Natural Resources Management Program

AN ADDENDUM
TO THE NATURAL
RESOURCES MANAGEMENT PLAN
FOR

Joshua Tree National Monument
California

Prepared by
Joshua Tree National Monument Current as of 3/82

NATIONAL PARK SERVICE/U.S. DEPARTMENT OF THE INTERIOR/REVISION OF [redacted] 1980

NATURAL RESOURCES

MANAGEMENT PROGRAM

AN ADDENDUM TO THE

NATURAL RESOURCES MANAGEMENT PLAN

FOR

JOSHUA TREE NATIONAL MONUMENT

CALIFORNIA

Prepared by

JOSHUA TREE NATIONAL MONUMENT
NATIONAL PARK SERVICE
DEPARTMENT OF THE INTERIOR

Revision ~~of October 1980~~ CURRENT AS OF MARCH 1982

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SUMMARY

NATURAL RESOURCES MANAGEMENT PROGRAM

(October 1980 Revision)

This Management Program is a reference document for use in programming funds to carry out key identified natural resources projects in Joshua Tree National Monument. While the Natural Resources Management Plan (NRMP) for the Monument proposes a long-term action program, this revised Management Program deals with the next five years only. The Program proposes projects for Fiscal Years 1981 through 1985. As often as needed, generally annually, the Management Program will be revised and updated for a new five-year period as work is completed and new projects are proposed.

The Management Program presented on the subsequent pages of this document consists of:

1. Introduction describing past results and future direction of the Monument's natural resources management activities.

2. Natural Resources Projects Programming Summary listing each project's priority, requested funds, and work schedule for a five-year period.

3. Natural Resources Project Statements. These serve as "blueprints" for proposed actions and serve as an outline from which to develop a detailed research or management project.

4. Status List of Natural Resources Projects. This list summarizes completed and currently active management and research projects in the Monument.

5. Appendix. This section contains a bibliography, research prescriptions for resource management, and guidelines for daily operations.

A Service-team completed an NRMP and Environmental Assessment for the Monument in October 1974. The Superintendent and staff worked under the direction of Dr. Milton C. Kolipinski, Western Regional Office and with primary consultation from Dr. Charles Douglas, Cooperative Resources Study Unit Leader, University of Nevada (Las Vegas). That Plan included an addendum, the Management Program. This May 1980 edition represents the first revision of the original Management Program. Holders of the Resources Management Plan should replace the original Management Program with this 1980 revision.

This revision proposes that two additional projects be carried out at Joshua Tree National Monument. These proposals are presented in the following Project Statements:

1. Air Quality Monitoring and Evaluation (AQ-1)

2. Monument Water Resources Management Plan (W-2)

Both of these studies are legislatively mandated.

This revised Management Program also includes an updating of several formerly submitted Project Statements. These updatings reflect partially completed studies, experience gained in managing resources, inflationary cost increases, etc.

"Ecology of Joshua Trees, Phase 2, JOTR N-10b" is the most important of the revised Project Statements. Recently, about 1,000 Joshua Trees of all age classes became afflicted with an unknown malady possibly associated with an infectious organism. The numerous dead and dying Joshua Trees have created concern that a non-native pathogen or an unnatural ecological process is underway. A study of this problem including an applied management strategy, if necessary, becomes a critically high priority in this revised Management Program.

It was determined through public and National Park Service review of the 1974 NRMP, Environmental Assessment, and Management Program that proposed actions lacked potential to cause significant impacts on the human environment.

Review copies of the documents were sent to 26 agencies or organizations and to 78 individuals in 1974. Former Monument Superintendent, Homer L. Rouse, received 11 responses generally supporting proposed actions. He prepared a "Consultation and Coordination" addendum to the NRMP in April, 1975. This addendum summarized review comments on the NRMP and included responses to these comments.

In carrying out projects proposed in the 1980 revision of the Management Program, provisions of the National Environmental Policy Act, National Historic Preservation Act, and Endangered Species Act will be complied with as they have been in the past. Because newly proposed projects in this document fall within the "umbrella" of the 1974 Environmental Assessment, no further consultation and/or documentation of environmental impacts is necessary prior to project implementation.

10/9/80
Date

Rick T. Anderson
Superintendent, Joshua Tree Natl Monument

10/16/80
Date

Howard H. Chapman
Regional Director, Western Region

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INTRODUCTION

Since the adoption of Joshua Tree National Monument's "Resource Management Plan" in 1974, many elements of resource significance have changed. Research projects, designed to provide the foundation for a resource management program have been completed. Some of the resource management projects prescribed in 1974 have been completed. Several of those not yet completed have been re-evaluated and new projects have been created. Development of private lands circumscribing the Monument's boundary have created new disturbances of management significance. As elsewhere, the energy shortage may represent the demise of uninhibited private transit, thus altering visitor-use patterns. In short, six years have wrought some significant accomplishments and new problems to be addressed in this revised management program.

Completed research projects have provided some answers to resource questions and created new ones. Specific recommendations for management strategies based on prescriptions from completed research are located in the appendix to this document (p. 22). Also within the appendix is a bibliography of research that, while not necessarily providing direct management prescriptions, represents information of potential importance. While the Management Program is a reference document for use in programming funds, the appendix has been developed as an administrative tool to provide short term guidance for the daily resource management operations.

Rapid growth, common to southern California, has created many new outside threats to resource qualities. The Monument's boundary, once obscure, has become increasingly defined by contrast associated with changing land uses contiguous to its perimeter.

The Monument's perimeter is complex, contributing significantly to a relatively large circumference. For example, if the Monument's 870 square miles were arranged in an approximately square configuration, the perimeter would be about 118 miles. However, the Monument's perimeter measures 190 miles. The Monument, therefore, must manage a longer border region than that of most parks of equivalent size.

Ninety per cent of the Monument's boundary circumscribes designated wilderness. The management of wilderness must preserve the plant and living systems as well as the abiotic elements. Thus, air quality management receives as much attention as wildlife management. A well marked perimeter may decrease the trespass of offroad vehicles. But only cooperation with parties producing external sources of air contamination can prevent deterioration of wilderness ecosystems from this element. The increase in external threats to Monument ecosystems and the susceptibility to turbulence due to a critical area/boundary relationship must be mitigated through an aggressive resource management effort.

Total visitation to the Monument showed slight declines in 1978 and 1979 compared to average visitation for the six year period 1974-1979. However, the number of visitors camping overnight showed a significant increase for this same two-year period. This trend may be indicative of visitation trends under the recent energy shortage.

This increase in the amount of time visitors remain in the Monument may significantly expand pressure on the natural resources. For example, most of the Monument's wilderness areas are inaccessible to the typical day-use, drive-through visitor. Increased camping places additional burdens on limited campground facilities and front-country areas, thus stimulating increased use of back country areas. Management strategies must reflect these changes.

Since the original resource management plan was adopted, the results of research have provided additional tools for solving some of the Monument's resource problems. However, the management issues have become more complex requiring an accelerated effort to continue the development of a responsive resource management program. Complex problems do not always require complex solutions. However, the methods of investigation and prescription formulation must be as incisive as the solution's apparent obscurity.

Interdisciplinary approaches through increased interdivisional collaboration can provide some of the ingenuity necessary to create new management techniques appropriate to the problem. For example, RESOURCE PROTECTION IS THE OBJECTIVE OF ALL PARK SERVICE DIVISIONS.

In part, interpretation deals with preventative protection through education of visitors. Protection rangers administer the law and if necessary, utilize the judicial branch for punitive protection actions. Traditionally, this has served for years. However, increased pressure on resource quality may call for increased creativity for development of solutions.

An example of this type of approach is a new program developed at Joshua Tree National Monument through the cooperation of all divisions and the U. S. Magistrate. Visitors found guilty of environmental crimes by the U. S. Magistrate's Court may elect to participate in an environmental awareness course in lieu of payment of court imposed fines. Rather than punish misguided visitors, the strategy is to educate them (see bibliography: Moon, 1979).

The natural resource projects outlined in this revision represent re-evaluations of resource issues and the development of a program strengthened by past accomplishments and guided by an appreciation for existing conditions.

INTRODUCTION

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Total visitation to the Monument showed slight declines in 1978 and 1979 compared to average visitation for the six year period 1974-1979. However, the number of visitors camping overnight showed a significant increase for this same two-year period. This trend may be indicative of visitation trends under the recent energy shortage.

NATURAL RESOURCES PROJECTS PROGRAMMING SHEET

Joshua Tree National Monument, California

Revised: March 1982

Area Priority	Reference No.	Project Title	NPS Costs Expressed in $1,000 FY 1 (83) BASE*	FY 1 (83) NEW**	FY 2 (84) BASE*	FY 2 (84) NEW**	FY 3 (85) BASE*	FY 3 (85) NEW**	FY 4 (86) BASE*	FY 4 (86) NEW**	FY 5 (87) BASE*	FY 5 (87) NEW*
1	AQ-1	Air Quality Study	2	28	2	5	2	5	2	5	2	5
2	N-10b	Ecology of Joshua Trees, Phase II		30		15						
3	RM-5	Palm Oases Management		4		4		4		4		4
4	N-24	Fire Ecology				6		6				
5	RM-1	Wildlife Guzzlers						40		20		20
6	N-25	Analysis of the Impact of Man						20				
7	W-2	Monument Water Resource Management Plan						20		20		
8	N-17	Ecology of Mule Deer								8		7
9	N-11	Ecology of Pinyon-Juniper Woodland								6.5		6.5
10	N-14	Analysis of Vertebrate Populations								7		7
11	N-16	Energy Exchange										7
12	N-28	Interrelationship, Tree Rings & Spring Flow										5
13	N-18	Soil Inventory 2 years - $15,500									After 1987	
14	N-22	Climatology 11 years - $28,000									After 1987	
15	N-23	Effects of Smog 4 years - $12,000									After 1987	

Area Priority	Reference No.	Project Title	NPS Costs Expressed in $1,000 FY 1 (83) BASE*	FY 1 (83) NEW**	FY 2 (84) BASE*	FY 2 (84) NEW**	FY 3 (85) BASE*	FY 3 (85) NEW**	FY 4 (86) BASE*	FY 4 (86) NEW**	FY 5 (87) BASE*	FY 5 (87) NEW
16	N-26	Paleoecology of JOTR I: Vegetation 2 years - $ 14,000									After 1987	
17	N-27	Paleoecology of JOTR II: Pollen 1 year - $ 6,500									After 1987	
18	N-12	Ecological Relationships in Creosote Bush Community 2 years - $14,000									After 1987	
19	N-13	Inventory of Algae, Fungi & Lichens 2 years - $12,000									After 1987	
20	N-6	Plant Succession in Pinto Basin 2 years - $10,000									After 1987	
21	N-15	Analysis of Invertebrate Populations 4 years - $14,000									After 1987	
22	N-19	Study of Erosion 2 years - $10,000									After 1987	
23	N-20	Physical Geology 2 years - $12,000									After 1987	
24	N-21	Historical Geology 2 years - $12,000									After 1987	

*BASE - Funds available in Monument's basic annual allocated budget.

**NEW - Funds requested from Western Regional Office; project to begin when funds will become available.

NATURAL RESOURCE PROJECT STATEMENT

1. PARK AND REGION: Joshua Tree National Monument, Western Region

2. PROJECT NAME AND NUMBER: Air Quality Study (JOTR AQ-1)

3. STATEMENT OF PROBLEM:

Air quality is recognized as one of the Monument's natural resources. Air-quality related values such as visibility of panoramas inside the park and clear, long distance vistas outside the park are considered to be primary attractions and essential to a visitor's enjoyment of the park. Some views have already diminished because of a gradual deterioration of air quality in recent decades primarily contributed by polluting sources in the Los Angeles Basin. Various mountain peaks and features such as the Salton Sea outside are easily seen from within the Monument at particular vista sites. A clear day offers the visitor enjoyment of seeing features such as Signal Peak in Mexico nearly 100 miles away.

Air pollution is detectable in the park on most days. The Little San Bernardino Mountains often form a barrier to the air pollution sources from the Los Angeles Basin.

Besides existing air pollution sources from Los Angeles Basin and Kaiser Steel Eagle Mountain Mine, other sources may develop in the future. For example, a Pacific Gas and Electrical Generating Plant has been proposed near Johnson Valley about 25 miles north of the Monument's northwest boundary. Other similar proposals also are currently under consideration, including coal-fired generating plants even closer to the Monument boundary.

The crux of the problem rests in the lack of quantitative information on air pollutant levels, visibility characteristics, etc. Without such information service officials have little basis upon which to evaluate and comment on proposals for developments outside the Monument that may further degrade air quality within its boundaries.

Because of its Wilderness Units, Joshua Tree National Monument carries a mandatory Class I status as designated by Congress. The Clean Air Act (Section 169A) grants the service substantial authority and responsibility in "prevention of any future, and the remedying of any existing, impairment of visibility in mandatory Class I Federal areas which impairment results from man-made air pollution."

4. WHAT HAS BEEN DONE: For nearly two years air quality has been monitored in the nearby community of Twentynine Palms. The Air Quality Management District records show that during the period May 1978 to July 1979, 45 days failed to meet State maximum permissable oxidont (ozone) levels.

Possibly other monitoring stations exist outside the Monument, close enough to provide estimates of air quality levels within it. So far, existence of any such monitoring program is unknown, but will be checked out with EPA and State of California.

5. DESCRIPTION OF WORK TO BE DONE:

For park air resources to be managed according to the requirements of this Act, base line data must be identified through research and monitoring programs, such as:

a. Current levels of air pollution for criteria pollutants (SO_2, SO_4, NO_x, photochemical oxidants) and particulates.

b. Current levels of other air pollutants such as fluoride, arsenic, fugitive dust, lead, cadmium, etc.

c. Inventory of air quality related values including visibility, flora, fauna, geologic, historic and cultural resources.

Thereafter, a continuing program of monitoring and research will be required to identify current adverse effects of air pollutants on air quality and on impacted resources in the park and to prevent significant deterioration to these values and resources in the future.

Section 165, paragraph (d)(2)(C)(ii) of the Clean Air Act reads as follows: "In any case where the Federal Land Manager demonstrates to the satisfaction of the State that the emissions from such (major emitting) facility will have an adverse impact on the air quality-related values (including visibility) of such lands, notwithstanding the fact that the change in air quality resulting from emissions from such facility will not cause or contribute to concentrations which exceed the maximum allowable increases for a Class I area, a permit (for construction) shall not be issued." This paragraph is interpreted to be a catch-all for Class I areas, irrespective of the above established increments and specified types of pollutants.

Following consultation with the Service's Air Quality Coordinator, Western Regional Office, two or three monitoring stations will be established at appropriate locations in the Monument.

6. LENGTH OF TIME NEEDED: After installation of monitoring equipment in the first year of this program, parameters will be continually monitored and periodically evaluated in a long-range program for an indefinite number of years.

7. WHAT WILL HAPPEN IF NOT UNDERTAKEN: Air quality standards may be already exceeded or become exceeded in the future. This may result in damage to natural and cultural resources, a decrease in visitor enjoyment of recreation opportunities, and a possible increase in respiratory health hazards. The Service has legal mandates and a moral obligation to strive for acceptable air quality levels in the Monument.

8. WHAT ARE THE ALTERNATIVES:

a. Do not monitor air quality at all.

b. Monitor air quality at only one station in the Monument.

c. Monitor air quality from other stations outside the recreation area in cooperation with other agencies.

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Possibly other monitoring stations exist outside the Monument, close enough to provide estimates of air quality levels within it. So far, existence of any such monitoring program is unknown, but will be checked out with EPA and State of California.

9. PERSONNEL: Contracted personnel in first year of study with training and subsequent data collection and analysis by Monument staff.

10. ADMINISTRATION AND LOGISTICS: Installation and instruction on monitoring equipment will be done by two technicians from EPA and/or State under consultation with NPS air quality specialists in WRO and DSC. Natural Resources Management (NRM) Specialist of the Monument will subsequently direct this program after appropriate training and instruction. NRM Specialist will analyze and interpret data and recommend actions to Superintendent about existing levels of pollutants, proposals for development outside the Monument that may alter air quality, etc.

Following appropriate training, selected Monument staff, under Monument's NRM Specialist's direction, will periodically collect air quality data and maintain equipment.

FUNDING

	Year in Program Sequence				
	1st	2nd	3rd	4th	5th
Non-NPS Personal Services	8,000	0	0	0	0
NPS Personal Services	2,000	2,000	2,000	2,000	2,000
Other than PS (Monitoring equipment, station maintenance, etc.)	20,000	5,000	5,000	5,000	5,000
Grand Total	30,000	7,000	7,000	7,000	7,000
Funds Available in Park Base	2,000	2,000	2,000	2,000	2,000
Funds Requested from Regional Office	28,000	5,000	5,000	5,000	5,000

On Form: 10-238 Date Submitted: To be submitted

11. REFERENCES AND CONTACTS:

Kathleen Davis, NPS Air Quality Coordinator, WRO
NPS Denver Service Center, Air Quality Team

Susan L. Moore, Director, Morongo Basin Conservation Association
29 Palms, CA

NATURAL RESOURCES PROJECT STATEMENT

1. PARK AND REGION: Joshua Tree National Monument, WRO

2. PROJECT NAME AND NUMBER: Monument Water Resources Management Plan (JOTR-W2)

3. STATEMENT OF PROBLEM: In compliance with Public Law 92-500 (Federal Water Pollution Control Act) and as amended by Public Law 95-217 (Clean Water Act of 1977) and as furthered by the Service Memorandum of Understanding with Environmental Protection Agency (EPA), each area must develop a Park Water Plan.

4. WHAT HAS BEEN DONE: No comprehensive water management plan has been developed for the area. However, some aspects of water resources management have been considered in the Monument's Natural Resources Management Plan approved in October 1974. The plan describes the hydrological nature of the Monument area. U. S. Geological Survey has measured water levels in selected wells in the Monument for 15 years or longer.

   Some serious hydrologic problems that need to be solved have already been identified. For example, continued withdrawal from Kaiser Steel Company's well will result in decreased water levels throughout the Pinto Basin. Other examples of hydrologic problems involve a lowering water table at Oasis of Mara, and a reduction in flow of historic springs and their associated biological populations throughout the Monument.

   Of over 120 known water sources, including springs, wells, seeps, and impoundments in the Monument, little information exists about water quality and quantity.

5. DESCRIPTION OF WORK TO BE UNDERTAKEN:

   Water Resources Management Plan will be prepared with special emphasis on:

   a. An historical report on management of water resources in and adjacent to the Monument.

   b. Classification of all surface and ground waters by present and proposed uses.

   c. An analysis of the present status of park waters, including:

      (1) Identification of water quality required to support specified uses and, where appropriate, to comply with or assist in establishing State and Federal water quality standards.

      (2) Relationship of water quality to any threatened, endangered, or otherwise sensitive species indigenous to the park, and relationship of water quality to the protection of all natural resources.

      (3) An annotated bibliography and summary statement of available information concerning existing quality of park waters.

d. A description of proposed actions relating to management of park waters.

e. A detailed plan for monitoring the quality of park waters that will reveal existing water quality and significant trends.

Future coordination/cooperation with EPA and the State is required to ascertain established water standards.

6. LENGTH OF TIME NEEDED: 2 years

7. WHAT WILL HAPPEN IF PROJECT NOT UNDERTAKEN: Changes will occur in natural hydrobiological processes within the Monument. Service noncompliance with the above Federal Laws could lead to legal actions against the Service.

8. WHAT ARE THE ALTERNATIVES: React only to emergencies and manage water resources on a piecemeal basis.

9. PERSONNEL: Assistance from WRO, Water Resources Division, with contracted U. S. Geological Survey to develop/initiate basic aspects. Future monitoring will be done by Monument staff in conjunction with U. S. Geological Survey.

10. ADMINISTRATION AND LOGISTICS:

Funding	Year in Program Sequence				
	1st	2nd	3rd	4th	5th
Personal Services (Non-NPS)	10,000	10,000	0	0	0
Other than personal services (Equipment, Travel, etc.)	10,000	10,000	0	0	0
Grand Total	20,000	20,000			
Funds available in park base	0	0			
Funds requested from Regional Office	20,000	20,000			

On Form: 10-250 Date Submitted: To be submitted

11. REFERENCES AND CONTACTS: Division of Water Resources, WRO

12. DATE OF PROJECT STATEMENT SUBMISSION: May 1980

NATURAL RESOURCES PROJECT STATEMENT

1. PARK AND REGION: Joshua Tree National Monument, WRO

2. PROJECT NAME AND NUMBER: Monument Water Resources Management Plan (JOTR-W2)

3. STATEMENT OF PROBLEM: In compliance with Public Law 92-500 (Federal Water Pollution Control Act) and as amended by Public Law 95-217 (Clean Water Act of 1977) and as furthered by the Service Memorandum of Understanding with Environmental Protection Agency (EPA), each area must develop a Park Water Plan.

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      (1) Identification of water quality required to support specified uses and, where appropriate, to comply with or assist in establishing State and Federal water quality standards.

      (2) Relationship of water quality to any threatened, endangered, or otherwise sensitive species indigenous to the park, and relationship of water quality to the protection of all natural resources.

      (3) An annotated bibliography and summary statement of available information concerning existing quality of park waters.

NATURAL RESOURCES PROJECT STATEMENT

1. PARK AND REGION: Joshua Tree National Monument, WRO

2. PROJECT NAME AND NUMBER: Ecology of Joshua Trees, Phase 2, JOTR-N-10b

3. STATEMENT OF PROBLEM: Phase two represents additional research of *Yucca brevifolia* ecology necessary to complete data accumulation for species management and alleviate population declines associated with a recent pestilence.

During the first week in March 1980, a number of Joshua trees near the West Entrance station (Monument access from town of Joshua Tree) showed signs of debilitation in the form of foliage dieback.

A preliminary survey has located several disease sites throughout the species' distribution within and beyond park boundaries. At this time approximately 1,000 individuals within the Monument appear to be affected. All age classes seem to be affected and clustering may indicate a disease pathogen. The exact extent of the distribution within and beyond Monument boundaries is not known. At this time the causal agent or ecological significance of the losses are undetermined.

4. WHAT HAS BEEN DONE:

A study completed in May 1977 through CPSU/UNLV on Joshua tree ecology represents the completion of phase one. This report, title and author, provides data on distribution, plant and animal associations and other aspects of Joshua tree ecology.

To understand the nature of the recent Joshua tree deaths, a study of the distribution, rates of debilitation and disease spread has been initiated. The University of California at Riverside's Agricultural Extension Service has taken samples for laboratory analysis. Several plant ecologists familiar with *Yucca brevifolia* and arid systems have been contacted. However, at this time neither the pathologists nor ecologists have been able to determine the probable cause.

5. DESCRIPTION OF WORK TO BE UNDERTAKEN:

This proposed study should include elements of *Yucca brevifolia* ecology such as fire regeneration, seedling survival, disease organisms and autecological and synecological assessments of current population debilitation. The research objectives should include an applied phase investigating disease control methods, especially if the pathological considerations indicate the existence of an exotic pathogen.

6. LENGTH OF TIME NEEDED: 2 years

7. WHAT WILL HAPPEN IF NOT UNDERTAKEN:

The Monument contributes to the preservation of Joshua Trees. It behooves management to understand the ecological requirements of this species as well as possible. If the study is not undertaken, the current population decline would accelerate and destroy many more *Yucca brevifolia* within the Monument. This would be especially critical if the population decline is related to unnatural processes.

8. WHAT ARE THE ALTERNATIVES:

a. Do not conduct studies.

b. Develop only a reactionary study to identify and describe current disease outbreak without an attempt to place this incident into the broader ecological consideration.

9. PERSONNEL:

Unknown, probably contracted specialists to be determined later.

10. ADMINISTRATION AND LOGISTICS:

Funding	Year in Program 1st	2nd
Personal Services (Contract)	25,000	10,000
Other Than Personal Services	5,000	5,000
Grant Total	30,000	15,000
Funds Available in Park Base	0	0
Funds Requested from Regional Office	30,000*	15,000

11. REFERENCES AND CONTACTS:

NPS, Chief, Div. of Natural Science, WRO
UC Riverside, Agricultural Extension Service
Natural Resources Management Specialist, JOTR NM

12. DATE OF SUBMISSION: May 1980

*If $30,000 is unavailable this study can be broken down into two studies, one the disease problem and a second one on ecology of Joshua Trees to be carried out later.

NATURAL RESOURCES PROJECT STATEMENT

1. PARK AND REGION: Joshua Tree National Monument, WRO

2. PROJECT NAME AND NUMBER: Ecology of Joshua Trees, Phase 2, JOTR-N-10b

3. STATEMENT OF PROBLEM: Phase two represents additional research of *Yucca brevifolia* ecology necessary to complete data accumulation for species management and alleviate population declines associated with a recent pestilence.

During the first week in March 1980, a number of Joshua trees near the West Entrance station (Monument access from town of Joshua Tree) showed signs of debilitation in the form of foliage dieback.

A preliminary survey has located several disease sites throughout the species' distribution within and beyond park boundaries. At this time approximately 1,000 individuals within the Monument appear to be affected. All age classes seem to be affected and clustering may indicate a disease pathogen. The exact extent of the distribution within and beyond Monument boundaries is not known. At this time the causal agent or ecological significance of the losses are undetermined.

4. WHAT HAS BEEN DONE:

A study completed in May 1977 through CPSU/UNLV on Joshua tree ecology represents the completion of phase one. This report, title and author, provides data on distribution, plant and animal associations and other aspects of Joshua tree ecology.

To understand the nature of the recent Joshua tree deaths, a study of the distribution, rates of debilitation and disease spread has been initiated. The University of California at Riverside's Agricultural Extension Service has taken samples for laboratory analysis. Several plant ecologists familiar with *Yucca brevifolia* and arid systems have been contacted. However, at this time neither the pathologists nor ecologists have been able to determine the probable cause.

5. DESCRIPTION OF WORK TO BE UNDERTAKEN:

This proposed study should include elements of *Yucca brevifolia* ecology such as fire regeneration, seedling survival, disease organisms and autecological and synecological assessments of current population debilitation. The research objectives should include an applied phase investigating disease control methods, especially if the pathological considerations indicate the existence of an exotic pathogen.

6. LENGTH OF TIME NEEDED: 2 years

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 analyzed. One of the major actions of this project will be to inventory exotic flora, such as mesquito, and fauna of the Monument and to propose management recommendations to minimize their influence where feasible. External threats such as poaching and illegal offroad vehicle use will be examined. Land tenure and utilization patterns adjacent to the Monument will be assessed.

6. LENGTH OF TIME NEEDED: One year

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.

Funding	Year in Program Sequence
	First
Personal Services (Contract)	20,000
Other Than Personal Services	0
Grand Total	20,000
Funds Available from Park Base	0
Funds Requested from Regional Office	20,000

11. DATE OF SUBMISSION: May 1980

NATURAL RESOURCES PROJECT STATEMENT

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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.

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 and fire frequency in Joshua tree forests and other vegetational communities in the monument. It is likely that some wildlife species have been affected by fire suppression. By investigating the relationship between fire and flora communities, we can get a better understanding of wildlife habitat requirements.

4. WHAT HAS BEEN DONE: Transect monitoring of Covington Flat burn of 1978.

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 long unburned areas.

Sample plots of about 5 acres will be prescribe burned on an experimental basis to evaluate effects, behavier, and techniques, unburned plots will be used for comparison.

A fire management plan will be prepared based on information of the role of fire in the monument. A management objective is to determine where natural fire zones can be established and the prescribed conditions for these fires. Prescribed fire will likely be part of the plan.

6. LENGTH OF TIME NEEDED: 2 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. 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 curriculum or through private contract.

Funding	Year in Program Sequence	
	2nd	3rd
Personal Services (Contract)	6,000	6,000
Other Than Personal Services	0	0
Grand Total	6,000	6,000
Funds Available in Park Base	0	0
Funds Requested from Regional Office	6,000	6,000

11. DATE OF SUBMISSION: May 1980

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 and fire frequency in Joshua tree forests and other vegetational communities in the monument. It is likely that some wildlife species have been affected by fire suppression. By investigating the relationship between fire and flora communities, we can get a better understanding of wildlife habitat requirements.

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Sample plots of about 5 acres will be prescribe burned on an experimental basis to evaluate effects, behavier, and techniques, unburned plots will be used for comparison.

A fire management plan will be prepared based on information of the role of fire in the monument. A management objective is to determine where natural fire zones can be established and the prescribed conditions for these fires. Prescribed fire will likely be part of the plan.

6. LENGTH OF TIME NEEDED: 2 years

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 reconnaisance 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 ¼ 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: 3 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 1984. 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, Quail Mountain, and Coxcomb.

Funding	Year in Program Sequence			
	1st	2nd	3rd	4th
Personal Services	0	6,000	4,000	4,100
Other Than Personal Services	0	34,000	16,000	16,000
Grand Total	0	40,000	20,000	20,100
Funds Available in Park Base	0	0	0	0
Funds Requested from Regional Office	0	40,000	20,000	20,100

11. REFERENCES AND CONTACTS: Unit leader, UNLV

12. DATE OF SUBMISSION: May 1980

NATURAL RESOURCES PROJECT STATEMENT

1. PARK AND REGION: Joshua Tree National Monument, WRO

2. PROJECT NAME AND NUMBER: Wildlife Guzzlers, JOTR-RM-1

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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 reconnaisance has been conducted which verifies the need for additional sources and recommends locations. Previous recommendations suggested the need for nine additional guzzlers.

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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.

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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. For the last two summers (1978, 1979), and again this summer (1980), Y.C.C. crews have been removing mesquite. By the end of summer 1980, approximately 75 per cent of the removal should be complete.

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.

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

11. DATE OF SUBMISSION: May 1980

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

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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.

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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.

NATURAL RESOURCES PROJECT STATUS SHEET

Joshua Tree National Monument

Revised: May 1980

Ref. No.	Page #	Project Title	Year Started	Year Completed	Comments
RM-1	42	Wildlife Guzzlers	1975		Continuing
RM-2	44	Bighorn Management	1974		Continuing
RM-4	46	Maintenance, Wildlife Guzzlers	1974		Continuing
N-1a	50	Bighorn Ecology	1974	1979	Contract through Cooperative Unit, UNLV
N-3	48	Fan Palm Oases Study	1974	1977	Contract through Cooperative Unit, UNLV
N-8	56	Natural History Inventory	1974	1977	Contract through Cooperative Unit, UNLV
N-9	81	Survey & Evaluation of Endemic Plants	1974	1977	Contract through Cooperative Unit, UNLV
N-10	58	Ecology of Joshua Trees	1974	1977	Contract through Cooperative Unit, UNLV

APPENDIX

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Bibliography I. Reports from completed "Natural Resource Projects (NRMP, 1974) 23

Bibliography II. Recent research of resource management significance (organized by ecological components, i.e. geological substrate, climatic parameters and associated phenomena, producer organisms, primary consumers, secondary and tertiary consumers, man - highest level consumer, decomposers and fire ecology 24

APPENDIX

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Bibliography II

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