Available in Park Base	0	0	0	0	0
	-	_____	_____	_____	_____
Funds Requested from Regional Office	0	11,000	11,000	12,100	12,100

<u>On Form</u>	<u>Date Submitted</u>	<u>On Form</u>	<u>Date Submitted</u>
10-237 <input type="checkbox"/>		10-250 <input type="checkbox"/>	
10-238 <input checked="" type="checkbox"/>	10/4/72	10-251 <input type="checkbox"/>	

## NATURAL RESOURCES PROJECT STATEMENT

1. PARK AND REGION: Joshua Tree National Monument, WRO
2. PROJECT NAME AND NUMBER: Bighorn Management, JOTR-RM-2
3. STATEMENT OF PROBLEM:

A decline in monument water sources since the 1940's has been determined as a limiting factor to survival of desert bighorn and other major vertebrates. A continuation of annual bighorn censuses is important to document population trends and determine the health of the herd. As progress on the guzzler project (JOTR-RM-1) restores water to historical watering sites annual censuses will be needed to determine the effect of restored water on the bighorn population.

4. WHAT HAS BEEN DONE:

Annual censuses have been conducted at selected water sites. They have consisted of two-man teams observing selected sites from sunrise to sunset for three consecutive days. Evidence indicates that sheep have accepted and are using, new water sources. The use of automatic time-lapse 8mm movie cameras has been tried for sheep census work and the result has been encouraging.

5. DESCRIPTION OF WORK TO BE UNDERTAKEN:

Expansion of the photo census to provide simultaneous coverage of all major water sources over a four-day period is proposed. This method of data collection is less expensive in terms of man-hours, creates less disturbance to animals and provides a permanent record which can be used from year to year for comparative purposes. The films will be made available on-site to qualified researchers when required.

6. LENGTH OF TIME NEEDED: Continuing annually
7. WHAT WILL HAPPEN IF NOT UNDERTAKEN:

Discontinuance will preclude effective management of the bighorn population and lead to a decline of the established herd.

8. WHAT ARE THE ALTERNATIVES: Do not conduct census studies.

9. PERSONNEL:

Census will be conducted by monument personnel and coordinated through the Unit Leader, Cooperative NPS Resources Study Unit, University of Nevada.

10. ADMINISTRATION AND LOGISTICS:

Censuses will be conducted each year, normally in the latter part of June, before the rainy season when temperatures have been sufficiently high to dry up minor water sources. A total of twelve identical 8mm movie cameras with intervalometers have been acquired by the University of Nevada, Las Vegas, Cooperative Studies Unit, Death Valley National Monument and Joshua Tree National Monument. Census activities in Southern California NPS areas will be coordinated, and cameras pooled, to provide maximum simultaneous coverage of major watering sources within each area.

<u>Funding</u>	<u>Year in Program Sequence</u>				
	1st	2nd	3rd	4th	5th
Personal Services	400	450	500	550	600
Other Than Personal Services	200	200	200	200	200
	—	—	—	—	—
Grand Total	600	650	700	750	800
Funds Available in Park Base	600	650	700	750	800

<u>On Form</u>	<u>Date Submitted</u>	<u>On Form</u>	<u>Date Submitted</u>
10-237 <input type="checkbox"/>		10-250 <input type="checkbox"/>	
10-238 <input type="checkbox"/>		10-451 <input type="checkbox"/>	



## NATURAL RESOURCES PROJECT STATEMENT

1. PARK AND REGION: Joshua Tree National Monument, WRO
2. PROJECT NAME AND NUMBER: Guzzler Maintenance, JOTR-RM-4
3. STATEMENT OF PROBLEM:

The guzzlers installed to restore previous water sources (JOTR-RM-1) need to be maintained to assure water for an indefinite period. This periodic maintenance is necessary to keep guzzlers operating to capacity.

4. WHAT HAS BEEN DONE:

Three existing guzzlers and one adit have been maintained with park funds.

5. DESCRIPTION OF THE WORK TO BE UNDERTAKEN:

Existing water sources (four) and additional proposals (four) will require two inspections annually in order to insure proper functioning. These inspections are required because of vandalism, high winds, extreme temperature changes and damage caused by browsing animals. Each rain apron will be maintained in satisfactory condition and each float valve tank and drinking basin will be cleared of sediment and debris. Float valves will be checked for leaks or worn gaskets, and reset.

6. LENGTH OF TIME NEEDED: Continuing
7. WHAT WILL HAPPEN IF NOT UNDERTAKEN:

Wildlife water sources will decline and cease to function.

8. WHAT ARE THE ALTERNATIVES:

Do not restore historical water sources and accept possible loss of animals.

9. PERSONNEL:

Guzzler maintenance work can be accomplished by monument personnel.

10. ADMINISTRATION AND LOGISTICS:

Maintenance work will be scheduled each spring prior to the summer rainy season, and in January. Each guzzler will require one or two man-days work. Stubbe Springs guzzler will continue to be serviced by water truck when required to maintain a sufficient level of water in the holding tanks.

<u>Funding</u>	<u>Year in Program Sequence</u>				
	1st	2nd	3rd	4th	5th
Personal Services	5,000	5,000	5,000	5,000	5,000
Other Than Personal Services	2,000	2,000	2,000	2,000	2,000
	_____	_____	_____	_____	_____
Grand Total	7,000	7,000	7,000	7,000	7,000
Funds Available in Park Base	0	0	0	0	0
	_____	_____	_____	_____	_____
Funds Requested from Regional Office	7,000	7,000	7,000	7,000	7,000

<u>On Form</u>	<u>Date Submitted</u>
10-237 <input type="checkbox"/>	9/18/73 (needs new form)
10-238 <input type="checkbox"/>	
10-250 <input type="checkbox"/>	
10-451 <input type="checkbox"/>	

## NATURAL RESOURCES PROJECT STATEMENT

1. PARK AND REGION: Joshua Tree National Monument, WRO
2. PROJECT NAME AND NUMBER: Fan Palm Oasis Study, JOTR-N-3
3. STATEMENT OF PROBLEM:

Since the 1940's there has been a slow fall in the level of the water table beneath the Oasis of Mara. Prior to 1946, water flowed out onto the ground in the oasis to form open pools. At present, the water table is estimated to be about 10 feet below the surface. This may endanger the shallow-rooted palm trees, which are an important resource of the monument. Data on the other oases in the area are limited, but indicate that the condition of the Oasis of Mara is the most critical.

4. WHAT HAS BEEN DONE:

Two transects of shallow test wells have been drilled in the Oasis of Mara. A water recording gauge is to be installed on the well. Archeological reconnaissance of the Oasis of Mara was conducted. See reference list, Item 11.

5. DESCRIPTION OF THE WORK TO BE UNDERTAKEN:

Each of the oases should be mapped and inventoried for baseline data from which vegetational succession can be measured. Permanent vegetational transects and sample plots should be established, recorded, and photographed. Dominance and percentage composition of species should be determined, as these will change after prescribed burning and/or irrigation. The rapidity of plant succession will determine future management practices.

6. LENGTH OF TIME NEEDED: 4 years
7. WHAT WILL HAPPEN IF NOT UNDERTAKEN:

Substantial management programs involved with oasis protection and restoration will be based upon insufficient knowledge.

8. WHAT ARE THE ALTERNATIVES: Do not conduct the studies.

9. PERSONNEL:

The project should be contracted for study with a university, and Mr. Lawrence T. McHargue should be contracted as a consultant.

10. ADMINISTRATION AND LOGISTICS:

The study is proposed for four years. The contract investigator should be appointed an NPS Collaborator to have use of NPS facilities.

<u>Funding</u>	<u>Year in Program Sequence</u>			
	1st	2nd	3rd	4th
Personal Services (Contract)	5,000	7,000	7,000	7,000
Other Than Personal Services	0	0	0	0
	<hr/>	<hr/>	<hr/>	<hr/>
Grand Total	5,000	7,000	7,000	7,000
Funds Available in Park Base	5,000	0	0	0
	<hr/>	<hr/>	<hr/>	<hr/>
Funds Requested from Regional Office	0	7,000	7,000	7,000

<u>On Form</u>	<u>Date Submitted</u>	<u>On Form</u>	<u>Date Submitted</u>
10-237 <input type="checkbox"/>		10-250 <input type="checkbox"/>	
10-238 <input type="checkbox"/>		10-451 <input type="checkbox"/>	

11. REFERENCES AND CONTACTS:

- McHargue, L.T. 1969. A floristic and ecological study of the palm oases of Joshua Tree National Monument. Special Report to NPS. 105 pp.
- McHargue, L.T. 1969. A management policy for the California fan palm oases of Joshua Tree National Monument. Addendum report to ecological study. Special report to NPS. 18 pp.
- Mr. Lawrence T. McHargue; 1016 Orange Grove Avenue, South Pasadena, California 91030.

## NATURAL RESOURCES PROJECT STATEMENT

1. PARK AND REGION: Joshua Tree National Monument, WRO
2. PROJECT NAME AND NUMBER: Life History, Distribution, and Ecology of Desert Bighorn in Joshua Tree National Monument, JOTR-N-1a
3. STATEMENT OF PROBLEM:

Some information is known about the desert bighorn in and around Joshua Tree National Monument, but this limited knowledge only points to a need for more data about movements, numbers, and general life history. Once widespread throughout the desert ranges, the bighorn is now confined by civilization to scattered bands in remote and isolated areas. Potentially serious problems exist in the monument's bighorn population. Low lamb-ewe ratios in the past years and a lopsided pyramid of age structure indicate poor lamb survival. The research will attempt to determine the factors limiting the health and vigor of the Joshua Tree herd.

4. WHAT HAS BEEN DONE:

See reference list, item 11. Preliminary distributional surveys. Waterhole counts at some springs.

5. DESCRIPTION OF WORK TO BE UNDERTAKEN:

Ground and aerial surveys will be conducted to determine seasonal distribution and usage of water sources. Preferred ranges and major forage species will be determined, on a seasonal basis. Direct observation of sheep will aid in determining preferred forage species and the time spent feeding on select plants. Population dynamics will be investigated. Sex and age data will be gathered, as will data on population numbers, reproduction, and mortality. Transmitters will be attached to some individuals in order that seasonal and individual movements can be determined. Data from trapped animals will include body weight, body measurements, age, parasites, blood samples, and other parameters as warranted.

6. LENGTH OF TIME NEEDED: 5 years
7. WHAT WILL HAPPEN IF NOT UNDERTAKEN:

It will not be possible to effectively manage the habitat or population of this rare native species. Losses of animals

could be expected due to neglect of watering requirements, range conditions, and other ecological parameters.

8. WHAT ARE THE ALTERNATIVES: Do not conduct studies.

9. PERSONNEL:

This study will be conducted in part by the NPS research biologist with assistance from the monument staff and university personnel.

10. ADMINISTRATION AND LOGISTICS:

The study will be conducted over a five-year period ending in FY 1979. Data gathered from the Bighorn Management project (JOTR-RM-2) can be used to supplement this study. This study can assist in determining further research needs and the amount and degree of management work needed.

<u>Funding</u>	<u>Year in Program Sequence</u>				
	1st	2nd	3rd	4th	5th
Personal Services	0	4,300	5,000	5,000	5,000
Other Than Personal Services	0	0	0	0	0
	—	—	—	—	—
Grand Total	0	4,300	5,000	5,000	5,000
Funds Available in Park Base	0	0	0	0	0
	—	—	—	—	—
Funds Requested from Regional Office	0	4,300	5,000	5,000	5,000

<u>On Form</u>	<u>Date Submitted</u>	<u>On Form</u>	<u>Date Submitted</u>
10-237 <input type="checkbox"/>		10-250 <input type="checkbox"/>	
10-238 <input type="checkbox"/>		10-451 <input type="checkbox"/>	

11. REFERENCES AND CONTACTS:

- a. Allen, Rex W. 1962. A preliminary study of parasites of bighorn sheep on the Desert Game Range. Trans. Des. Bighorn Council. pp. 69-72.

- b. Banko, Winston E. and Lowell Sumner. 1962. A proposal for coordinated life history and management study. Trans. Des. Bighorn Council. pp. 23-28.
- c. Barrett, Reginald H. 1965. A history of the bighorn of California and Nevada. Trans. Des. Bighorn Council. pp. 40-48.
- d. Blaisdell, James A. 1966. The National Park Service concept of wildlife management and the probable effects on desert bighorn. Trans. Des. Bighorn Council. pp. 30-35.
- e. Call, Mayo W. 1966. A proposed desert bighorn sheep range development project. Trans. Des. Bighorn Council. pp. 53-55.
- f. Dengler, William F. 1966. Wildlife research and management in Joshua Tree National Monument. Trans. Des. Bighorn Council. pp. 50-53.
- g. \_\_\_\_\_ 1967. Notes concerning current policy affecting bighorn management at Joshua Tree National Monument. Trans. Des. Bighorn Council. pp. 77-79.
- h. Devan, Ged. 1959. Handling captive bighorn at Desert Game Range. Trans. Des. Bighorn Council. pp. 42-46.
- i. Goodman, Dr. John D. 1962. Annual migration of desert bighorn sheep. Trans. Des. Bighorn Council. pp. 43-52.
- j. Graham, Hatch. 1968. Habitat studies in the San Gabriel Mountains bighorn range in California. Trans. Des. Bighorn Council. pp. 54-58.
- k. Hansen, Dr. Charles G. 1965. Summary of distinctive bighorn sheep observed on the Desert Game Range, Nevada. Trans. Des. Bighorn Council. pp. 6-10.
- l. \_\_\_\_\_ 1965. Management units and bighorn sheep herds on the Desert Game Range, Nevada. Trans. Des. Bighorn Council. pp. 11-14.
- m. Hall, John M. 1966. Bighorn sheep management in the National Forests. Trans. Des. Bighorn Council. pp. 47-52.
- n. Knudson, Mark. 1962. Devices for tracking bighorn sheep. Trans. Des. Bighorn Council. pp. 53-56.

- o. Logsdon, H. Steven. 1967. Summary of wildlife management study on determination of safe methods of immobilizing and tranquilizing bighorn sheep for the purposes of capture. Spec. Rep. Des. National Wildlife Range, Nevada. pp. 29.
- p. \_\_\_\_\_ 1967. Preliminary results of administering drugs to desert bighorn sheep for capture programs. Trans. Des. Bighorn Council. pp. 27-52.
- q. Moore, Tom D. 1959. Handling and transplanting bighorn. Trans. Des. Bighorn Council. pp. 47-49.
- r. Schneeegas, Edward R. 1965. A bighorn sheep habitat management plan. Trans. Des. Bighorn Council. pp. 53-54.
- s. Tevis, Lloyd, Jr. 1959. Man's effect on bighorn in the San Jacinto-Santa Rosa Mountains. Trans. Des. Bighorn Council. pp. 69-76.
- t. Welles, Ralph E. 1959. Significant life history features of Death Valley bighorn. Trans. Des. Bighorn Council. pp. 58-68.
- u. \_\_\_\_\_ 1965. Progress report on Joshua Tree National Monument bighorn research. Trans. Des. Bighorn Council. pp. 49-52.
- v. \_\_\_\_\_ 1967. Status of the bighorn in Death Valley and Joshua Tree National Monuments. Trans. Des. Bighorn Council. pp. 59-63.
- w. Wilson, Lanny O. 1966. Research and future rehabilitation of the bighorn sheep in southeastern Utah. Trans. Des. Bighorn Council. pp. 56-58.
- x. Woodgren, Wesley R. 1962. Observability of colored earmarkers in Rocky Mountain bighorn sheep. Trans. Des. Bighorn Council. pp. 65-68.
- y. Yoakum, James D. 1962. Range improvement methods and practices. Trans. Des. Bighorn Council. pp. 41-42.



## NATURAL RESOURCES PROJECT STATEMENT

1. PARK AND REGION: Joshua Tree National Monument, WRO
2. PROJECT NAME AND NUMBER: Fan Palm Oasis Management, JOTR-RM-5
3. STATEMENT OF THE PROBLEM:

From the time of discovery in the 1800's until 1946, there were flowing springs and pools of water in the Oasis of Mara. This oasis is now dry and the groundwater level is about 10 feet below the surface. This threatens the survival of the shallow-rooted Washington palms. The cause of the lowering water table is imprecisely known, but is thought to be due, in part, to a drought cycle; and to the pumping of a well for the town of Twentynine Palms; and to the increased growth of unnatural vegetation around the palm trees. In the absence of periodic burning by Indians and natural causes, the oases have become overgrown. The fire-controlled subclimax vegetation is absent and threatens the survival of these oases.

4. WHAT HAS BEEN DONE:

Six test wells were drilled in the Oasis of Mara and the monitoring of groundwater levels begun during FY 1974. Dried skirts of Washington palms were trimmed as a precautionary measure in an attempt to increase the chances of their survival should a fire occur. It has been recommended that no controlled burning should be attempted without preliminary selective thinning of dense brush.

5. DESCRIPTION OF WORK TO BE UNDERTAKEN:

After studies are made to monitor groundwater levels and the effect of burning in dense brush these oases should be burned and/or cleared to restore their natural appearance. If it becomes necessary to irrigate them to restore former amounts of water, then pipelines should be installed and pools dug so that water from outside sources can be used.

A program of burning, irrigation, and protection from severe visitor impact needs to be initiated. Any artificial structures that restrict periodic flood waters from penetrating these oases should be removed.

6. LENGTH OF TIME NEEDED:

Continuing. Burning operations will be required at approximately 30 year intervals.

7. WHAT WILL HAPPEN IF NOT UNDERTAKEN:

The natural progression of fan palm oases will be interrupted and lead to their premature extinction in this area.

8. WHAT ARE THE ALTERNATIVES:

Make no attempt to alleviate modern man's influence on the natural scene.

9. PERSONNEL:

The entire project can be accomplished by monument personnel with the assistance of the Service Center and personnel with specific expertise where required. Some construction and clearing operations may be accomplished by contract.

10. ADMINISTRATION AND LOGISTICS:

This program is to be coordinated with the Fan Palm Oasis Study (JOTR-N-3). The burning portion of the project would recur every 30 years. Irrigation of the oases will need to be regulated by local conditions so periodic inspections of soil and moisture will determine the time for operating the system.

<u>Funding</u>	<u>Year in Program Sequence</u>				
Personal Services	0	2,300	2,300	2,400	2,500
Other Than Personal Services	5,000	500	500	500	500
Grand Total	5,000	2,800	2,800	2,900	3,000
Funds Available in Park Base	5,000	0	0	0	0
Funds Requested from Regional Office	0	2,800	2,800	2,900	2,900

<u>On Form</u>	<u>Date Submitted</u>	<u>On Form</u>	<u>Date Submitted</u>
10-237 <input checked="" type="checkbox"/>	4/18/74	10-250 <input type="checkbox"/>	
10-238 <input type="checkbox"/>		10-241 <input type="checkbox"/>	

## NATURAL RESOURCES PROJECT STATEMENT

1. PARK AND REGION: Joshua Tree National Monument, WRO
2. PROJECT NAME AND NUMBER: Natural History Survey of Joshua Tree National Monument, JOTR-N-8
3. STATEMENT OF PROBLEM:

It is critical that detailed information be obtained about the distribution of flora and fauna in the monument. A detailed vegetational map for the monument does not exist. Although the major kinds of plant communities have been identified, the extent of their ranges within the monument is not known. Likewise, vegetational and faunal associations characteristic of each major plant community are poorly known. An inventory, or base map, is of critical importance in helping determine carrying capacity of various habitats for animals such as the endangered desert bighorn, and in helping protect the habitat of important plants such as the Joshua tree.

4. WHAT HAS BEEN DONE:
5. DESCRIPTION OF WORK TO BE UNDERTAKEN:

A detailed vegetational map should be prepared for Joshua Tree National Monument utilizing aerial photographs, aerial surveys, and ground verification studies. Color and IR photographs are especially desirable for such a study. Quantitative analysis of canopy and ground cover plants should be conducted in each of the major plant communities. Any unique or relict communities should be carefully evaluated. Vertebrate and invertebrate fauna of each major plant community should be collected, identified, and evaluated to the extent practical. Owing to the seasonality of some plants and animals, the study should be structured to encompass all seasons, and should be of sufficient duration to allow adequate sampling and analysis.

6. LENGTH OF TIME NEEDED: 2 years for the preliminary mapping.
7. WHAT WILL HAPPEN IF NOT UNDERTAKEN:

Management programs involving vegetational communities will be based upon little knowledge.

8. WHAT ARE THE ALTERNATIVES: Do not conduct studies.

9. PERSONNEL:

Unit Leader, Cooperative NPS Resources Study Unit, University of Nevada. Contract with University of Nevada.

10. ADMINISTRATION AND LOGISTICS:

Unit Leader, UNLV; university personnel, plane rental.

<u>Funding</u>	<u>Year in Program Sequence</u>	
	1st	2nd
Personal Services (Contract)	7,000	7,000
Other Than Personal Services	0	0
	<hr/>	<hr/>
Grand Total	7,000	7,000
Funds Available in Park Base	7,000	7,000
	<hr/>	<hr/>
Funds Requested from Regional Office	0	0

On Form

Date Submitted

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Date Submitted

10-237 ☐

10-250 ☐

10-238 ☐

10-451 ☐

## NATURAL RESOURCES PROJECT STATEMENT

1. PARK AND REGION: Joshua Tree National Monument, WRO
2. PROJECT NAME AND NUMBER: Ecology of Joshua Trees, JOTR-N-10
3. STATEMENT OF PROBLEM:

The distribution of Joshua trees, the age of trees in various parts of its range, and the species of plants and animals associated with Joshua trees are poorly understood for the monument. Little is known of growth, reproduction, and seedling survival of Joshua trees. Some areas where Joshua trees grow have been disturbed by fire and/or grazing; other areas are relatively undisturbed. It is not known how past disturbance has affected various stands of the Joshua tree. Nor is it known how present smog encroachment into the monument may affect this important species of plant.

4. WHAT HAS BEEN DONE:

A contract presently is in operation with the University of Nevada for the study of distribution, plant and animal associates, and other aspects of the ecology of this species.

5. DESCRIPTION OF WORK TO BE UNDERTAKEN:

The present studies will clarify the distribution and basic ecological parameters of the population. A second study of two-year duration should be undertaken to determine seedling survival, growth, disease organisms, effects of fire and smog, and related ecological considerations. Measurements of environmental parameters such as temperature and precipitation, begun during the first part of this research, should continue.

6. LENGTH OF TIME NEEDED: 4 years
7. WHAT WILL HAPPEN IF NOT UNDERTAKEN:

The monument was created to perpetuate and preserve this species of plant. It behooves management to understand the ecological requirements of this species as well as possible. Losses of plants could result from neglect.

8. WHAT ARE THE ALTERNATIVES:

Do not conduct studies. Since the studies have begun, it seems

reasonable to continue with additional studies to clarify as much as practicable about the life history of this species.

9. PERSONNEL:

These studies are in progress by personnel of the University of Nevada, Las Vegas.

10. ADMINISTRATION AND LOGISTICS:

<u>Funding</u>	<u>Year in Program Sequence</u>			
	1st	2nd	3rd	4th
Personal Services (Contract)	7,000	7,000	7,000	7,000
Other Than Personal Services	0	0	0	0
	_____	_____	_____	_____
Grand Total	7,000	7,000	7,000	7,000
Funds Availabile in Park Base	0	0	0	0
	_____	_____	_____	_____
Funds Requested from Regional Office	7,000	7,000	7,000	7,000

<u>On Form</u>	<u>Date Submitted</u>	<u>On Form</u>	<u>Date Submitted</u>
10-237 <input type="checkbox"/>		10-250 <input type="checkbox"/>	
10-238 <input type="checkbox"/>		10-451 <input type="checkbox"/>	

## NATURAL RESOURCES PROJECT STATEMENT

1. PARK AND REGION: Joshua Tree National Monument, WRO
2. PROJECT NAME AND NUMBER: Analysis of the Impact of Man on the Ecosystem of Joshua Tree National Monument, JOTR-N-25
3. STATEMENT OF PROBLEM:

Man continues to shape the land as he desires without regard for the consequences. Road and mining scars, air and ground pollution, and sight and sound pollution commonly detract from the naturalness of these ecosystems of the monument. In addition, the mere presence of man can cause some animals to be attracted and others to be repelled. An analysis of man's impact on the natural environment is needed to assist the resource manager in protecting the integrity of the monument.

4. WHAT HAS BEEN DONE: Nothing
5. DESCRIPTION OF WORK TO BE UNDERTAKEN:

An inventory is needed of all alterations of the ecosystem accomplished by man. The full impact of these alterations must be determined and analysed. One of the major actions of this project will be to inventory the exotic flora and fauna of the monument and to propose management recommendations to minimize their influence where feasible.

6. LENGTH OF TIME NEEDED:
7. WHAT WILL HAPPEN IF NOT UNDERTAKEN:

Management decisions concerning visitor impact and future development may be based on incomplete data.

8. WHAT ARE THE ALTERNATIVES: Do not conduct the studies.
9. PERSONNEL:

An interdisciplinary team comprised of ecologists, a sociologist, a geologist-hydrologist, and a resource management specialist should conduct the study. A management biologist may be used to gather basic details for the team.

10. ADMINISTRATION AND LOGISTICS:

These personnel should work as a team and sample the area for the physical changes to the area. The team should study the area during high and low periods of visitation to obtain an overview of the impact of man on the area.

<u>Funding</u>	<u>Year in Program Sequence</u>
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	2nd
Personal Services	20,000
(Contract)	
Other Than Personal	0
Services	<hr/>
Grand Total	20,000
Funds Available from	0
Park Base	<hr/>
Funds Requested from	20,000
Regional Office	

<u>On Form</u>	<u>Date Submitted</u>	<u>On Form</u>	<u>Date Submitted</u>
10-237	<input type="checkbox"/>	10-250	<input type="checkbox"/>
10-238	<input type="checkbox"/>	10-451	<input type="checkbox"/>



## NATURAL RESOURCES PROJECT STATEMENT

1. PARK AND REGION: Joshua Tree National Monument, WRO
2. PROJECT NAME AND NUMBER: Analysis of Vertebrate Populations, JOTR-N-14
3. STATEMENT OF PROBLEM:

Faunal distribution and abundance has been studied for some species in the monument. Little is known about population dynamics, seasonal distribution, reproductive seasons, etc., for most animal species in Joshua Tree. The information is needed to better understand the resources of the monument, and to provide for interpretation and for management of this natural park.

4. WHAT HAS BEEN DONE:
5. DESCRIPTION OF WORK TO BE UNDERTAKEN:

The study will entail studying various classes of vertebrates through collection and taxonomic determinations. Populations will be assigned by capture-marking-releasing-recapture methods, analysis of age groupings in the populations, and other aspects of population dynamics as appear warranted. Because of the diversity of vertebrates in Joshua Tree, a separate study should be conducted on birds, another on small animals, and a third on amphibians and reptiles.

6. LENGTH OF TIME NEEDED: 6 years (3 studies of 2 years each)
7. WHAT WILL HAPPEN IF NOT UNDERTAKEN:

Management decisions affecting vertebrates of the monument will be based on inadequate knowledge unless such studies are undertaken. Some species of vertebrates may be lost, or at least adversely affected because of an inadequate understanding of their needs.

8. WHAT ARE THE ALTERNATIVES: Do not conduct the studies.
9. PERSONNEL: Park Research Biologist; graduate students.
10. ADMINISTRATION AND LOGISTICS: Contracts with a university.

<u>Funding</u>	<u>Year in Program Sequence</u>	
----------------	---------------------------------	--

	2nd	3rd
Personal Services (Contract)	7,000	7,000
Other Than Personal Services	0	0
Grand Total	7,000	7,000
Funds Available in Park Base	0	0
Funds Requested from Regional Office	7,000	7,000

<u>On Form</u>	<u>Date Submitted</u>	<u>On Form</u>	<u>Date Submitted</u>
10-237 <input type="checkbox"/>		10-250 <input type="checkbox"/>	
10-238 <input type="checkbox"/>		10-451 <input type="checkbox"/>	

## NATURAL RESOURCES PROJECT STATEMENT

1. PARK AND REGION: Joshua Tree National Monument, WRO
2. PROJECT NAME AND NUMBER: Ecology of Mule Deer in Joshua Tree National Monument, JOTR-N-17
3. STATEMENT OF PROBLEM:

Deer have not been studied in the monument, and little is known about their distribution or population numbers. Deer are concentrated on the western side of the monument, and range out onto adjacent lands. When water sources are developed in western parts of the monument, it is possible that the mule deer will be affected. If so, any population increase might be detrimental to the habitat. In addition, deer might encroach on the habitat of the desert bighorn. This study will provide knowledge about the habitat of the deer, about the population, and about the interaction of deer and other large mammals.

4. WHAT HAS BEEN DONE:
5. DESCRIPTION OF WORK TO BE UNDERTAKEN:

This ecological study will include determination of forage and water resources presently used by deer. Factors which limit the present range of the population will be studied, and population data will be acquired by pellet-group transects, waterhole counts, etc. Data from the Mule Deer Management project (JOTR-RM-3) will be useful for this study.

6. LENGTH OF TIME NEEDED: 3 years
7. WHAT WILL HAPPEN IF NOT UNDERTAKEN:

A large deer population could cause damage to forage that is important to desert bighorn. Any potential competition between deer and bighorn should be understood by management; not to understand the situation would increase the stress on rare desert bighorn populations.

8. WHAT ARE THE ALTERNATIVES:

Do not conduct studies until range deterioration is noted. This is not an acceptable alternative.

9. PERSONNEL:

Unit Leader, UNLV, and university personnel.

10. ADMINISTRATION AND LOGISTICS:

Research contract with University of Nevada, Las Vegas, recommended.

<u>Funding</u>	<u>Year in Program Sequence</u>		
	3rd	4th	5th
Personal Services (Contract)	8,000	7,000	7,000
Other Than Personal Services	0	0	0
	<hr/>	<hr/>	<hr/>
Grand Total	8,000	7,000	7,000
Funds Available in Park Base	0	0	0
	<hr/>	<hr/>	<hr/>
Funds Requested from Regional Office	8,000	7,000	7,000

<u>On Form</u>	<u>Date Submitted</u>	<u>On Form</u>	<u>Date Submitted</u>
10-237 <input type="checkbox"/>		10-250 <input type="checkbox"/>	
10-238 <input type="checkbox"/>		10-451 <input type="checkbox"/>	

## NATURAL RESOURCES PROJECT STATEMENT

1. PARK AND REGION: Joshua Tree National Monument, WRO
2. PROJECT NAME AND NUMBER: Ecological Study of Pinyon-Juniper Woodlands of Joshua Tree National Monument, JOTR-N-11
3. STATEMENT OF PROBLEM:

The pinyon and juniper woodland is limited to higher elevations in the western part of the monument. In anticipation of potential visitor impact on this area, and to restore natural conditions lost through mining and grazing activities, it is necessary to formulate management procedures. A base line study of these woodlands is needed.

4. WHAT HAS BEEN DONE:
5. DESCRIPTION OF WORK TO BE UNDERTAKEN:

The age distribution of pinyon pines and juniper trees will be evaluated. Age distribution within the woodland will be correlated with plant species in the ground cover. Soil characteristics of the stand will be studied and described. Climatic parameters such as air temperature, humidity, soil temperature, precipitation, evaporation, and soil moisture will be studied and evaluated. This study will require scientific instruments and laboratory facilities. An inventory of the associated vertebrates should be conducted in conjunction with this study.

6. LENGTH OF TIME NEEDED: 3 years
7. WHAT WILL HAPPEN IF NOT UNDERTAKEN:

Managers have no baseline data from which to project management procedures. Visitor impact may irreparably damage this woodland before management problems are understood.

8. WHAT ARE THE ALTERNATIVES:

Do not conduct studies until damage is apparent.

9. PERSONNEL:

University personnel should be used for this study.

10. ADMINISTRATION AND LOGISTICS:

Assistance of Park Biologist; university contract.

<u>Funding</u>	<u>Year in Program Sequence</u>		
	3rd	4th	5th
Personal Services (Contract)	6,500	6,500	6,500
Other Than Personal Services	0	0	0
	_____	_____	_____
Grand Total	6,500	6,500	6,500
Funds Available in Park Base	0	0	0
	_____	_____	_____
Funds Requested from Regional Office	6,500	6,500	6,500

<u>On Form</u>	<u>Date Submitted</u>	<u>On Form</u>	<u>Date Submitted</u>
10-237 <input type="checkbox"/>		10-250 <input type="checkbox"/>	
10-238 <input type="checkbox"/>		10-451 <input type="checkbox"/>	

## NATURAL RESOURCES PROJECT STATEMENT

1. PARK AND REGION: Joshua Tree National Monument, WRO
2. PROJECT NAME AND NUMBER: Energy Exchange in Ecosystems of Joshua Tree National Monument, JOTR-N-16
3. STATEMENT OF PROBLEM:

Nothing is known about the availability of energy in plant species that are eaten by various animals in Joshua Tree. Nor is it known how effectively energy is transformed by various animals. From a management standpoint, energy exchange is most important as it relates to wildlife, and therefore should be studied as a vital component of related studies, such as studies of food habits of herbivores. Energy concerns also are related to the quality of the environment: healthy plants are physiologically more active, have larger potential energy available for animals, and may be selected for by herbivorous species.

4. WHAT HAS BEEN DONE: Nothing
5. DESCRIPTION OF WORK TO BE UNDERTAKEN:

Plants eaten on a seasonal basis by desert bighorn and by deer provide a desirable starting point for this study. Major browse species should be sampled periodically, dried, ground, and burned in a bomb calorimeter. Energy values of such samples should be correlated with major nutritive components, such as percentage protein, carbohydrates, and fat. It may be desirable to have mineral analyses conducted on some samples to help account for selection by herbivores. Such a study should be correlated insofar as possible with growth of herbivores under field conditions.

6. LENGTH OF TIME NEEDED: 4 years
7. WHAT WILL HAPPEN IF NOT UNDERTAKEN:

This study is vital to understanding management needs of large herbivores in the monument.

8. WHAT ARE THE ALTERNATIVES: Do not conduct studies.
9. PERSONNEL: Unit Leader, Coop. NPS Research Unit

10. ADMINISTRATION AND LOGISTICS:

The University of Nevada has a bomb calorimeter that could be used for such studies. Grand Canyon National Park also has such a machine. Contract with the University of Nevada recommended.

<u>Funding</u>	<u>Year in Program Sequence</u>		
	3rd	4th	5th
Personal Services (Contract)	7,000	7,000	7,000
Other Than Personal Services	0	0	0
	_____	_____	_____
Grand Total	7,000	7,000	7,000
Funds Available in Park Base	0	0	0
	_____	_____	_____
Funds Requested from Regional Office	7,000	7,000	7,000

<u>On Form</u>	<u>Date Submitted</u>	<u>On Form</u>	<u>Date Submitted</u>
10-237 <input type="checkbox"/>		10-250 <input type="checkbox"/>	
10-238 <input type="checkbox"/>		10-451 <input type="checkbox"/>	



## NATURAL RESOURCES PROJECT STATEMENT

1. PARK AND REGION: Joshua Tree National Monument, WRO
2. PROJECT NAME AND NUMBER: Climatology of Joshua Tree National Monument, JOTR-N-22
3. STATEMENT OF PROBLEM:

Climatological parameters are measured at two permanent weather stations. Because of the vast acreage and elevational gradients, data are needed from a greater number of localities in order to provide basic data required for other research work and for management purposes. Sporadic measurements and general observations indicate a greater difference in climatic parameters between various parts of the monument than is now indicated from the two existing "base" stations. No data on wind direction and velocity exists. Data on microclimate (the climate at or immediately above ground surface) is lacking.

4. WHAT HAS BEEN DONE:

Two weather stations have been operative in the monument for a number of years.

5. DESCRIPTION OF WORK TO BE UNDERTAKEN:

Establish 5 climatological stations, to measure ambient air and soil temperatures, solar radiation, precipitation, wind direction and velocity, relative humidity, and evaporation. Such stations should record climatic variables at different elevations, in different plant communities, and on different facing slopes of at least one major canyon or mountain range. Data should be compared between stations in order to elucidate differences caused by topography and elevation. Computer summaries and analyses of data should be performed. Data should be correlated and analyzed in relation to known frontal systems reported by the U.S. Weather Bureau.

6. LENGTH OF TIME NEEDED: 11 years
7. WHAT WILL HAPPEN IF NOT UNDERTAKEN:

Present natural history research projects, as well as future projects, will not have necessary baseline data on climate.

8. WHAT ARE THE ALTERNATIVES:

Do not conduct studies; work some environmental measurement into other studies.

9. PERSONNEL:

This study should be conducted by university personnel on contract.

10. ADMINISTRATION AND LOGISTICS:

The first year's work of this study will be primarily establishing stations and testing equipment. The following 10 years should then be mostly a process of monitoring the equipment and evaluating the data.

<u>Funding</u>	<u>Year in Program Sequence</u>	
	4th	5th
Personal Services (Contract)	20,000	8,000
Other Than Personal Services	0	0
	<hr/>	<hr/>
Grand Total	20,000	8,000
	<hr/>	<hr/>
Funds Available in Park Base	0	0
	<hr/>	<hr/>
Funds Requested from Regional Office	20,000	8,000

<u>On Form</u>	<u>Date Submitted</u>	<u>On Form</u>	<u>Date Submitted</u>
10-237 <input type="checkbox"/>		10-250 <input type="checkbox"/>	
10-238 <input type="checkbox"/>		10-451 <input type="checkbox"/>	

## NATURAL RESOURCES PROJECT STATEMENT

1. PARK AND REGION: Joshua Tree National Monument, WRO
2. PROJECT NAME AND NUMBER: Inventory, Distribution, and Structure of the Major Soils of Joshua Tree National Monument, JOTR-N-18
3. STATEMENT OF PROBLEM:

The soils of Joshua Tree have not been studied sufficiently to provide information on major types, distribution, structure, chemical composition, and related geologic and biologic features. These data are basic and needed to form a more complete basis for the management of the natural resources of the area.

4. WHAT HAS BEEN DONE:
5. DESCRIPTION OF WORK TO BE UNDERTAKEN:

This work will entail an inventory of major soil types and a collection and laboratory study of structure and chemical composition of these soils.

6. LENGTH OF TIME NEEDED: 2 years
7. WHAT WILL HAPPEN IF NOT UNDERTAKEN:

The inventory of basic resources will not be complete.

8. WHAT ARE THE ALTERNATIVES: Do not conduct studies.
9. PERSONNEL:

This study should be conducted by university personnel.

10. ADMINISTRATION AND LOGISTICS:

<u>Funding</u>	<u>Year in Program Sequence</u>	
	4th	5th
Personal Services (Contract)	8,500	7,000
Other Than Personal Services	0	0
	_____	_____
Grand Total	8,500	7,000
Funds Available in Park Base	0	0
	_____	_____
Funds Requested from Regional Office	8,500	7,000

<u>On Form</u>	<u>Date Submitted</u>	<u>On Form</u>	<u>Date Submitted</u>
10-237	<input type="checkbox"/>	10-250	<input type="checkbox"/>
10-238	<input type="checkbox"/>	10-451	<input type="checkbox"/>

## NATURAL RESOURCES PROJECT STATEMENT

1. PARK AND REGION: Joshua Tree National Monument, WRO
2. PROJECT NAME AND NUMBER: Interrelationship of Tree Rings and Spring Discharge, JOTR-N-28
3. STATEMENT OF PROBLEM:

The annual growth of trees is known to be influenced by availability of moisture. Growth of trees as seen in incremental borings (tree rings) has been studied extensively in the Southwest in efforts to correlate known environmental conditions with present tree growth. From this baseline, it is possible to extrapolate backward in time and relate past tree growth to past climate.

It is known that spring discharge has decreased markedly in Joshua Tree over the past 20 years. It is not understood whether spring discharge is a cyclic phenomenon. The study of tree rings in trees growing on springs, as well as those growing some distance from springs should yield data on the nature and history of spring discharge in the Joshua Tree area. It is vital that management understand whether the present drying trend is a cyclic phenomenon, or whether decreased spring discharge is caused by man's misuse of water resources.

4. WHAT HAS BEEN DONE:

Test wells have been drilled in the Oasis of Mara. Monitoring equipment has been installed on one well to record diurnal fluctuations and seasonal levels of the water table. The USGS takes two readings annually of water levels of other test wells in the monument.

5. DESCRIPTION OF WORK TO BE UNDERTAKEN:

Phreatophytes living on and near the Oasis of Mara should be cored and the tree rings studied in relationship to tree growth in other parts of the monument. A chronology should be developed for Joshua Tree National Monument, and this should be analyzed in relation to known climate, and to other chronologies of tree growth in the Southwest. Cross sections of phreatophytes may be needed to help interpret borings. This work should be undertaken in conjunction with management procedures in the Oasis of Mara.

6. LENGTH OF TIME NEEDED: 2 years

7. WHAT WILL HAPPEN IF NOT UNDERTAKEN:

Lessened spring flow endangers wildlife and may result in the death of Washington palms which grow in the various oases of the monument. We do not understand the cause of the lessened spring discharge, therefore management decisions are based on good intentions but little factual data. If such conditions are cyclic, such knowledge would have a significant part to play in management decisions.

8. WHAT ARE THE ALTERNATIVES:

a. Study only phreatophytic species. This would be less expensive than studying phreatophytes and non-phreatophytes, and establishing a chronology for the monument. Nevertheless, the growth of non-phreatophytes (ex. conifers) provides a baseline for evaluating growth of phreatophytes, which tend to be much less sensitive to climatic changes.

b. Do not conduct studies. This is not an acceptable alternative.

9. PERSONNEL:

University personnel should be utilized for this study.

10. ADMINISTRATION AND LOGISTICS:

Park personnel will need to assist investigator(s) in locating stands of conifers for sampling. Management of the Oasis of Mara such as clearing of phreatophytes should be correlated with this study.

<u>Funding</u>	<u>Year in Program Sequence</u>	
	4th	5th
Personal Services	5,000	5,000
(Contract)		
Other Than Personal Services	0	0
	<hr/>	<hr/>
Grand Total	5,000	5,000
Funds Available in Park Base	0	0
	<hr/>	<hr/>
Funds Requested from Regional Office	5,000	5,000

On Form                      Date Submitted

10-237 ☐

10-238 ☐

On Form                      Date Submitted

10-250 ☐

10-451 ☐

11. REFERENCES AND CONTACTS:

Ferguson, W. Dendrochronology Lab, University of Arizona, Tuscon

Fritz, H., Smith et al. American Antiquity, 31, Part 2, 1965.

## NATURAL RESOURCES PROJECT STATEMENT

1. PARK AND REGION: Joshua Tree National Monument, WRO
2. PROJECT NAME AND NUMBER: Fire Ecology in Joshua Tree National Monument, JOTR-N-24
3. STATEMENT OF PROBLEM:

Empirical data indicate that a long history of fire suppression has encouraged successional plants that differ from those occurring in fire-controlled subclimax vegetation. Comparisons of burns of various ages with unburned parts of Joshua tree forests indicate that unburned areas tend to have a preponderance of shrubby understory replacing natural grasslands. The 1968 Randolph Fire demonstrated that a previously unburned understory having a high fuel and heat potential can, upon burning, destroy mature Joshua trees.

This project is needed to scientifically evaluate the role of fire in Joshua tree forests and other vegetational communities in the monument.

4. WHAT HAS BEEN DONE:
5. DESCRIPTION OF WORK TO BE UNDERTAKEN:

A chronological history of fires in the monument will be prepared. This chronology will be supplemented by maps, photographs, and analyses of successional stages of vegetation in burns of various ages. Transects and quadrants will be utilized to compare vegetation of burned areas with areas having no fire history.

Sample plots of about 5 acres each will be control burned on an experimental basis to evaluate methods and results of burning techniques for an effective rotational burning program, and/or a program to permit future wildfires to burn freely.

A management objective is to determine those areas of the monument where natural fires could burn freely and what the limits of those fires should be, and to establish guidelines to manage fires within those limits.

6. LENGTH OF TIME NEEDED: 2 to 3 years



7. WHAT WILL HAPPEN IF NOT UNDERTAKEN:

Management decisions relating to fire will be based on imperfect data.

8. WHAT ARE THE ALTERNATIVES: Do not conduct studies.

9. PERSONNEL:

The study should be done on a contract basis with a forestry management student interested in fire ecology. Personnel for prescribed burning experiments are available in the monument.

10. ADMINISTRATION AND LOGISTICS:

The study should be designed for a two to three year period to coincide with a graduate Ph.D. curriculum.

<u>Funding</u>	<u>Year in Program Sequence</u>
	5th
Personal Services	6,000
(Contract)	
Other Than Personal	0
Services	_____
Grand Total	6,000
Funds Available in	0
Park Base	_____
Funds Requested from	6,000
Regional Office	

<u>On Form</u>	<u>Date Submitted</u>	<u>On Form</u>	<u>Date Submitted</u>
10-237	<input type="checkbox"/>	10-250	<input type="checkbox"/>
10-238	<input type="checkbox"/>	10-451	<input type="checkbox"/>

## NATURAL RESOURCES PROJECT STATEMENT

1. PARK AND REGION: Joshua Tree National Monument, WRO
2. PROJECT NAME AND NUMBER: Effects of Smog in Joshua Tree National Monument, JOTR-N-23
3. STATEMENT OF PROBLEM:

The monument lies about 150 miles east of Los Angeles where about 10 million people live. Smog already is affecting human health and is responsible for killing certain plants in the surrounding mountains. The prevailing westerly winds occasionally carry smog from the Los Angeles and San Diego areas to the monument. A study of the amount and effect of smog in the monument, as well as a monitoring system, is needed to help in protecting and managing this fragile desert habitat.

4. WHAT HAS BEEN DONE: No studies of this nature have been conducted.
5. DESCRIPTION OF WORK TO BE UNDERTAKEN:

This study will require instrumentation to monitor oxidants such as ozone and/or PAN that are present in smog. The vegetation should be studied to determine if any plants presently are being affected by the various air pollutants.

6. LENGTH OF TIME NEEDED: 4 years (study may require additional years if the data indicate more time is needed)
7. WHAT WILL HAPPEN IF NOT UNDERTAKEN:

Damage to plants may be occurring at present.

8. WHAT ARE THE ALTERNATIVES:

Wait until plant damage becomes apparent, then react.

9. PERSONNEL:

University personnel should be used for this study with consultation with local agencies working on similar problems elsewhere, such as the Forest Service in San Bernardino National Forest.

10. ADMINISTRATION AND LOGISTICS:

<u>Funding</u>	<u>Year in Program Sequence</u>
	5th
Personal Services	12,000
(Contract)	
Other Than Personal	0
Services	<hr/>
Grand Total	12,000
Funds Available in	0
Park Base	<hr/>
Funds Requested from	12,000
Regional Office	

<u>On Form .</u>	<u>Date Submitted</u>	<u>On Form</u>	<u>Date Submitted</u>
10-237 <input type="checkbox"/>		10-250 <input type="checkbox"/>	
10-238 <input type="checkbox"/>		10-451 <input type="checkbox"/>	

## NATURAL RESOURCES PROJECT STATEMENT

1. PARK AND REGION: Joshua Tree National Monument, WRO
2. PROJECT NAME AND NUMBER: Survey and Evaluation of Endemic Plants of Joshua Tree National Monument, JOTR-N-9
3. STATEMENT OF PROBLEM:

It is critical that detailed information be obtained about the distribution of endemic plants within the monument. The vegetational map (JOTR-N-8) and the accompanying study should reveal areas within the monument that should be investigated for relict populations of plants and animals. Knowledge of the locations of endemic species is of vital importance to managers, in order that these localities can be protected from construction, or from visitor impact, as is necessary.

4. WHAT HAS BEEN DONE:
5. DESCRIPTION OF WORK TO BE UNDERTAKEN:

Areas of botanical interest, as identified in the natural history survey, should be investigated thoroughly. Endemic plant distribution should be mapped, and added to the base map. Any endemic species of plants should be evaluated in regard to numbers, vigor of the stand, factors that endanger the distribution, etc. Voucher specimens should be pressed and prepared as herbarium specimens. One voucher specimen should remain in the collection at the monument, the other should be housed in a university museum. A publication concerning endemic species of the monument hopefully will result from this research.

6. LENGTH OF TIME NEEDED: 2 years
7. WHAT WILL HAPPEN IF NOT UNDERTAKEN:

There is danger of losing native, endemic species through ignorance of their locations, or management needs.

8. WHAT ARE THE ALTERNATIVES:

- a. Do not conduct the study.
- b. Extend JOTR-N-8 to cover this research.

9. PERSONNEL:

Contract with University of Nevada, Las Vegas, preferred.

10. ADMINISTRATION AND LOGISTICS:

Helicopter rental for backcountry surveys.

<u>Funding</u>	<u>Year in Program Sequence</u>
	5th
Personal Services (Contract)	7,000
Other Than Personal Services	0
	_____
Grand Total	7,000
Funds Available in Park Base	0
	_____
Funds Requested from Regional Office	7,000

<u>On Form</u>	<u>Date Submitted</u>	<u>On Form</u>	<u>Date Submitted</u>
10-237 <input type="checkbox"/>		10-250 <input type="checkbox"/>	
10-238 <input type="checkbox"/>		10-451 <input type="checkbox"/>	

11. REFERENCES AND CONTACTS:

Dr. Wesley Niles, Department of Biological Sciences, University of Nevada, Las Vegas.

## NATURAL RESOURCES PROJECT STATEMENT

1. PARK AND REGION: Joshua Tree National Monument, WRO
2. PROJECT NAME AND NUMBER: Paleoecology of JOTR: I. Analysis of Vegetation from Prehistoric Pack Rat Nests, JOTR-N-26
3. STATEMENT OF PROBLEM:

There is a need to establish floral, faunal, hydrological, and climatic conditions in the recent past (last 10,000 years) in order to determine the course of management in many segments of the monument. Good data are available in the well-preserved vegetation used by prehistoric (Pleistocene and recent) pack rats for nest material. When this material is identified and age-dated, excellent data will be available for assessing any changes in the flora and climate of the monument that have occurred over the past several thousand years.

4. WHAT HAS BEEN DONE: Studies have not been conducted.
5. DESCRIPTION OF WORK TO BE UNDERTAKEN:

Fossil pack rat nests are to be located and selected for analysis. Those analyzed will be sampled and vegetal material will be identified and age-dated by standard methods. A chronological inventory will then be made and used with data from other studies to establish floral and climatic conditions in the recent past.

6. LENGTH OF TIME NEEDED: 2 years
7. WHAT WILL HAPPEN IF NOT UNDERTAKEN:

Interpretation of the prehistory of the monument will be based on incomplete data.

8. WHAT ARE THE ALTERNATIVES: Do not conduct the studies.
9. PERSONNEL:

This study should be accomplished by contract with a university.

10. ADMINISTRATION AND LOGISTICS:

Two years have been suggested for this study with the first year primarily for field work and the second for laboratory work.

<u>Funding</u>	<u>Year in Program Sequence</u>
	5th
Personal Services (Contract)	7,000
Other Than Personal Services	0
	_____
Grand Total	7,000
Funds Available in Park Base	0
	_____
Funds Requested from Regional Office	7,000

<u>On Form</u>	<u>Date Submitted</u>	<u>On Form</u>	<u>Date Submitted</u>
10-237 <input type="checkbox"/>		10-250 <input type="checkbox"/>	
10-238 <input type="checkbox"/>		10-451 <input type="checkbox"/>	

11. REFERENCES AND CONTACTS:

Phillip Wells, University of Kansas, Lawrence, Kansas 66044

## NATURAL RESOURCES PROJECT STATEMENT

1. PARK AND REGION: Joshua Tree National Monument, WRO
2. PROJECT NAME AND NUMBER: Peleoeecology of JOTR: II. Analysis of Fossil Pollen, JOTR-N-27

3. STATEMENT OF PROBLEM:

The prehistoric floral, faunal, hydrological, and climatic conditions of the monument are unknown. Knowledge of the paleoecology of the monument is needed to facilitate interpretation and management of the ecosystem. Good data are available in the fossil pollen that is found in mud around springs and oases, and perhaps even in the cracks of some monzonite boulders. When this material is identified and age-dated, excellent clues to the changes in flora, fauna, and climate may be found.

4. WHAT HAS BEEN DONE: Studies have not been conducted.

5. DESCRIPTION OF WORK TO BE UNDERTAKEN:

Soil cores should be taken from sediment around wet areas and from the wind-blown material found in the cracks in rocks. Fossil pollen will be identified in a laboratory by standard techniques. The data should be analyzed and placed in chronological sequence for interpretive purposes.

6. LENGTH OF TIME NEEDED:

7. WHAT WILL HAPPEN IF NOT UNDERTAKEN:

Interpretation of the prehistory of the monument will be based on incomplete data.

8. WHAT ARE THE ALTERNATIVES: Do not conduct studies.

9. PERSONNEL:

This study should be conducted by university personnel on contract.

10. ADMINISTRATION AND LOGISTICS:

This study should be completed in one year. However, if these data are insufficient, additional time may be required.



FundingYear in Program Sequence

Personal Services  
(Contract)  
Other Than Personal  
Services

Grand Total

Funds Available in  
Park Base

Funds Requested from  
Regional Office

On Form

Date Submitted

On Form

Date Submitted

10-237 ☐

10-250 ☐

10-238 ☐

10-451 ☐

## NATURAL RESOURCES PROJECT STATEMENT

1. PARK AND REGION: Joshua Tree National Monument, WRO
2. PROJECT NAME AND NUMBER: Ecological Relationships in the Creosote Bush Community, JOTR-N-12
3. STATEMENT OF PROBLEM:

The Creosote Bush Community covers a large part of the monument. Little is known about plant and animal relationships in this community within the monument. Knowledge of such relationships is important for management and for interpretation. Owing to the heavy impact of visitor usage, management needs to dictate a study of the ecology of this widespread plant community.

4. WHAT HAS BEEN DONE:
5. DESCRIPTION OF THE WORK TO BE UNDERTAKEN:

A systematic survey should be made of the community to produce a quantitative assessment of the associated plants and animals. Collections should be made to determine faunal and floral species present, and to study the relationships that exist. The impact of man on this community should be assessed. Comparisons should be made of disturbed (grazed, visitor usage areas) and undisturbed parts of the community. Soil constituents should be related to plant or animal associations wherever possible.

6. LENGTH OF TIME NEEDED:
7. WHAT WILL HAPPEN IF NOT UNDERTAKEN: Impossible to assess.
8. WHAT ARE THE ALTERNATIVES: Do not conduct the studies.
9. PERSONNEL: Contract with a university.
10. ADMINISTRATION AND LOGISTICS:  
University contract; assistance of park personnel.

Funding

Year in Program Sequence

Personal Services

(Contract)

Other Than Personal  
Services

Grand Total

Funds Available in  
Park Base

Funds Requested from  
Regional Office

On Form

Date Submitted

On Form

Date Submitted

10-237 ☐

10-250 ☐

10-238 ☐

10-451 ☐

11. REFERENCES AND CONTACTS:

Dr. T.W. Yang, Department of Biological Sciences, University of  
Arizona, Tuscon

## NATURAL RESOURCES PROJECT STATEMENT

1. PARK AND REGION: Joshua Tree National Monument, WRO
2. PROJECT NAME AND NUMBER: Inventory of Algae, Fungi, and Lichens of Joshua Tree National Monument, JOTR-N-13

3. STATEMENT OF PROBLEM:

No complete inventory of algae, fungi, and lichens has been made in Joshua Tree National Monument. This biotic resource is almost completely unknown from this area where climate and chemical reagents tend to retard biotic decomposition.

4. WHAT HAS BEEN DONE:

5. DESCRIPTION OF WORK TO BE UNDERTAKEN:

Study the algae, fungi, and lichens sufficiently to produce an inventory of these organisms.

6. LENGTH OF TIME NEEDED: 2 years

7. WHAT WILL HAPPEN IF NOT UNDERTAKEN:

The natural resource inventory will not be complete, and these data will not be available for management.

8. WHAT ARE THE ALTERNATIVES: Do not conduct studies.

9. PERSONNEL: University personnel

10. ADMINISTRATION AND LOGISTICS:

<u>Funding</u>	<u>Year in Program Sequence</u>
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Personal Services

(Contract)

Other Than Personal  
Services

Grand Total

Funds Available in  
Park Base

Funds Requested from  
Regional Office

<u>On Form</u>	<u>Date Submitted</u>	<u>On Form</u>	<u>Date Submitted</u>
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11. REFERENCES AND CONTACTS:

Dr. I. Friedman, Florida State University, Tallahassee, Florida  
32306 (Independent Research on Endolithic Desert Algae and Lichens)

## NATURAL RESOURCES PROJECT STATEMENT

1. PARK AND REGION: Joshua Tree National Monument, WRO
2. PROJECT NAME AND NUMBER: Plant Succession Transects in Pinto Basin, JOTR-N-6
3. STATEMENT OF PROBLEM:

In the Pinto Basin, there are disturbed areas in both the Turkey Farm (T3S, R11E, Sec. 22) and the Warner Brothers movie location (4S, R12E, Sec. 3) that afford ideal sites for observing vegetative succession in relation to the contiguous, undisturbed desert. Information gained from this study will establish the recovery rate and trend for disturbances to the Larrea-Franseria Community in the Pinto Basin. It also will provide data useful for both management and interpretation.

4. WHAT HAS BEEN DONE: Cursory inspection of areas.
5. DESCRIPTION OF WORK TO BE UNDERTAKEN:

Permanent transects will be established through these areas to determine current differences in the structure of the perennial vegetation and to monitor the trend and rate of succession.

6. LENGTH OF TIME NEEDED: 2 years
7. WHAT WILL HAPPEN IF NOT UNDERTAKEN:

An excellent opportunity to learn details of successional rates and species composition of various successional phases will be lost. Such data are rare for desert vegetation, therefore managers have little information upon which to base management decisions.

8. WHAT ARE THE ALTERNATIVES: Do not conduct the studies.
9. PERSONNEL:

The major work should be accomplished by university personnel under contract. Periodic work and the long-term monitoring should be accomplished by Park Service personnel.

10. ADMINISTRATION AND LOGISTICS:

The initial project is designed for two years of intensive study and the establishment of vegetational transects. Subsequent long-term sampling and monitoring may require 10 to 20 years of perhaps only one or two days spent every year or two reading the transects

Funding

Year in Program Sequence

Personal Services

(Contract)

Other Than Personal  
Services

Grand Total

Funds Available in  
Park Base

Funds Requested from  
Regional Office

On Form

Date Submitted

On Form

Date Submitted

10-237 ☐

10-250 ☐

10-238 ☐

10-451 ☐

## NATURAL RESOURCES PROJECT STATEMENT

1. PARK AND REGION: Joshua Tree National Monument, WRO
2. PROJECT NAME AND NUMBER: Analysis of Invertebrate Populations, JOTR-N-15
3. STATEMENT OF PROBLEM:

Distribution and abundance of invertebrates is poorly understood for Joshua Tree. Little is known about the relationship of invertebrates to various plant communities within the monument, despite the fact that invertebrates are important components of any ecosystem. Information is needed to enable managers to better understand the resources of the monument, and to provide for interpretation and for management of this natural area.

4. WHAT HAS BEEN DONE:

Considerable effort has been expended in studying several taxa of invertebrates, but little is known about most families of invertebrates in the monument.

5. DESCRIPTION OF WORK TO BE UNDERTAKEN:

A basic survey of the invertebrate fauna is needed. Various kinds of traps (water, sticky, light) should be run in various parts of the monument. Extensive collecting and taxonomic determinations should be done in unusual habitats, such as the various oases, and any relict vegetational communities that are identified as a result of current studies. Seasonal aspects of distribution and abundance should be evaluated. Because of the complexity of invertebrate forms, it is impossible for one investigator to adequately study all invertebrates in an area the size of Joshua Tree National Monument.

6. LENGTH OF TIME NEEDED: 4 years (2 studies of 2 years each)
7. WHAT WILL HAPPEN IF NOT UNDERTAKEN:

The most abundant animals in the monument would not be understood. If management problems exist, they would not be recognized without such studies. The basic resources inventory would not be complete without much better knowledge about invertebrates than presently is available. There may be endemic species of snails, or other forms, that would be lost through neglect and lack of knowledge.



8. WHAT ARE THE ALTERNATIVES: Do not conduct the studies.
9. PERSONNEL: Park Research Biologist, university personnel.
10. ADMINISTRATION AND LOGISTICS:

Contracts with a university.

Funding

Year in Program Sequence

Personal Services  
(Contract)  
Other Than Personal  
Services

Grand Total

Funds Available in  
Park Base

Funds Requested from  
Regional Office

On Form      Date Submitted

10-237 ☐

10-238 ☐

On Form

Date Submitted

10-250 ☐

10-451 ☐

## NATURAL RESOURCES PROJECT STATEMENT

1. PARK AND REGION: Joshua Tree National Monument, WRO
2. PROJECT NAME AND NUMBER: Study of the Rate of Erosion of Material of Granitic Origin in Joshua Tree National Monument, JOTR-N-19
3. STATEMENT OF PROBLEM:

A study of alluviation on fans and valley fill and corresponding rates of denudation from soils and gravels on various slopes and through all elevations will provide needed data for vegetation and ecological studies as well as predictive data for road and trail designers, planners, and maintenance staff. Data gathered on exfoliation and boulder formation would also assist in the interpretation of the area.

4. WHAT HAS BEEN DONE:
5. DESCRIPTION OF WORK TO BE UNDERTAKEN:

This work will entail measuring rates of sediment transportation and erosion in selected canyons, their respective alluvial fans, selected portions of valleys and selected high areas. This study will relate the rate of soil production, erosion and transport. All elevations and all areas of the monument should be considered.

6. LENGTH OF TIME NEEDED: 2 years
7. WHAT WILL HAPPEN IF NOT UNDERTAKEN:

The inventory of basic resources will not be complete.

8. WHAT ARE THE ALTERNATIVES: Do not conduct the studies.
9. PERSONNEL: This study should be contracted to a university.

10. ADMINISTRATION AND LOGISTICS:

Funding

Year in Program Sequence

Personal Services  
(Contract)  
Other Than Personal  
Services

Grand Total

Funds Available in  
Park Base

Funds Requested from  
Regional Office

On Form . Date Submitted

10-237 ☐

10-238 ☐

On Form

Date Submitted

10-250 ☐

10-451 ☐

## NATURAL RESOURCES PROJECT STATEMENT

1. PARK AND REGION: Joshua Tree National Monument, WRO
2. PROJECT NAME AND NUMBER: Study of the Geological Formations at Joshua Tree National Monument, JOTR-N-20

3. STATEMENT OF PROBLEM:

The stratigraphy and structure of the various mountains in the monument need to be studied to help in the interpretation and protection of this resource. Also the origin and manner of emplacement of the various rock and alluvial formations need study for the same reason.

4. WHAT HAS BEEN DONE:

5. DESCRIPTION OF WORK TO BE UNDERTAKEN:

Mapping of sedimentary and intrusive rocks on scale of at least 1:62,500 showing stratigraphy and structure of entire range and intermontane valleys. Work would include measuring representative sections and collection of rock and fossil specimens required to identify and date beds and extend correlation of sedimentary units.

6. LENGTH OF TIME NEEDED: 2 years

7. WHAT WILL HAPPEN IF NOT UNDERTAKEN:

The inventory of basic resources will not be complete.

8. WHAT ARE THE ALTERNATIVES: Do not conduct the studies.

9. PERSONNEL:

This could be made by several students under contract with a university.

10. ADMINISTRATION AND LOGISTICS:

The monument should be divided into geological units and one or more units studied at a time.

Funding

Year in Program Sequence

Personal Services  
(Contract)  
Other Than Personal  
Services

Grand Total

Funds Available in  
Park Base

Funds Requested from  
Regional Office

On Form

Date Submitted

On Form

Date Submitted

10-237 ☐

10-250 ☐

10-238 ☐

10-451 ☐

## NATURAL RESOURCES PROJECT STATEMENT

1. PARK AND REGION: Joshua Tree National Monument, WRO
2. PROJECT NAME AND NUMBER: Pleistocene and Recent Geological History of Joshua Tree National Monument, JOTR-N-21
3. STATEMENT OF PROBLEM:

There is a need to identify and date alluvial deposits, development of springs, dune fields, and surface water in the monument. These data are needed to interpret the geological resource and to protect and manage it in a knowledgeable manner.

4. WHAT HAS BEEN DONE:
5. DESCRIPTION OF WORK TO BE UNDERTAKEN:

The historical geological literature should be searched. The field work should include an inventory of the fossil flora and fauna from the area and stratigraphy to determine the key horizons for use in establishing the succession of emplacement. A study of fossil pollen may provide an important source of information in determining the physical history of the monument.

6. LENGTH OF TIME NEEDED: 2 years
7. WHAT WILL HAPPEN IF NOT UNDERTAKEN:

The inventory of basic resources will not be complete.

8. WHAT ARE THE ALTERNATIVES: Do not conduct studies.
9. PERSONNEL:

The study should be conducted by contract with a university.

10. ADMINISTRATION AND LOGISTICS:

The monument should be divided into geological units and each unit mapped separately, perhaps by separate students.

Funding

Year in Program Sequence

Personal Services  
(Contract)  
Other Than Personal  
Services

Grand Total

Funds Available in  
Park Base

Funds Requested from  
Regional Office

On Form

Date Submitted

On Form

Date Submitted

10-237 ☐

10-250 ☐

10-238 ☐

10-451 ☐

## NATURAL RESOURCES PROJECT STATEMENT

1. PARK AND REGION: Joshua Tree National Monument, WRO
2. PROJECT NAME AND NUMBER: Test Wells, Hidden Valley, JOTR-W-1
3. STATEMENT OF PROBLEM:

Hidden Valley campground has no water source for public use. The nearest water is at Ryan Mountain campground, approximately two miles away. This is a great inconvenience to campers.

4. WHAT HAS BEEN DONE:

A hydrologic investigative report has been completed by the U.S. Geological Survey at the request of the Park Service. The report was made on July 15, 1963.

5. DESCRIPTION OF WORK TO BE UNDERTAKEN:

Test wells will be drilled in accordance with the above report.

6. LENGTH OF TIME NEEDED: Three to four months.
7. WHAT WILL HAPPEN IF NOT UNDERTAKEN:

The campground will continue as a dry campground.

8. WHAT ARE THE ALTERNATIVES:

a. No action.

b. Haul water to the campground from an outside source.

9. PERSONNEL: Contract with drilling company recommended.



10. ADMINISTRATION AND LOGISTICS:

<u>Funding</u>	<u>Year in Program Sequence</u>				
	1st	2nd	3rd	4th	5th
Personal Service (Contract)			15,000		
Other than Personal Services			0		
Grand Total			15,000		
Funds Available in Park Base			0		
Funds Requested from Regional Office			15,000		
<u>On Form</u>	<u>Date Submitted</u>		<u>On Form</u>	<u>Date Submitted</u>	
10-237 <input type="checkbox"/>			10-250 <input checked="" type="checkbox"/>	8/25/69	
10-238 <input type="checkbox"/>			10-451 <input type="checkbox"/>		

NATURAL RESOURCES PROJECTS PROGRAMMING SHEET

Joshua Tree National Monument, California

October 1974

(1) Pkg. #	(2) Area Priority	(3) Project file	(4) (5)				NPS Costs Expressed in \$1000				(15) Form No. & Date			(16) No. of Contract					
			MY	Cost	Yr. 1(74)	MY	Cost	Yr. 2(75)	MY	Cost	Yr. 3(76)	MY	Cost		Yr. 4(77)	MY	Cost	10-250	10-237
126	1	RM-1 Wildlife Guzzlers	-	-	-	-	11.0	-	11.0	-	12.1	-	12.0	-	-	-	-	10/4/72	In progress
	2	RM-2 Bighorn Management	0.1	0.6	0.1	0.6	0.1	0.7	0.1	0.75	0.1	0.8	-	-	-	-	-	-	Continuing
	3	RM-4 Maintenance, Wildlife Guzzlers	0.5	7.0	0.5	7.0	0.5	7.0	0.5	7.0	0.5	7.0	7.0	-	-	-	-	9/18/73 (needs new form)	Continuing
	4	N-3 Fan Palm Oases Study	-	5.0	-	7.0	-	7.0	-	7.0	-	-	-	-	-	-	-	-	In Progress
	5	N-8 Natural History Inventory	-	7.0	-	7.0	-	-	-	-	-	-	-	-	-	-	-	-	8092-0002-10
	6	N-10 Ecology of Joshua Trees	-	7.0	-	7.0	-	7.0	-	7.0	-	-	-	-	-	-	-	-	8092-0004-10
014	7	RM-5 Palm Oases Management	-	5.0	0.3	2.8	0.3	2.8	0.3	2.9	0.3	3.0	-	-	-	-	-	4/18/74	Continuing
	8	N-1a Bighorn Ecology	-	-	-	4.3	-	5.0	-	5.0	-	5.0	-	5.0	-	-	-	-	Contract
	9	N-25 Analysis of the Impact of Man	-	-	-	20.0	-	-	-	-	-	-	-	-	-	-	-	-	Contract
	10	N-14 Analysis of Vertebrate Populations	-	-	-	7.0	-	7.0	-	7.0	-	-	-	-	-	-	-	-	Contract
160	11	W-1 Test Wells, Hidden Valley	-	-	-	-	-	-	-	15.0	-	-	-	-	-	-	-	-	Contract
	12	N-17 Ecology of Mule Deer	-	-	-	-	-	-	-	8.0	-	7.0	-	7.0	-	7.0	-	-	Contract
	13	N-11 Ecology of Pinyon-Juniper Woodland	-	-	-	-	-	-	-	6.5	-	6.5	-	6.5	-	6.5	-	-	Contract
	14	N-16 Energy Exchange	-	-	-	-	-	-	-	7.0	-	7.0	-	7.0	-	7.0	-	-	Contract

(1) Pkg. #	(2) Area Priority	(3) Project Title	(4) NPS Costs Expressed in \$1000				(5) Yr. 1(74) Yr. 2(75) Yr. 3(76) Yr. 4(77)				(15) Form No. & Date				(16) No. of Contract
			MY	Cost	MY	Cost	MY	Cost	MY	Cost	10-250	10-237	10-238		
15	N-22	Climatology	-	-	-	-	-	-	-	20.0	-	8.0	-	-	Contract
16	N-18	Soil Inventory	-	-	-	-	-	-	-	8.5	-	7.0	-	-	Contract
17	N-28	Interrelationship, Tree Rings & Spring Flow	-	-	-	-	-	-	-	5.0	-	5.0	-	-	Contract
18	N-24	Fire Ecology	-	-	-	-	-	-	-	-	-	6.0	-	-	Contract
19	N-23	Effects of Smog	-	-	-	-	-	-	-	-	-	12.0	-	-	Contract
20	N-9	Survey & Evaluation of Endemic Plants	-	-	-	-	-	-	-	-	-	7.0	-	-	Contract
21	N-26	Paleoecology of JOTR I: Vegetation	-	-	-	-	-	-	-	-	-	7.0	-	-	Contract
22	N-27	Paleoecology of JOTR II: Pollen	1 year	-	\$ 6,500										After 1978
23	N-12	Ecological Relationships in Creosote Bush Community	2 years	-	\$14,000										After 1978
24	N-13	Inventory of Algae, Fungi & Lichens	2 years	-	\$12,000										After 1978
25	N-6	Plant Succession in Pinto Basin	2 years	-	\$10.00										After 1978
26	N-15	Analysis of Invertebrate Populations	4 years	-	\$14,000										After 1978
27	N-19	Study of Erosion	2 years	-	\$10,000										After 1978
28	N-20	Physical Geology	2 years	-	\$12,000										After 1978
29	N-21	Historical Geology	2 years	-	\$12,000										After 1978

# LIST OF NATURAL RESOURCES PROJECTS

Reference Number	Project Title	Years Required for Completion
RM-1	Wildlife Guzzlers	5 (in progress)
RM-2	Bighorn Management	Continuing
RM-4	Maintenance, Wildlife Guzzlers	Continuing
N-3	Fan Palm Oases Study	4 (in progress)
N-1a	Bighorn Ecology	5 (in progress)
RM-5	Palm Oases Management	Continuing
N-6	Plant Succession in Pinto Basin	2
N-8	Natural History Inventory	2 (in progress)
N-9	Survey & Evaluation of Endemic Plants	2
N-10	Ecology of Joshua Trees	4 (in progress)
N-11	Ecology of Pinyon-Juniper Woodland	3
N-12	Ecological Relationships in Creosote Bush Community	2
N-13	Inventory of Algae, Fungi & Lichens	2
N-14	Analysis of Vertebrate Populations	6
N-15	Analysis of Invertebrate Populations	4
N-16	Energy Exchange	4
N-17	Ecology of Mule Deer	3
N-18	Soil Inventory	2
N-19	Study of Erosion	2
N-20	Physical Geology	2

<u>Reference Number</u>	<u>Project Title</u>	<u>Years Required for Completion</u>
N-21	Historical Geology	2
N-22	Climatology	11
N-23	Effects of Smog	4
N-24	Fire Ecology	3
N-25	Analysis of the Impact of Man	1 (in progress)
N-26	Paleoecology of JOTR I: Vegetation	2
N-27	Paleoecology of JOTR II: Pollen	1
N-28	Interrelationship, Tree Rings & Spring Flow	2
W-1	Test Wells, Hidden Valley	Undetermined





