

# **NATURAL RESOURCES MANAGEMENT PLAN**

## **CARLSBAD CAVERNS NATIONAL PARK**

**Division of Natural Sciences  
Southwest Region  
National Park Service  
Department of Interior**





NATURAL RESOURCES MANAGEMENT PLAN

FOR

CARLSBAD CAVERNS NATIONAL PARK

NEW MEXICO

OCTOBER


1974

Prepared by: Carlsbad Caverns National Park Staff and Southwest Region  
Office of Natural Sciences

Reviewed by: Southwest Region Offices of History, Archeology, Planning,  
Maintenance, Interpretation and Resources Management

Approved by:   
Acting Regional Director, Southwest Region

10-8-74  
Date



Digitized by the Internet Archive  
in 2012 with funding from  
LYRASIS Members and Sloan Foundation

<http://archive.org/details/naturalcarlsbad00nati>



FIG. 1. CHRISTMAS TREE FORMATION IN NEW CAVE. CACA Photo.





## NATURAL RESOURCES MANAGEMENT PLAN

A Natural Resources Management Plan is a strategic planning document and a key factor in good management and preservation of the monument's resource.

This plan is a set of project statements which include proposed actions for implementation as well as 5-year programming sheets for maintenance and research actions. Other sections of the plan serve as an introduction and a set of parameters. Project statements are determined on the basis of approved Management Objectives and Land Classification, Management Constraints and Completed Research serve as guidelines for projects. The Plan serves the Superintendent in two ways: 1) as a manual for maintenance activities that will preserve the environment or achieve an environmental status quo to comply with Park Service Standards, and 2) a set of research projects and priorities that are designed to obtain additional information for management and interpretation.





## TABLE OF CONTENTS

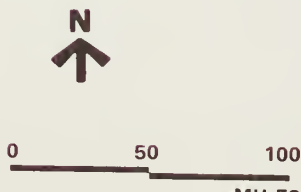
- I. MANAGEMENT OBJECTIVES
  - II. LAND CLASSIFICATION
  - III. ANNOTATED MANAGEMENT CONSTRAINTS
  - IV. NATURAL RESOURCES MANAGEMENT PROGRAM
  - V. PROGRAMMING SHEETS AND RESEARCH PRIORITIES
    - MAINTENANCE
    - RESEARCH
  - VI. APPENDICES
    - A. Constraint Documents
    - B. Completed Research
    - C. Collections
    - D. Specific Management Plans
    - E. Annual Review, Changes and Dates
- OVERVIEW



C O L O R A D O



VICINITY





## I. MANAGEMENT OBJECTIVES

### STATEMENT FOR MANAGEMENT AND PLANNING

#### Purpose of the Park

Carlsbad Caverns National Park was created in 1930 to preserve a cave system which is now internationally renown for its beauty and tremendous size. The area was designated as a public park "for the benefit and enjoyment of the people."

#### Management Category

Natural Area

#### Basic Data Highlights

##### Background Information:

Carlsbad Caverns first became a national monument by Presidential proclamation in 1923. National Park status for the 719.22 acre (291 ha) tract was achieved May 14, 1930 (46 Stat. 279). The 1930 Act authorized enlargement of the park, within specified lands, by proclamation of the President and specified administration under the provision of the National Park Service establishment Act of August 25, 1916.

The park boundaries were adjusted in 1933 (47 Stat. 2556) and 9,240 acres (3740 ha) added to include the remaining known area of Carlsbad Caverns and some adjacent lands. Another adjustment in 1939 (53 Stat. 2523) added 39,488 acres (1600 ha) for the primary purpose of cave protection including New Cave and Painted Grotto in Slaughter Canyon.

Public Law 88-249 of December 30, 1963 (77 Stat. 818) provided that the Rattlesnake Springs tract, used as a water supply for the park, be included within the park as a detached section. Peripheral lands were added and others eliminated and Section 4 of the 1930 Act which allowed boundary changes by proclamation was repealed. Section 3 of the 1963 Act authorized the Secretary to grant the State of New Mexico a right-of-way to construct a second road between the Caverns and US Highway 62-180 in the vicinity of Whites City. The section further provides for the road to be built to National Park Standards upon a mutually agreed location and upon completion to be reconveyed to the United States without cost. No proposal has been made by the State of New Mexico for the construction of this road to date.

Under rules printed in the Code of Federal Regulations, Title 36, Chapter I, hunting, grazing, logging, prospecting, mining and other forms of trespass are prohibited in park areas. Special regulations for Carlsbad





Caverns National Park in the same chapter prohibit entering any cave or undeveloped part or passageway of any cave without a written permit from the Superintendent and also preclude solo exploration or investigation.

### Objectives

Carlsbad Caverns National Park is categorized as a National Park Service "Natural Area."

To achieve the purposes for which various areas of this park were added to the National Park System, planning for the management and development of the park will be guided by the following National Park Service objectives.

#### To Preserve the Resources

The caves of Carlsbad Caverns National Park will be managed to assure the perpetuation of a natural cave environment for future generations. No development or use will be allowed which will destroy or seriously impair the biological and geological processes normal to the cave system. Subject to this constraint, the Service will offer to the public the greatest possible variety of cave experiences.

The surface resources of the park should be considered supplemental and complementary to the subterranean resources which are or may be present. In keeping with the intent of Congress, any use or development which could have a deleterious effect on subsurface resources through an alteration of drainage patterns or surface percolation must be prohibited.

The open, arid landscape is particularly susceptible to visual intrusions, and is easily scarred and slow to heal. This condition requires that the greatest care be taken in placing structures and in avoiding disturbances of the plant cover.

The last remaining inholding should be acquired so that it may be managed and protected in a manner consistent with the adjoining park lands.

Trespass livestock will be excluded from the park, because they are non-native animals.

The extent of cave resources will be determined as fully as possible to ensure their protection and highest use.

Some caves or portions of caves will be established as research natural areas so that they may receive a high degree of protection and be saved for various orders of scientific study. Selected caves will be monitored and used as standards for comparison with developed caves.



The decrease in the bat population is of grave concern. Not only is this a tragic loss of major park resources, but it may also have serious ecological significance for the region. The cause of this die-off must be determined and followed by broad corrective action.

Mule deer populations vary with climatic conditions that limit available water and food supply. Close cooperation on wildlife matters will continue with State game and fish departments, whose sale of hunting licenses helps to control migratory animals moving outside of park confines. The restoration of species extirpated from National Park Service areas is a recurring program. The exchange of wildlife between the states and the National Park Service is also a continuing program.

### To Serve the Visitor

Because of Carlsbad Caverns' exceptional fame as a superlative natural feature, no substitute cave trip can satisfy the firsttime visitor. Therefore, in order to achieve its greatest longterm human benefits, without excessive impairment of the cave or of the visitor experience, it is an objective of the Service to improve the quality of the cave experience, while extending the opportunity to serve more visitors.

In this period of escalating concern with the quality of the environment and man's survival, the scope of interpretation will be enlarged to provide visitors with ecological insights. The simple and limited ecosystems of caves are especially suited to help explain the much more complex systems of the surface. The increase in cave swallows is a dramatic example of our changing environment. An expanded ecological awareness could well be the major benefit of a park visit.

Visitors should be assured of satisfactory accommodations, such as motels, restaurants, and overnight camping, all within a convenient distance, so that they may enjoy the park without excessive anxiety about the necessities of shelter and subsistence. Providing for essential visitor needs, by some means, is an important consideration in reaching a desirable level of benefit from park resources.

The benefits that can be derived from back-country use in this park require careful consideration. The roadless area, with its caves, rugged canyons, world-renowned exposures exhibiting Permian stratigraphy and paleo-environments, and ecological relationships of the Chihuahuan desert, comprises a major value to conserve for those seeking a desert experience or wishing relief from the effects of civilization, particularly in the future.

In order to make park visits more gratifying, the National Park Service will cooperate with other agencies and individuals to broaden the visitor's experience through use and appreciation of off-park resources and facilities such as roads, trails, educational exhibits, restaurants, motels, and campgrounds.





To Administer the Park

Carlsbad Caverns National Park will be managed for year-round use and enjoyment of the people.

Carlsbad Caverns and Guadalupe Mountains National Parks will be managed jointly by a superintendent and his staff.

Access and egress from the park must be improved, in order to eliminate the traffic congestion now suffered by summer visitors, and to prevent the occasional isolation resulting from flood damage to the road.



# Carlsbad Caverns

primary visitor use focus

## CAVE INTERPRETATION

- CAVE TOUR FACILITIES & ACTIVITIES
- VISITOR CENTER

## CONCESSION SERVICES

- FOOD SERVICE FACILITIES
- CURIO SHOP
- OPERATIONS
- OFFICES
- MAINTENANCE FACILITIES
- HOUSING

## Back Country

scientific study &  
dispersed use area

## CAVE PRESERVATION

- PROTECTION DEVICES
- RECREATION
- TRAIL SYSTEM

## Slaughter Canyon - New Cave

secondary visitor use focus

## SUPPLEMENTAL CAVE INTERPRETATION

## GENERATION OF BACK-COUNTRY USE

- CAVE TOUR FACILITIES & ACTIVITIES
- ORIGIN OF BACK COUNTRY TRAIL SYSTEM
- CONTACT STATION
- PARKING
- INTERPRETIVE DEVICES

To  
City of  
Carlsbad  
(Headquarters)

## Whites City

ACCOMMODATIONS  
FOOD SERVICE

## Rattlesnake Canyon

TRAIL HEAD PARKING

## Rattlesnake Springs

PARK WATER SUPPLY FACILITIES  
PICNIC AREA

## Double Canyon

TRAIL HEAD PARKING



0 1 2 3  
MILES

130 20,005  
FEB. 73 DSC

# GENERAL DEVELOPMENT

PROP. ONE-WAY

NATURE ROAD

MOTOR

EXIST. ACCESS ROAD

PROPOSED ROAD TO FORM ONE-WAY SYSTEM

PRIMITIVE CAMPGROUND

PROPOSED ACCESS ROADS

U.S. 62-180

To  
El Paso

TRAIL HEAD PARKING

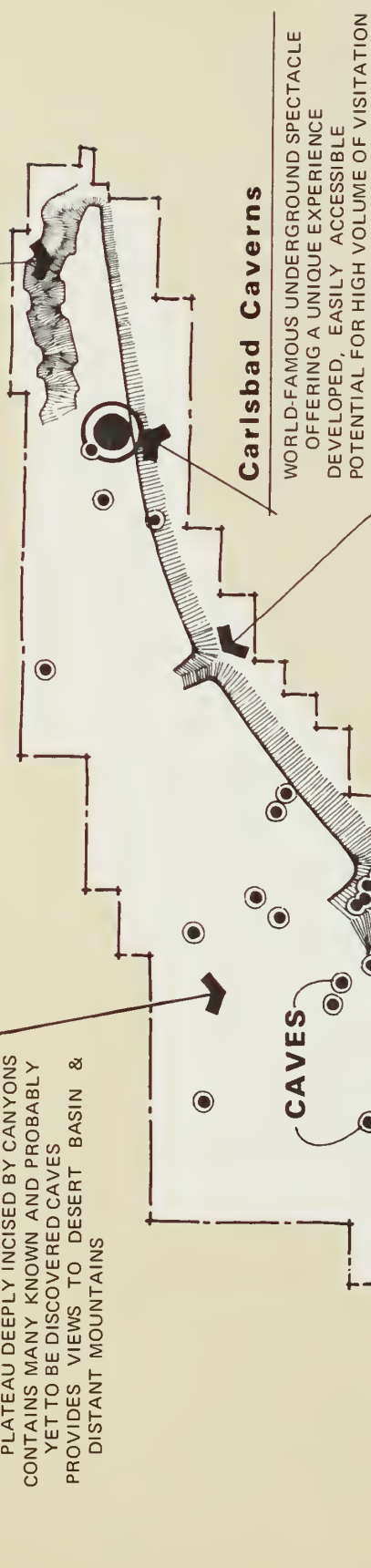


# Walnut Canyon

ACCESS ROUTE TO THE CAVERNS  
WINDING ALIGNMENT TRAVERSES  
INTERESTING RUGGED DESERT SCENERY  
SUBJECT TO FLASH FLOODS

# Back Country

DRY, RUGGED UNDEVELOPED DESERT  
PLATEAU DEEPLY INCISED BY CANYONS  
CONTAINS MANY KNOWN AND PROBABLY  
YET TO BE DISCOVERED CAVES  
PROVIDES VIEWS TO DESERT BASIN &  
DISTANT MOUNTAINS



# Carlsbad Caverns

WORLD-FAMOUS UNDERGROUND SPECTACLE  
OFFERING A UNIQUE EXPERIENCE  
DEVELOPED, EASILY ACCESSIBLE  
POTENTIAL FOR HIGH VOLUME OF VISITATION

# Rattlesnake Canyon

OPENING IN THE ESCARPMENT  
DISPLAYS AN IMPORTANT GEOLOGICAL  
EXPOSURE

# Rattlesnake Springs

PERMANENT WATER SOURCE  
CONCENTRATION OF EXOTIC TREES  
LARGE BIRD POPULATION

# Slaughter Canyon

A RAGGED OPENING IN THE ESCARPMENT  
LEADING TO THE HEART OF THE  
BACK COUNTRY  
CONTAINS A MAJOR CONCENTRATION OF  
CAVES, INCLUDING SOME OF  
INTERPRETIVE VALUE

# New Cave

A LARGE COLORFUL UNDEVELOPED CAVE  
WITH MANY MASSIVE FORMATIONS  
ACCESS MODERATELY DIFFICULT

# Escarpment

EXPOSURE OF ONE OF THE WORLD'S LARGEST  
& BEST EXPOSED LIMESTONE BARRIER  
REEFS  
DOMINANT VISUAL FEATURE

# Double Canyon

OPENING IN THE ESCARPMENT EXTENDING  
INTO LINCOLN NATIONAL FOREST



# THE RESOURCE





## II. LAND CLASSIFICATION







# LAND CLASSIFICATION



### III. ANNOTATED MANAGEMENT CONSTRAINTS

- A. Cooperative Agreement with U. S. Soil Conservation Service dated August 28, 1964. See copy in Appendix A.
- B. Cooperative Agreement between the National Park Service and the New Mexico Department of Game and Fish, dated May 23, 1972. See copy in Appendix A.
- C. Secretary of Interior's Authority to convey a right-of-way for a road between the western boundary of the SE $\frac{1}{4}$  Sec. 24, T. 24 S., R. 25 E. and the vicinity of the caverns. This authority and its restrictions are contained in PL 88-249: 77 Stat. 819. See copy of Public Law 88-249 in Appendix A.
- D. Constraints contained in the Wilderness Act will be effective over all lands that may be included in wilderness. See map of Proposed Wilderness Area.
- E. Water rights perfected by the United States (for Carlsbad Caverns National Park). A total right to 1/2 second foot of water from Rattlesnake Springs. Opinion rendered June 14, 1960 by U. S. District Judge Waldo H. Rogers, also Decree and Amendment dated June 27, 1960 in Civil (cause) No. 4194: "U. S. v. H. F. Ballard et al.," in the U. S. District Court for the District of New Mexico. See Appendix A for proration of use set forth under this opinion and decree.
- F. Certain rights-of-way for water-lines to convey water from Rattlesnake Springs to the property of holder who shares valid water rights from this source with the National Park Service. These are documented and contained under Special Use Permits as follows:

3:130-0006 J. W. Miller, Washington Ranch

3:130-0010 Washington Ranch.



#### IV. NATURAL RESOURCES MANAGEMENT PROGRAM

For the purpose of clarity, all of the projects discussed will be separated into Natural, Archeological and Historical Resources. Actions included in the project discussions will be divided into four types and be discussed within these categories in the Environmental Impact Assessment. The four types of actions are:

- I. Those actions whose implementation will have a significant and measurable effect on the environment.
- II. Those actions which will continue existing maintenance.
- III. Those actions which will initiate new maintenance.
- IV. Those actions which entail research.

Action types are included for each action statement; e.g., Significant Action, Continue Maintenance, New Maintenance and Research.

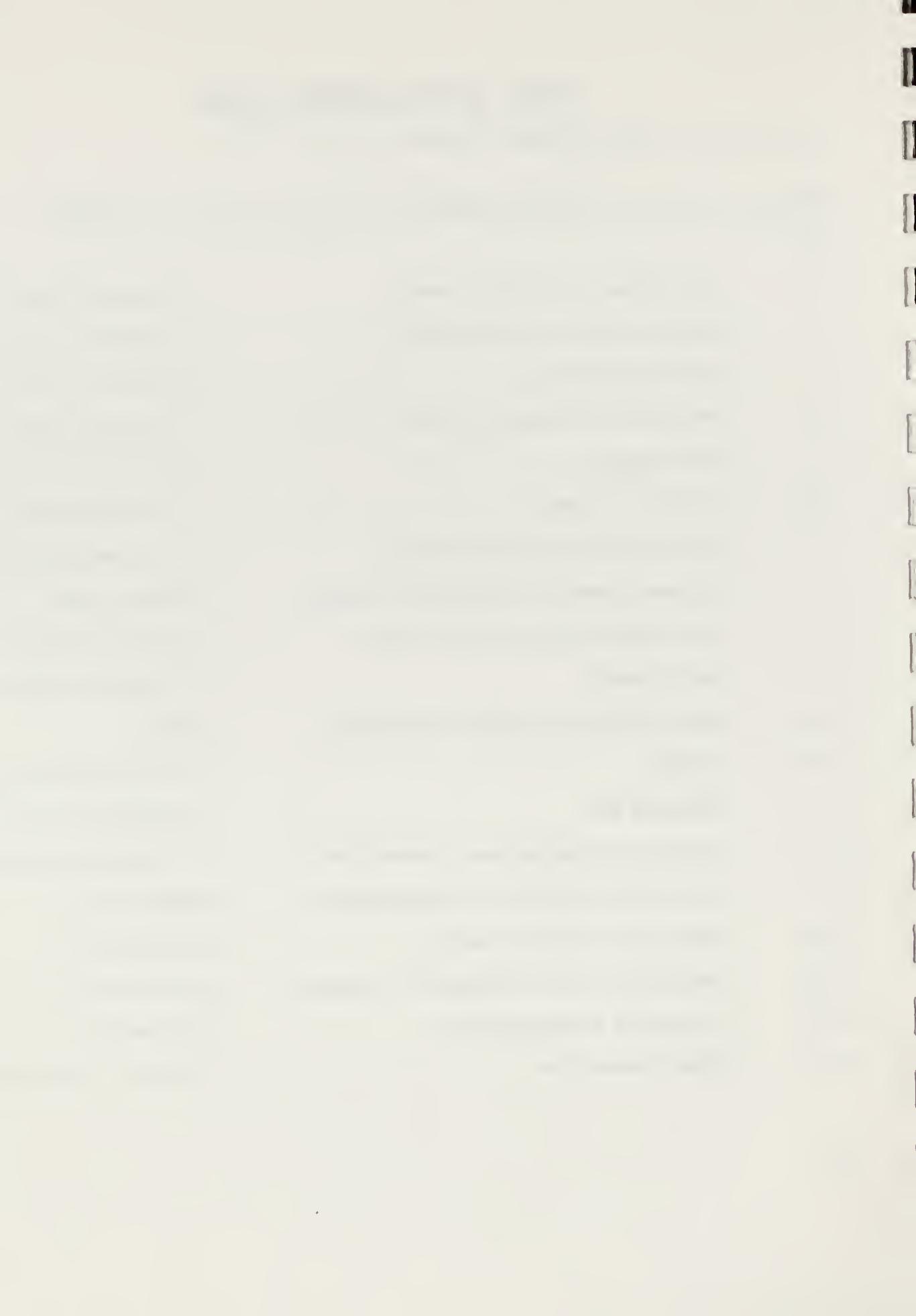


NATURAL RESOURCE MANAGEMENT PROGRAM

Current Natural Science RSP-WRP Program

<u>Number</u>	<u>Project Title</u>	<u>Status</u>
<u>RSP</u>		
N-1	Climatology in Carlsbad Caverns	In Progress since 1969
N-2	Studies of Cave Invertebrates	In Progress since 1969
N-3	Deer Range Ecology	In Progress since 1967
N-4	Dry Season Food Habits of Deer	In Progress since 1967
N-5	Cave Mapping	In Progress since 1968
N-6a	Locations of Caves	In Progress since 1968
N-7	Subsurface Seismological Studies	In Progress since 1968
N-8	Paleoenvironments of Carbonate Deposits	Completed 1969
N-9	Rock Stress Studies in the Caverns	In Progress since 1969
N-10	Deer Movement	In Progress since 1969
N-11	Natural Ecological Surface Conditions	Revised
N-11a	Wildfire	In Progress since 1969
N-12	Ecosystem Map	In Progress since 1969
N-13	Population Dynamics, Mex. Freetail Bat	In Progress since 1969
N-14	Factors Effecting Relict Plant Species	Approved only
N-15	Energy Flow in Cave Community	Approved only
N-15a	Energy Flow in Cave Community - Consumers	Approved only
N-16	Bat Musk as a Homing Factor	Approved only
N-17	Walnut Caterpillar	Completed, June 1971

WRP





## 1. Project: Completion of Natural Resource Basic Inventory

Additional basic natural resource data are needed for formulation of sound management planning and decisions, to fulfill interpretive needs, and to comply with Natural Science Studies Activity Standards.

### Action (Research)

Initiate research projects to complete the park's natural resource inventory, and prepare an area ecosystem map, as per CACA-N-12. Begin map with data presently available and add natural science data as it becomes available.

### Research

Several studies are needed to provide the park with a basic natural resources inventory. They are:

- A. Inventory all vascular plants and all significant nonvascular plants denoting those species that are considered rare and/or endangered or of unusual size or of visitor and scientific interest.
- B. Prepare a list of known fungi and bacteria in the park area.
- C. Inventory the invertebrate fauna denoting those species that are considered rare and/or endangered or of significant visitor or scientific interest.
- D. Inventory all of the hydrological features; e.g., streambeds, groundwater, and other water resources.

### Alternatives

- A. Do nothing. Lack of knowledge in any of the listed areas will preclude the formulation of ecologically sound management planning and decision making.
- B. Contract studies on an emergency basis only as required, by immediate necessities such as construction or environmental disasters.
- C. Engage in cooperative agreements with organizations such as universities and the Cave Research Foundation to aid in basic data accumulation.

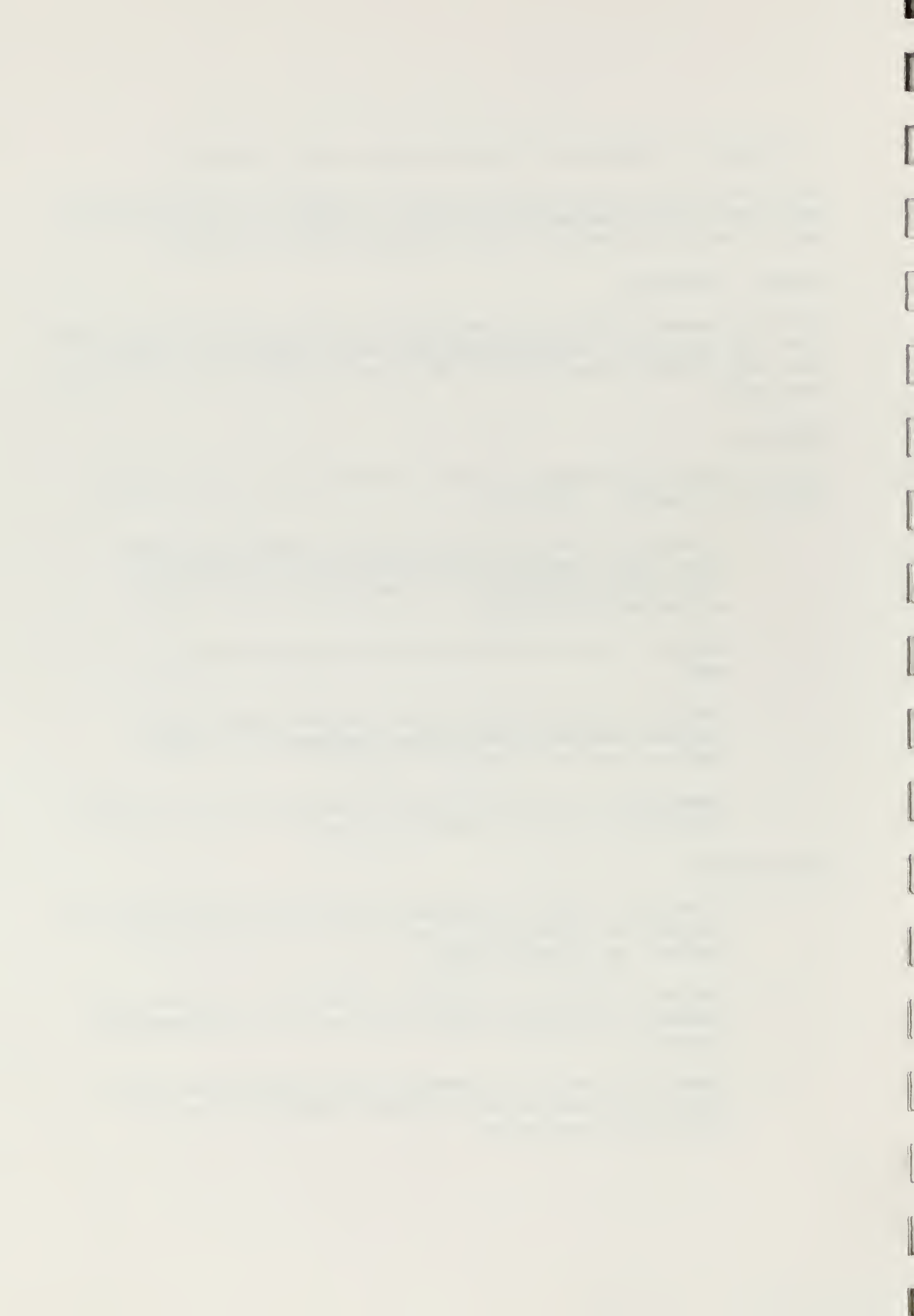




FIG. 2. SLAUGHTER CANYON WHERE TRAILS LEAD INTO BACK COUNTRY. CACA Photo.





## 2. Project: Cave Inventory, Protection and Use.

The caves of Carlsbad Caverns National Park are the primary reason for the Park's establishment and development. There presently is only a sketchy idea of the extent of this resource, and many basic data are needed to provide safety to the public and preservation of the unique underground ecosystems with varying levels and types of use. Research Natural Areas will be designated when needed.

### Action (Research)

Continue on-going program of locating and assessing noteworthy scenic and scientific values, inherent hazards to the public, and gathering base-line ecosystem data on all caves within the park. This is an area-wide project in cooperation with the U. S. Forest Service, Bureau of Land Management and personnel of the U. S. Geological Survey's Albuquerque Office, Water Resources Division. It will provide for the sharing of mutually useful data on cave resources throughout this geographic region. A copy of the Cave Management and Cave Classification System being used by the cooperating agencies is included in Appendix G.

Where caves are found to contain significant hazards to human life or health, or where they contain scientifically significant geologic, biologic or ecological resources, such caves will be gated and kept locked.

Utilize a cave outside the heavily impacted area surrounding Carlsbad Caverns to provide a site for "primitive lantern tours" as an additional type of cave experience. New Cave, in Slaughter Canyon provides excellent opportunities to provide such an experience for the hardier visitor with a minimum of development and alteration of existing conditions within a cave containing resources not interpretable in Carlsbad Caverns proper.

These cave resources will be examined for potential for meeting four of the current Management Objectives for Carlsbad Caverns:

- A. "....to assure the maintenance of ecological factors necessary to the perpetuation of a natural cave environment for future generations."
- B. "The extent of cave resources will be determined as fully as possible to assure their protection and highest use."
- C. "Some caves or portions of caves will be established as research natural areas...and be saved for various scientific studies...and used as standards for comparison with developed caves."





- D. "The Service will offer to the public the greatest possible variety of cave experiences" so long as such use will not destroy or seriously impair the biological and geological processes normal to the cave system.

### Research

CACA-N-6a is directed towards attaining a total inventory of all caves of the park, through a variety of means including gravity surveys, far infrared aerial scan, helicopter or other aerial reconnaissance, and ground reconnaissance.

CACA-N-5 is directed towards obtaining complete maps of each cave in the park through accurate three-dimensional surveys. This project is being pursued by the Cave Research Foundation with cooperation of Service employees.

CACA-N-7, Microearthquake Study in Carlsbad Caverns, and CACA-N-9, Rock Stress Studies are directed towards determining the amount of motion in rock exposed within the Caverns resulting from external and internal causes. CACA-N-9 has been underway since 1970 under U. S. G. S. employee John McLean of the Albuquerque Office, with continuous monitoring by staff Cave Research Technician Charles Peterson. Much information on rock motion has been gathered from installation of strain gauges in a pair of intersecting joints meeting at approximate right angles, located in the Grape Arbor near the Underground Lunchroom. To provide the maximum of usable information, CACA-N-7 should run for at least a year concurrently with CACA-N-9, so as to be able to identify microseismic events of local origin and then, determine quantitatively the resultant rock movement and calculate any residual or unrelieved stress buildup in the cave rock. It is hoped that CACA-N-7 can be commenced in the near future. Research Geophysicist Richard T. Zbur of the Air Force Weapons Laboratory is expected to be the chief investigator in this project.

### Alternatives

- A. Stop the current on-going studies and fail to undertake the proposed studies. In both instances, the result would be that management of the resources would suffer from lack of basic information required for ecologically sound management practice.

If no outstanding caves are soon recognized for their potential value as "standards of comparison" for developed cave ecological change through use, we run the risk of so altering all known caves to the point that none can serve this purpose adequately.



- B. The alternative to gating those caves which present substantial hazards to human life, or to noteworthy natural resources of outstanding scenic or scientific value, would be to leave them vulnerable to unauthorized entry, destruction of resource, and potential tort claims resulting from injury sustained. Future expansion of cave use by the public would be diminished in both quality and quantity.

If access to additional caves is to be curtailed, the public will be denied a variety of cave experiences which cannot be provided within the limits of Carlsbad Caverns proper. New Cave offers an opportunity to interpret subjects lacking or inaccessible in Carlsbad Caverns such as the history and methods of guano mining, prehistoric human use of cave resources, and paleontological details demonstrating extinction of certain mammalian species including some bat species.







FIG. 3. VISITORS ON THE TRAIL TO NEW CAVE. CACA Photo.





### 3. Project: The Microclimate in Carlsbad Caverns

Any appreciable development and public use of a cave will inevitably result in significant alteration of the natural cave climate and ecosystems within the developed use areas.

This has occurred in Carlsbad Caverns with loss of standing water, drying of speleothems, and lower relative humidity being the most apparent alterations affecting the beauty of the cave and the quality of the visitor experience.

#### Action (Research)

First priority was given to completion of the project of effectively sealing off the elevator shafts to prevent further wintertime loss of moist cave air.

It will then be necessary to establish an artificial but acceptable inter-relationship between temperature and relative humidity which can be maintained indefinitely so as to restore and perpetuate the most natural appearance and greatest scenic beauty possible under heavy visitor use.

#### Research

CACA-N-1a conducted by U. S. Geological Survey personnel out of the Albuquerque office, Water Resources Division has accomplished the analysis of the existing microclimate within the cave, and has pin-pointed the major human-use and development factors responsible for recent environmental degradation of the cave environment.

One phase of this study is yet to be accomplished, and that is to determine the extent of stratigraphic variation in temperature in the Big Room. All parameters studied in the course of the main investigation will be continually monitored on a reduced frequency basis so that no avoidable degradation of cave habitat will occur in the future.

#### Alternatives

- A. No Action. This would see the continued degradation of cave resources and decline in the quality of visitor experience, both of which occur at an accelerating pace.
- B. Close the cave to all human use and make an attempt to remove all evidence of past development and public use. This would leave Carlsbad Caverns National Park with little purpose within the national park system, and, at best, the restoration effort could not approach the conditions that existed prior to the park's establishment.



- C. Close and seal the elevators to prevent the loss of moisture laden air from the cave. This would require the visitor to climb the 800 + feet (250 m) back out the natural entrance. This would preclude some segment of the visitor population due to the physical limits of elderly or other infirmed persons.



FIG. 4. REVOLVING DOORS BETWEEN UNDERGROUND LUNCHROOM AND ELEVATOR LOBBY  
RETAIN WARM, HUMID CAVE AIR. CACA Photo.







#### 4. Project: Vegetative Cover and Effects of Grazing

Pre-establishment use of park lands for intensive livestock grazing has unquestionably altered surface ecosystems; the continuing trespass of domestic (non-native) stock has slowed the recovery of the area because of the "unnatural" pressure upon the vegetative resources.

##### Action (Research)

The park boundary must be adequately fenced to halt competition by trespass domestic stock before restoration of natural habitat can be effected. Fencing of boundary is covered by a two-phase construction program scheduled for initiation in FY 1974.

Initiate necessary research to "establish and if possible recreate those ecological conditions that prevailed before the advent of Post-Columbian culture and activities of Man," and to meet the Activity Standards for Natural Science Studies when possible.

##### Research

Floristic mapping by composition and dominance has been completed, and a soils map was prepared under a cooperative agreement with the U. S. Soil Conservation Service. A continuing study should determine appropriate vegetative productivity, succession, biomass, water and nutrient needs, and other ecological parameters; establish benchmarks for a monitoring system that would provide a warning system of future vegetative changes, and continue the study of analysis of feral animals upon the Carlsbad Caverns National Park environment.

Research of fire (CACA-N-11a) as a management tool is included as project number 7, and is directly related to vegetative cover.

##### Alternatives

The sole alternative to appropriate exclusion of trespass livestock is failure to build the suggested boundary fence. This non-action would preclude the solution of the primary problem. No action on the research studies required would further prevent attainment of Activity Standards for Natural Resource Management and Natural Science Studies, and would be inconsonant with service policies for the Administration and Management of Natural areas.



## 5. Project: Basic Climatological Data

Basic natural resources data are needed for formulation of sound management planning and decisions, to fulfill interpretive needs, and to comply with Natural Science Studies Activity Standards.

### Action (Research)

Initiate research to develop long-term chronology of climate and continue to maintain climatological records within the park.

### Research

Total analysis of the Carlsbad Caverns National Park climatological basic data should include, 1) climatological patterns of temperature and precipitation, 2) seasonal ranges, and 3) short and long-term trends and cycles. The latter phase will require tree-ring analysis and chronological data that may primarily be derived from research within the Guadalupe Mountains. This study is a prerequisite to Project 11, Ecosystem Analysis, and should complement Project 7.

### Alternative

No action will limit sound judgment in the overall planning and management potential for the total park.



## 6. Project: Water Resources Analysis

A thorough analysis of the water resources for each development site is necessary prior to sound management and decision making and to comply with requirements of the basic natural resource needs for a Basic Ecosystem Survey.

### Action (Continue Maintenance)

Monitor groundwater levels and spring flow at strategic locations, As an important interpretive theme, illustrate the importance of water in an arid land. Evaluate threats of potential water deficiencies, pollution of water, etc.

### Research

None needed.

### Alternatives

- A. No action. This alternative is unacceptable since Natural Science activity standards require these studies.
- B. Monitor water resources on the basis of need. This alternative would severely limit planning for present and future visitor use.





FIG. 5. ACTIVE STALACTITES IN PAINTED GROTTO. CACA Photo.





## 7. Project: Use of Fire as a Management Tool

There are 46,000 acres of grassland and woodland in the Park susceptible to range and/or forest fire. Occurrence of a large fire is not likely unless under impetus of a strong wind. However, all of the Park boundary is contiguous with private and Forest Service lands, and fire control is usually an obligation. Controlled burning may be a useful technique for range and forest management at Carlsbad Caverns, at least at certain times of the year. However, not enough is known yet to put any plan for controlled burning into effect.

### Action (Research)

Initiate research into the use of fire as a management tool for Carlsbad Caverns National Park.

A fire study should include the following:

#### For each ecosystem under consideration--

Complete literature search and coordination of all activities with other researchers.

Under what conditions of climate, slope, fuel, time of year, etc., do fires usually occur?

Are periodic fires a normal part of the ecosystem, i.e., are they required for the maintenance of the ecosystem or for a particular vegetative type within the ecosystem?

If so, what is the periodicity of such fires?

In a fire-adapted ecosystem, can there be too much fire?

What special adaptations are present in such an ecosystem?

What is the fire behavior--crown, surface, etc.--in the ecosystem?

Can wildfire smoke, heat, etc. damage neighboring plant communities?

If so, to what extent?

What are the relationships between natural fires and man-induced fires?

Are there benefits to fires programmed and prescribed by man?

If so, do the benefits outweigh the disadvantages?

What are the economics of fighting and of not fighting natural fires?



## 8. Project: Basic Data for Ungulate Management

This project, essentially an integral part of Project 4, is given separate statement due to the fact that deer are the greatest single factor affecting the maintenance of natural ecological conditions within the park. Hence many data regarding their proper relationship to other elements of the community must be determined and perhaps the population may require manipulation before a "balanced" ecosystem can be established.

### Action (Research)

Continue research. No manipulatory actions are planned in the immediate future.

### Research

Determine patterns of use of park lands and carrying capacities for the major habitat types within the park, and determine which browse species can be aided towards recovery to optimum condition within these major types. CACA-N-3a, Factors Limiting Ungulate Populations," should be continued at a monitoring level with emphasis upon learning more of deer nutrition in relation to forage available. CACA-N-10, Deer Movement Study, has been approved but prohibition now in force against use of tranquilizing drugs has held this important project in abeyance. It should be undertaken in cooperation with the State Department of Fish and Game and adjoining Federal land-administering agencies at the earliest possible moment.

### Alternatives

Since all proposed action is in the conduct of research studies already approved, the only alternative is no research.





FIG. 6. MULE DEER GRAZING IN CHARACTERISTIC CHIHUAHUAN DESERT OF PARK. New Mexico Department of Game and Fish Photo.





## 9. Project: Factors Affecting Relict Plant Species

Carlsbad Caverns National Park is located on the northern edge of the Chihuahuan Desert, and there is strong indication that the characteristic desert biomes are advancing at the expense of the more mesic formations as weather conditions throughout the area continue a climatic trend towards drier and warmer conditions. It is extremely difficult to isolate and assess how much of the ecological change is due to abuse attributable to modern man, yet this must be accomplished in order to take such remedial action as may be possible to improve the biotic potential of identified relic species.

### Action (Research)

Initiate research.

### Research

This problem is closely related to Projects 4 and 5 and CACA-N-14. In most instances it will be necessary to conduct studies of individual species in localities where they thrive at present, then to determine those obligatory relationships and influences absent or insufficient within the Carlsbad Caverns habitats. Relict species requiring in-depth studies include Arbutus texana, Ceanothus greggii, Quercus muhlenbergii, Juniperus deppeana, Pinus ponderosa, and possibly selected grasses such as bullmuhly (Muhlenbergia emersleyi) and sideoats grama (Bouteloua curtipendula).

### Alternatives

Without the studies and proposed actions, we risk loss of ecological values greater than the loss of the indicator plants upon which the suggested actions focus. For example, any of the subject species may well be involved in an obligatory relationship with other plants and/or invertebrate or vertebrate animal species which are truly endemic. In such a situation the ecologic loss could involve one or more gene pools lost from earth's diminishing resources.



## 10. Project: Faunal Factors

Considerable data must be obtained if the Park's wildlife is to be managed in the most effective method to conform with Service mandates and comply with Natural Science Studies Activity Standards. The area's Management Objectives adds emphasis to the program of restoration of extirpated wildlife, namely Montezuma Quail, Prairie Dog and Big Horn.

### Action (Research)

Initiate research to determine range suitability for wildlife restoration, and continue documentation of out-of-ordinary faunal sightings, and continue cooperative activities with State and Federal Wildlife Management agencies. It is likely that the opportunity for reestablishing prairie dogs may arise very soon with the presence of a colony nearby in an area soon to be impacted. The reestablishment area was inhabited by prairie dogs as recently as the 1940s.

### Research

A faunal study should include data gathering, analysis of distribution, abundance of animal species, population dynamics, migration, and immigration, and should be coordinated with faunal inventories included in Projects 1 and 8.

Special study will be required to determine range suitability for at least two extirpated animals; Montezuma Quail and Big Horn. This analysis must determine if reestablishment of these animals can be accomplished with expectation of success.

### Alternatives

- A. Continue documentation of special faunal sightings only.
- B. Do nothing, and ignore Management Objectives and Service mandates. No action will retain the status quo and lead to continued lack of knowledge for park planning.



## 11. Project: Poisonous Animal Control

Rattlesnakes are an important and interesting component of the natural ecosystems of the park, but can, on occasion, reach local population levels that pose some threat to human welfare. Since the poisonous species of snakes native to the area are predominately nocturnal in habit, only a minute percent of the population is ever encountered by the park's day-use visitation.

### Action (Continue Maintenance)

Whenever practical, rattlesnakes found within the areas of concentrated public use will be captured and released unharmed on National Park Service lands in areas of slight public use.

### Research

None required.

### Alternatives

Failure to remove any considerable number of rattlesnakes from heavily used areas could create an unnecessary hazard to the park visitor. The proposed action has been a standard operating procedure for 10 years or more and despite heavy travel and frequently large populations of rattlesnakes, not a single case of poisonous snake bite to resident or visitor has been recorded. As many as 20 poisonous snakes have been "relocated" in a single season from the area around the Caverns development.





## 12. Project: Population Dynamics of the Mexican Freetail Bat

Recurring massive mortality among the seasonally resident colony of Tadarida brasiliensis mexicana have ranged to possibly 100 percent of the young of the year in 1971 at Carlsbad Caverns. Other "die-offs" involving adults, perhaps more than juveniles, have occurred in the recent past. The history here roughly parallels that of many other populations of T. brasiliensis mexicana in the southwest. It seems likely that several of these populations have been reduced by 90 percent or greater over the past 15 to 20 years.

While this problem warrants, and should be, the focus of a major environmental concern for the entire nation, its complexities make it virtually impossible to attack at Carlsbad Caverns as an isolated phenomenon.

### Action (Research)

Initiate research, and provide strong support for this high priority study. CACA-N-13 has already been active as conditions of mortality within the caverns bat population have existed. This activity has been limited to monitoring the condition of the colony, gathering dead and moribund bats for analysis by the U. S. Bureau of Sport Fisheries and Wildlife laboratories in Denver. This level of action will continue with hope for a breakthrough in identifying the causative agents.

### Research

A massive frontal attack on the problem is necessary consisting of, but not limited to, the following:

- A. A banding program adequately funded to band a pre-determined percentage of the adult and young-of-the-year in each major maternity colony of T. b. mexicana in the American Southwest (Oklahoma, Texas, New Mexico, Arizona, and possibly Kansas and Arkansas) to be accomplished simultaneously.
- B. That every possible available diagnostic facility be alerted to the need to determine cause of death in any significant incident of mass mortality encountered during the term of this investigation. That large samples of moribund or fresh dead carcasses of adults and/or juvenile bats be prepared and deep frozen for distribution to suitable laboratories willing to apply their diagnostic capabilities in chemistry, epidemiology, or pathology towards identifying the cause(s)



of this severe threat to an exceptionally valuable economic asset to our ecological and agricultural well-being.

- C. That the U. S. Department of Agriculture and its network of county Agricultural Agents and perhaps the Environmental Protection Agency and others should be prepared to document the use of all pesticides in agricultural application, the pesticide and strength used, the location and acreage affected, and the dates of application.
- D. Because most of the great die-offs at Carlsbad Caverns have occurred coincident with the fall southerly migration of T. brasiliensis mexicana, it may prove especially informative to closely monitor the caves which are known to harbor the transient migrating populations during this period to obtain all dead and dying bats with particular emphasis on immediate preservation of any and all symptomatic bats bearing bands.
- E. Even without evidence of a die-off, a program of netting and release of bats at these "stop-over" caves can give much needed data on migration routes connecting or relating northern maternity caves (banding sites) with specific transient "stop-over" caves. Eventually this may serve to pin-point sources of exposure to specific pesticides or other causes of these mass mortalities that pose a real threat to the survival of the species.

### Alternatives

Assuming that man-caused alterations in the environment are a major factor in the alarming rate of population decline among colonial species of bats, it seems likely that the alternative to the broad-scale action proposed will be the extinction of some of the species. Further, it can be reasonably suggested that present low population levels of bats have had adverse ecological affects stemming from lack of natural controls on insects.





FIG. 7. SUNSET BAT FLIGHT AT MOUTH OF CARLSBAD CAVERNS. CACA Photo.





### 13. Project: Ecosystem Analysis

The lack of complete analysis of the park ecosystem, on the surface and within the caves, may limit planning and decision making. This study must be made to comply with Natural Science Studies Activity Standards. CACA-N-15 is addressed to energy flow in the cave communities.

#### Action (Research)

Initiate research.

#### Research

This all-inclusive study involves all phases of the area's natural resources and therefore is a final step in a comprehensive analysis. An ecosystem analysis involves the measurement of energy input and flow-through in an ecosystem, including the nutrient and mineral cycles of the ecosystem.

#### Alternatives

No feasible alternatives.



#### 14. Project: Air Pollution from Birds Nesting in Cave

The cave swallow (Petrochelidon fulva pallida) was considered a rare species in the United States as recently as 1962. These birds colonized the mouth of Carlsbad Caverns in 1966. Their accumulating droppings (guano) are now posing an untenable level of air pollution and possibly a hazard to public health.

Service personnel exposed for long periods in this environment occasionally are "overcome" by the nauseating odor from accumulated guano. This accumulation, in turn, is responsible for a large fly population which creates a second pest problem with great potential as a public health problem. The droppings coat both trails and vertical trail-retaining walls and result in an unsightly mess which is exceedingly difficult and expensive to remove; this constitutes a major and increasing maintenance chore.

#### Action (Continue Maintenance and Initiate Research)

Continue maintenance program of removing guano from walls and trails; necessary only during the summer season when birds are present. Encourage the residents to water lawns only at night and then only as much as is necessary. Prevent accumulation of water and associated mud which is utilized for nest building purposes. This may discourage the cave swallows from using the Carlsbad cave for nesting.

#### Research

In addition to the proposed action, the following information is deemed necessary to properly manage the swallow population:

- A. Determine the maximum level of continuing swallow population which can be allowed in the cave entrance which is consistent with normal visitor use.
- B. Consider means of encouraging greater use of other caves within the park as nesting sites. It seems quite likely that several of the seven cave sites within the park which have served as nesting sites are too far from permanent water sources to serve regularly as nesting sites, especially during abnormally dry periods to nest building times.
- C. Determine the total regional (park) population of the species and its present pattern of distribution in nesting sites. It seems assured that the present population nesting in the mouth of Carlsbad Caverns greatly exceeds the estimated total population in New Mexico as of 1962.
- D. Determine, in advance, that any management practice considered in solving the problem of excessive cave swallow population in the cave will not have any adverse effect on the continuing well-being of the bat colony.



### Alternatives

- A. No action. This would allow the problem to continue; the artificial lighting may continue to entice the breeding swallows farther into the cave and thus increase the problem.
- B. Return to the old system of guided tours. This method of interpretation is not feasible with the increasing visitor use of the caverns.







FIG. 8. CAVE SWALLOWS FOUND AT MOUTH OF CAVERNS. CACA Photo.



## 15. Project: Restoration of Disturbed Areas

An ecologically sound program is needed for restoring man-caused intrusions on the landscape to the native condition. Such intrusions include, but are not limited to abandoned roads and trails; scars left by burying utility lines; and scars resulting from the removal of structures.

### Action (Research)

#### Research

- A. Determine the best method for preparing the disturbed site for revegetation.
- B. Determine which species native to the disturbed habitat can be utilized in hastening the recovery time of the disturbed site. This will involve studies of seed germination and vegetative propagation.

### Alternatives:

- A. Introduce exotic species and run the risk of their escape.
- B. Do nothing. At best recovery would be a slow process. Wind or water erosion on the disturbed sites could aggravate the situation.







FIG. 9. CROSS AND FACE COVERING 30 SQUARE FEET PAINTED BY VANDALS ON CANYON WALL. (See exact center of page). CACA Photo.



V. PROGRAMMING SHEETS

For

MAINTENANCE

And

RESEARCH





MAINTENANCE  
ACTIVITIES AND 5-YEAR PROGRAMMING SHEET

Pkg. No.	Area Priority	RMP Ref. No.	Project Title	Year 1		Year 2		Year 3		Year 4		Year 5		Date Submitted 10-237 10-238
				NPS Cost/ M.Y. \$1000	NPS Cost/ M.Y. \$1000	NPS Cost/ M.Y. \$1000	NPS Cost/ M.Y. \$1000	NPS Cost/ M.Y. \$1000	NPS Cost/ M.Y. \$1000	NPS Cost/ M.Y. \$1000	NPS Cost/ M.Y. \$1000	NPS Cost/ M.Y. \$1000	NPS Cost/ M.Y. \$1000	
N6			Water Resources Analysis	.05	.1	.05	.1	.05	.1	.05	.15	.05	.15	.
N11			Poisonous Animal Control	.05	.1	.05	.1	.05	.1	.05	.15	.05	.15	
N14			Air Pollution from Bird Nesting in Cave	.1	1	.1	1	.1	1	.1	1.5	.1	1.5	



RESEARCH  
ACTIVITIES AND 5-YEAR PROGRAMMING SHEET

Pkg. No.	Area Priority	RMP Ref. No.	Project Title	Year 1		Year 2		Year 3		Year 4		Year 5	
				NPS Cost/ M.Y. \$1000	NPS Cost/ M.Y. \$1000	NPS Cost/ M.Y. \$1000	NPS Cost/ M.Y. \$1000	NPS Cost/ M.Y. \$1000	NPS Cost/ M.Y. \$1000	NPS Cost/ M.Y. \$1000	NPS Cost/ M.Y. \$1000	NPS Cost/ M.Y. \$1000	Date Submitted
129	1.	N12	Population Dynamics- Mex. Freetail Bat	20.0	15.0	15.0						2/73	10-237 10-238
	2.	N14	Air Pollution from Bird Nesting									9/73	
	3.	N7	Use of Fire as a Management Tool									11/73	
	4.	N2	Cave Inventory, Pro- tection and Use	.7	.7	.7	.8					11/73	
	5.	N8	Basic Data for Ungulate Management	.2	.2	.2	.3	.2	.3			11/73	
	6.	N1D	Inventory of Hydrologic Features									11/73	
	7.	N1A	Inventory of Vascular and Nonvascular Plants	.2	.2	.2	.1	.2	.1			11/73	
	8.	N5	Basic Climatological Data	.05	.05	.05	.06	.05	.06			11/73	
	9.	N6	Water Resources Analysis									11/73	
	10.	N1C	Inventory of Invertebrates									11/73	
	11.	N3	Microclimate in Caverns	.1	.1	.1	.1	.1	.1			11/73	
	12.	N4	Vegetative Cover and Effects of Grazing	.2	.2	.2	.2	.2	.2			11/73	



## RESEARCH

## ACTIVITIES AND 5-YEAR PROGRAMMING SHEET

Pkg. No.	Area Priority	RMP Ref. No.	Project Title	Year 1 NPS Cost/ M.Y. \$1000	Year 2 NPS Cost/ M.Y. \$1000	Year 3 NPS Cost/ M.Y. \$1000	Year 4 NPS Cost/ M.Y. \$1000	Year 5 NPS Cost/ M.Y. \$1000	Date Submitted 10-237 10-238
13.	N15		Restoration of Disturbed Areas	.5	.5	.5	.5		
14.	N9		Factors Effecting Relict Plant Species						11/73
15.	N1B		Preparation of List of Fungi and Bacteria						11/73
16.	N10		Faunal Factors						11/73
17.	N13		Ecosystem Analysis						11/73





## VI. APPENDICES

### APPENDIX A

#### CONSTRAINT DOCUMENTS

(Documents available at either the  
Regional Office or the National Park.)



## APPENDIX B

### COMPLETED RESEARCH

#### (1) CACA-N-1a Cave Climate Study

This is a 67 page preliminary report by John S. McLean, prepared by the U. S. Geological Survey for the National Park Service, and issued as an open-file report, May, 1971, under the title: The Microclimate in Carlsbad Caverns. The final report is expected early in 1974.

#### (2) CACA-N-8 Paleoenvironments of the Capitan Reef

An 88 page Thesis in Geology approved and accepted by the Graduate faculty of Texas Technological College in partial fulfillment of the Requirements for the Degree of Master of Science awarded to William George Hart, May, 1969. Title: Microfacies Analysis of the Permian Reef Complex (Guadalupian), Carlsbad Caverns, New Mexico.

46 identified slide-mounted thin-sections documenting this study are in the collections of Carlsbad Caverns National Park.

#### (3) CACA-N-17 Effect of Controlling Walnut Caterpillar

A 14 page Final Report, Titled as above, was submitted by the investigator, Research Biologist Walter H. Kittams, June 2, 1971. Report contains recommendations to management on the handling of Walnut caterpillar irruptions in the future.

#### (4) "Activity Patterns of the Mexican Free-tailed Bat" by Denny Constantine

A 79 page publication bearing the above title, issued as University of New Mexico Publications in Biology, Number 7, University of New Mexico Press, Albuquerque, 1967. Summarizes much data on causes of bat mortality, sex ratios in seasonally varying populations, statistics indicating span of parturition. Also provides comparative data for Carlsbad Caverns' bat population and several other major bat caves of the Southwest. Information derives from a ten-year period of study between 1955 and 1964.

#### (5) "Studies in the Excavation of Limestone Caves and the Deposition of Speleothems" by John V. Thrailkill, Princeton U., 1965.

A Doctoral dissertation of 193 pages covering work done by the author during two seasons of employment at Carlsbad Caverns in 1962 and 1963. A major contribution to knowledge of cave genesis.



- (6) "Analysis of Cave Waters from Carlsbad Caverns, New Mexico" by Paul S. Boyer.

A 58 page Senior Thesis for Bachelor of Arts in Geology, Princeton University, 1964. Field work done during summer of 1963 in assisting John V. Thrailkill with the analysis and interpretation of cave waters and their role in cave and speleothem development.

- (7) "Studies on the Helminth Parasites of the Mexican Free-tail Bat, *Tadarida brasiliensis mexicana* (Saussure)" by George D. Cain.

A 29 page (plus v and two plates) Masters Thesis submitted to the faculty of Purdue University, August 1964, covering work done at Carlsbad Caverns National Park during the summers of 1962 and 1963. Describes one (1) nematode species, one (1) cestode (being the first published report for this host), and four (4) species of trematodes of which one represents a new genus described herein, and another being a new species of a previously described genus.

- (8) "Life History of Cave Swallows" by James K. Baker

This study, financed under National Science Foundation Grant (G)10784, was pursued over a period of approximately three years. A typescript of Mr. Baker's award-winning paper on this study, presented to the 1963 Annual Meeting of the Cooper Ornithological Society, is in the park files, but we do not know of any final report submitted to the N.S.F.



SUMMARY OF RANGE CONDITIONS  
Inter-Agency Browse Analysis Survey  
Carlsbad Caverns National Park, 1972

This study was conducted in Carlsbad Caverns National Park to determine range conditions and trend. It was undertaken in cooperation with the New Mexico Department of Game and Fish, U.S. Forest Service; and the Bureau of Land Management with Biologist John Ross, U.S.F.S. coordinating the total Guadalupe surveys. All information was collected in accordance with procedures established in the "Inter-Agency Big Game Browse Analysis Survey", so that data could be pooled and compared by the various agencies concerned.

Browse condition and trend were determined through the establishment of permanent transects in key wildlife areas. Twenty-four transects were established on Carlsbad Caverns. Measurements were made on each transect to establish six ratings of range condition. The park ranges was divided into Lower and Upper sectors to recognize differences in vegetation. The Lower Range is mostly Desert Shrub and below 5,000 foot elevation; the Upper Range is mostly Mountain Shrub and above 5,000 foot elevation.

Lower Range

We established 11 transects on this sector. Browse Composition was mostly Low, meaning that preferred and staple browse species make up less than 50% of the composition. Browse Density was also Low; less than 10% of the ground area was covered by the crown (canopy) of browse plants. Browse Vigor was Low: more than 35% of the choice browse plants were heavily hedged. However, young plants are replacing older ones of key species at the lower elevations, and this denotes satisfactory conditions even though Vigor rating was Low. Browse Availability was High: 80% or more of the preferred and staple browse plants were within reach of deer.

Soil Stability on the Lower range, was also High: 65% or more of the ground was covered. Since over a long period, satisfactory range conditions can be maintained only on stable soils, and stable soils are maintained only under adequate vegetative cover, this condition class deserves credit. Understory was Medium: 65-90% of the ground was covered by plant material; 10-15% of this was cool season growers. Composition and relative density of the understory vegetation, especially as they relate to cool season growers, are important to big game animals.

Combined scorecard ratings indicate that the condition of Lower range averages Medium. Indicators of range trend, primarily from observations--age of plants, degree of hedging, relative use, and watershed status--point to a moderately upward trend.





### Upper Range

Thirteen permanent transects were established and most are located in the Mountain Shrub type. Browse Composition was Medium: choice and staple species making up 50% or more of the composition with choice species at least 15%. Browse Density was Medium: 11-20% of the ground area covered by browse plants. Browse Vigor was Low: 35% or more of the choice browse plants heavily hedged. However, established young plants were always adequate to replace decadent plants, making a satisfactory condition. Browse Availability and Soil Stability were High as on the Lower range. Understory was High: of the 90% plus understory, an excess of 20% was cool season growers.

Scorecard ratings indicate that condition of the Upper range is medium High. The four categories used for rating trend indicate upward trend on the Upper range.

### Summary Park-Wide

Scorecard ratings show Medium condition of the Lower range and Medium High for the Upper range. Standard observations show an upward trend for the range park-wide. We wish to reiterate that for the park range as a whole, few plants of preferred and staple species show damaging current use (which causes death), least desirable species are rarely used, cool season grasses and forbs are relatively abundant, and ground cover is improving. These observations further support the upward trend rating.

Some evidence remains of excessive use of the park range by livestock, even though it ended two decades ago. Recovery is slow in this region where climate is semi-arid and soils are very thin.

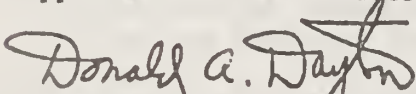
Prepared by:

Michael R. Glass, Park Technician

January 24, 1973

Roger E. Reisch, Resource Management Specialist

Approved for distribution:



Donald A. Dayton, Superintendent



## APPENDIX C

### COLLECTIONS

Significant collections of biological materials from within what is now known as Carlsbad Caverns National Park are listed below by major classificatory categories:

#### Botany:

1. Herbarium of Sul Ross University, Alpine, Texas.
2. Herbarium of Baylor University, Waco, Texas.
3. Herbarium of the University of New Mexico, Albuquerque.

#### Arthropods:

1. University of Kentucky, Lexington. Specialized collections of Cave arthropods, mainly gathered by Dr. Thomas C. Barr, Jr. and James R. Reddell, of the Department of Zoology and the Institute of Speleology of that institution.

#### Herptofauna:

1. University of Michigan Museum of Zoology, Ann Arbor. Probably the most extensive representation.
2. University of Kansas, Museum of Natural History, Lawrence. Probably has the second largest holdings.
3. United States National Museum, Washington.
4. Texas Natural History Collection, University of Texas, Austin.

#### Birds:

No large holdings collected exclusively from within the area of the designated park are known. Perhaps the best collections for this area are those collected primarily from the immediate vicinity of present day Guadalupe Mountains National Park and are now holdings of Louisiana State University and Texas A. & M. University. These comprise the 1938 and 1939 collections reported by Burleigh and Lowery in their paper Birds of the Guadalupe Mountain Region of Western Texas (Occasional Papers of the Museum of Zoology, Number 8, L.S. U. Press, August 20, 1940).

#### Mammals:

1. Collections by Vernon Bailey presumed to be in the collections of the old Bureau of Biological Survey.
2. Collections of the Natural History Survey, State of Illinois, University of Illinois, Champaign.



APPENDICES

APPENDIX D

SPECIFIC MANAGEMENT PLANS





# Carlsbad Caverns National Park Backcountry Management Plan

## Introduction

Data on park resources may be found in the Resource Management Plan, soil type map, water resource map, and the Big Game Habitat Analysis Report.

The plan's objective is to provide for visitor use and enjoyment of the backcountry within constraints and limitations established to provide for protection and preservation of the natural, archeological, and historical resources.

The plan conforms to the Administrative Policies for natural areas, to legislation authorizing the park, to the Code of Federal Regulations, and to the Master Plan, Wilderness Proposal, and Management Objectives.

## Specific Controls

### 1. Hiking on Trails

- a. The existing system of trails was established years ago by stockmen. Location of trails will probably remain the same but major construction and signing are required for visitor safety and protection of resources.
- b. Unrestricted use of trails by hikers will be allowed until use demands approach management capability.
- c. Because of the very small backcountry use presently existing, carrying capacities are not practical at this time but will be considered if use ever shows a significant buildup.
- d. Food containers and supplies carried in by users must be removed from backcountry by users.
- e. Absence of water throughout the park requires users to carry all water needs.

### 2. Saddle and Pack Stock

- a. Same policy will apply as for hiking.
- b. Absence of water will generally limit horse travel to day use.
- c. Holding enclosures at Yucca and Putman cabins may be used by visitors. Feed will be supplied by the user.



- d. Cross country travel is permitted but user should be informed of plant communities which may injure a horse.

### 3. Camping

- a. Facilities are not available for overnight camping along roads in the park.
- b. A primitive campsite will be located in the mouth of Slaughter Canyon. This campsite is designed primarily for those visitors departing on trips into the backcountry and is not intended for general camping.
- c. Individual campground sites will not be designated in the backcountry at this time because such use is almost nil. If significant backcountry use builds up to establish a pattern, designated sites will be determined. Also, if significant overnight backcountry camping ever develops, carrying capacities for designated campsites will be considered.
- d. As provided for in the Code of Federal Regulations, campfires will be permitted in the backcountry except in Walnut Canyon and along the unimproved motor loop nature road. Such excepted areas shall be posted as required. Recognizing the scarcity of native fuels, the use of containerized fuel, charcoal, or other non-native fuels will be encouraged. In no event shall the use of standing or live native fuels be permitted. If backcountry use increases significantly in the future and use of dead native fuels becomes a problem, additional restrictions will be considered.
- e. Fire permits will be issued to all users of the backcountry with overnight site locations and length of stay recorded.

### 4. Cave Resources

- a. Federal regulations will be enforced whereby no person shall enter any cave without a written permit from the superintendent, except Carlsbad Cavern, Goat Cave, and New Cave. Except for designated public-use caves, backcountry cave entry will be limited to research, educational, and administrative uses.

### 5. Access to Backcountry

South boundary - Rattlesnake, Slaughter, Yucca and Double Canyons -  
At present, several access points along the south boundary can be reached with difficulty. Park visitors must secure a gate key to cross private lands outside the park. Otherwise they must make a time-consuming drive over old roads to reach trail heads.



North boundary - There is no reasonable access to the north boundary except in the extreme northeast corner of the park,

West boundary - Trail systems in the Lincoln National Forest bring visitors to the park's west boundary.

## 6. Roads

Park Entrance Road - The present seven mile entrance road to the Caverns terminates at the visitor center. This is the only paved road in the park and it is in the eastern portion.

Walnut Canyon Loop Road - This old ranch road follows the ridge from the visitor center to Rattlesnake Canyon, then north and east down Walnut Canyon. It is about eight miles in length and can be navigated by pickup or high clearance vehicle only.

Slaughter Canyon Road - This is one mile of primitive road from the park boundary to the mouth of Slaughter Canyon.

Yucca Canyon Road - This is 1/2 mile of primitive road from the park boundary to the mouth of Yucca Canyon.

## 7. Controls on Public Use

It has been the policy to encourage use of the backcountry by the visiting public. High daytime temperatures, scarcity of water, poorly defined trails and the primary Cavern attraction have been a detriment to backcountry use. The low use of backcountry resources has precluded implementation of public use controls except issuance of fire permits for those entering the backcountry.

## 8. Archeological Resources

Archeological sites in the backcountry will receive a high degree of protection. They will be identified and interpreted to the public only when such protection can be provided.

## 9. Historical Resources

The history of guano mining, particularly at Ogle Cave, may be interpreted at some time in the future if conditions permit.



Addendum To  
BACKCOUNTRY MANAGEMENT PLAN  
CARLSBAD CAVERNS NATIONAL PARK

Staffing and Funding Requirements

A. Management and Protection

Because present backcountry use is negligible, the plan can be implemented with present staffing available. This may change if use increases significantly in the future.

B. Maintenance

Because of poor trail conditions, the following trail maintenance funding will be required to bring trails up to standard:

Four seasonal laborers WG-3	(1 MY)	\$7,000 annually
-----------------------------	--------	------------------





## CAVE MANAGEMENT

### CARLSBAD CAVERNS NATIONAL PARK

#### Inventory

To properly manage, protect, and administer the cave resources of the Guadalupe Mountains, consistent information is needed. For this reason a joint filing system has been set up between NPS and NFS with the files being kept separate.

#### Cave Filing

Each cave is being numbered. The numbering follows the BLM system, which has been set up to accommodate an area wide inventory.

A coded card file has been established for ease of data input and retrieval.

A folder of each cave is then prepared containing detailed information such as photographs, history, etc.

A USGS Quad. will be maintained for general cave locations. The coded card file, the cave folder, and the cave location map will be kept in confidential files.

To locate each cave on the ground, a brass cap will be set at the entrance giving the cave's number and the agency having the cave on file.

#### Management Direction

Each cave will have a dual classification; one for hazard and one for formation significance. Any management decision should be based on directions pertaining to both hazard and significance classification.

#### In Conclusion

The inventorying of caves will be a continuous task, and can best be accomplished by individuals experienced in caving using the criterion set forth in this paper.



## GENERAL CAVE AND ARCHEOLOGICAL SITE PRESERVATION POLICY

### CARLSBAD CAVERNS AND GUADALUPE MOUNTAINS NATIONAL PARKS

1. The locations of caves and archeological sites found in Carlsbad Caverns and Guadalupe Mountains National Parks will not be disclosed to the general public except at the discretion of the Superintendent. It is particularly important that cave locations be kept out of print. The reason for this policy is to further strengthen protection of these resources from unauthorized entry and vandalism. If any exceptions to this policy are felt necessary, they should be submitted to the Superintendent in writing for consideration. National Park Service employees who locate caves outside the park on their own time and outside the scope of their employment are also encouraged to apply this same policy.
2. Special Regulations provide:

"With the exception of the regular trips into Carlsbad Caverns under the guidance or supervision of employees of the National Park Service, no person shall enter any cave or undeveloped part or passageway of any cave situated within Carlsbad Caverns National Park without prior permission of the Superintendent in writing.

"Such permission will be granted only to individuals representing recognized scientific or educational institutions engaged in investigations which have demonstrable value to the National Park Service in its management and understanding of cave resources."
3. We will cooperate fully with qualified caving groups, and with bonafide researchers. We will also cooperate fully with those contributing or sharing information with us regarding other caves found outside the park. Such cooperation on the part of Federal and State agencies, organized caving groups, and individual cavers is appreciated greatly, and has contributed much to our understanding and interpretation of similar resources in the Park. We are hopeful that it will be continued.
4. Adequate security of cave and archeological resource file material will be maintained through the cooperation of the Carlsbad Caverns Natural History Association.



CODING KEY FOR CAVE CARD FILE

11 JANUARY, 1972

<u>NO.</u>	<u>ITEM</u>	<u>CODING, DESCRIPTION, AND INSTRUCTIONS</u>
1	CAVE NUMBER	ASSIGN UNUSED NUMBER BETWEEN 30,000 AND 32,999 FOR CAVES LOCATED IN LINCOLN NATIONAL FOREST; ASSIGN UNUSED NUMBER BETWEEN 20,000 AND 22,999 FOR CAVES LOCATED IN CARLSBAD CAVERNS NATIONAL PARK AND GUADALUPE MOUNTAINS NATIONAL PARK; ASSIGN OTHER UNUSED NUMBERS BY COUNTIES AFTER REFERRING TO THE NEW MEXICO CAVE INVENTORY (BLM LIST) FOR CAVE ON STATE AND PRIVATE LAND.
2	CAVE NAME	<p>ASSIGN NAME; MAKE SURE NAME IS UNUSED. SOME CAVES ARE ALREADY KNOWN BY SEVERAL NAMES; IN THIS CASE THE FOLLOWING IS SUGGESTED FOR FINAL NAME ASSIGNING:</p> <p>A. HISTORIC NAME OR NAME GIVEN BY FIRST PERSON DISCOVERING CAVE.</p> <p>B. IF 'A' IS UNDETERMINABLE THEN USE THE NAME THAT HAS THE LEAST HINT TO THE TOPOGRAPHIC LOCATION OF THE CAVE.</p> <p>C. LIST ALL 'OTHER' NAMES ON A SEPARATE CARD WITH A REFERENCE TO THE FINAL ASSIGNED CAVE NAME.</p> <p>(1) LIST ALL 'OTHER' NAMES UNDER "REMARKS" ON CAVE CARD.</p> <p>(2) LIST ALL 'OTHER' NAMES IN THE MASTER CAVE FILE.</p>
3	PHOTO NUMBER	LIST THE NUMBER OF THE AERIAL PHOTO THAT THE CAVE IS PLOTTED ON.
4	MASTER MAP	INDICATE IF CAVE LOCATION HAS BEEN PLOTTED ON THE MASTER CAVE MAP;
		Y - YES N - NO





<u>NO.</u>	<u>ITEM</u>	<u>CODING, DESCRIPTION, AND INSTRUCTIONS</u>
5	LEGAL LOCATION	STATE, COUNTY, RANGE, TOWNSHIP, SECTION, AND SUBSECTION TO THE NEAREST 1/4 OF 1/4 OF 1/4. ((EXAMPLE: --NEW MEXICO, EDDY, R22E, T25S, NE., NW., SW.))
6	GEOLOGIC FORMATION	START WITH THE FORMATION THE CAVE ENTRANCE IS LOCATED IN AND THEN THE PROGRESSIVE FORMATIONS ENCOUNTERED AS ONE WOULD MOVE FURTHER INTO THE CAVE.
7	ALTITUDE OF ENTRANCE	A4723 = ALTIMETER READING OF 4,723 FEET. E4750 = ESTIMATED READING OF 4,750 FEET USING CONTOURS ON TOPO MAPS.
8	TYPE OF CAVE	F - FISSURE P - PIT ONLY R - ROCK SHELTER S - SOLUTION T - TALUS
9	NUMBER OF LEVELS	1 - SINGLE 2 - TWO 3 - THREE 4 - ETC.
10	DOMINATE ROCK TYPE	CO - CONGLOMERATE    LS - LIMESTONE DO - DOLOMITE        MX - OTHER METAMORPHIC GY - GYPSUM          SH - SHALE HA - HALITE          SO - SOIL IX - IGNEOUS         SS - SANDSTONE TR - TRAVERTINE
11	TYPE OF ENTRANCE	CODE AS MANY AS APPLY STARTING WITH THE 'MAIN' ENTRANCE  L - LARGE HORIZONTAL (10 BY 10' OR LARGER; OR, MORE THAN 150 SQ. FT. H - SMALL HORIZONTAL (LESS THAN 10' BY 10' OR LESS THAN 150 SQ. FT. V - LARGE VERTICAL (SAME AS 'L' ABOVE). S - SMALL VERTICAL (SAME AS 'H' ABOVE). B - SIDE OR BOTTOM OF SINKHOLE. Q - QUARRY OR ROAD CUT GIVES ACCESS.



<u>NO.</u>	<u>ITEM</u>	<u>CODING, DESCRIPTION, AND INSTRUCTIONS</u>
12	NUMBER OF ENTRANCES	1 - ONE 2 - TWO 3 - THREE 4 - ETC.
13	LENGTH OF ALL PASSAGES (KNOWN)	S1250 = SURVEYED 1,250 FT. A1400 = APPROXIMATELY 1,400 FT.
14	PATTERN OF CAVE	S - SINGLE PASSAGE/ROOM ONLY P - PIT ONLY/NO PASSAGES OR ROOMS. R - RECTILINEAR PATTERN. D - DENDRITIC PATTERN, BIFURCATING. M - MAZE, BONEYARD, SOLUTION, ANASTOMOSED NETWORK. T - TRELLIS/JOINT CONTROL MAZE.
15	TREND OF CAVE FROM ENTRANCE	N24E = NORTH 24 EAST. S17W = SOUTH 17 WEST.
16	VERTICAL RELIEF OF CAVE	HIGHEST CEILING TO LOWEST FLOOR.  S368 = SURVEYED 368 FEET. A425 = APPROXIMATELY 425 FEET.
17	WATER ELEMENT	CODE AS MANY AS APPLY.  A - ARID, NO WATER. D - DRIPPING WATER. F - FLOODED. I - INTERMITTENTLY FLOODED L - LAKES PRESENT (100 SQ. FT. OF SURFACE AREA PLUS AN AVERAGE OF AT LEAST 6 INCHES DEEP). M - MOIST EARTH. P - POOLS PRESENT (LESS THAN LISTED FOR LAKES ABOVE). S - STREAM OR RIVER SYSTEM IN CAVE.
18	HAZARDS PRESENT	CODE AS MANY AS APPLY  C - CONFUSING PASSAGEWAYS. G - GASSES PRESENT. L - LOOSE ROCKS OR CAVE-IN HAZARD. V - VERTICAL DROPS. W - WATER WITH NO ALTERNATE ROUTE.



<u>NO.</u>	<u>ITEM</u>	<u>CODING, DESCRIPTION, AND INSTRUCTIONS</u>
19	SPECIALIZED SKILLS REQUIRED	C - TECHNICAL CLIMBING. D - DIVING (SCUBA OR AIR HOSE). R - RAPELLING, PRUSIKING, CABLE LADDER CLIMBING, ETC. S - SWIMMING REQUIRING WET OR DRY SUITS.
20	CAVE CONTENTS	CODE AS MANY AS APPLY.  A - ARCHAEOLOGICAL (ARTIFACTS). B - BIOLOGICAL (ORGANISMS). G - GEOLOGICAL (STRUCTURAL, HYDROLOGICAL, GENETIC). H - HISTORICAL. P - PALEONTOLOGICAL (FOSSILS). S - SPELEOTHEMS. N - NONE; CAVE, SHELTER, OR SINK OF NO SPECIAL ATTRACTION OR SIGNIFICANCE.
21	TYPE OF PROTECTION NEEDED	G - GATE H - SIGN CONCERNING HAZARDS. S - SIGN CONCERNING PROTECTION. P - PERMANENT CLOSURE (DYNAMITE, ETC.). N - NONE.
22	TYPE OF PROTECTION PROVIDED	SAME AS NO. 21 ABOVE.
23	CAVE MARKED AT ENTRANCE WITH BRASS CAP.	Y = YES. N = NO.
24	HINDS DUAL CLASSIFICA- TION CODING	HAZARD - A, B, C, D, OR E.* SIGNIFICANCE - I, II, III, IV, OR V.*

O - IN ANY ENTRY INDICATES - DOES NOT APPLY.

\* - THE CODINGS FOR HAZARD AND SIGNIFICANCE ARE EXPLAINED  
IN DETAIL IN THE CAVE MANAGEMENT PAPER BY ALLAN L. HINDS  
DATED 10-28-70 AND WILL BE ATTACHED.



## CAVE CLASSIFICATION STANDARDS

### I. Hazard Classes.

- A. The Class A cave offers the least hazard to the cave visitor, and can be safely visited by 2 or more people with proper lighting equipment who observe safety rules.
  - 1. Single, well-defined passageway, with no crawlways less than 3 feet in diameter.
  - 2. No lateral passageways leading off of the main passageway.
  - 3. No vertical drops over 3 feet.
  - 4. No loose ceiling rocks.
  - 5. Few loose rocks on floor.
- B. The Class B cave contains moderate hazards, are mostly horizontal, and can be safely explored by 2 or more persons with limited experience, with proper equipment and the observing of safety rules.
  - 1. Well defined main passageways, with only dead-end passageways leading away from the main passageway.
  - 2. No step-type drops over 10 feet.
  - 3. No crawlways less than 24 inches in diameter.
  - 4. No loose ceiling rocks.
  - 5. Loose floor material is permissible,





- C. Class C caves contain moderate vertical hazards and can be safely explored by 3 or more persons with moderate vertical experience, proper vertical equipment, and by observing vertical safety rules.
1. Multiple passageways with straight connecting passages.
  2. Crawlways less than 24 inches.
  3. Loose rocks on passages over 6 foot in height, no loose rocks on passages less than 6 feet in height.
  4. Vertical drops up to 50 feet.
- D. Class D caves are the most hazardous from the structural standpoint. These caves can only be explored safely by 4 or more persons, with considerable experience, with proper equipment, and by observing all safety precautions. One person should remain on the surface.
1. "Maze" type passageways.
  2. Vertical drops over 50 feet.
  3. Loose ceiling rocks on crawlways under 6 feet in height.
- E. Class E caves contain dangerous gasses, diseases, and/or poisonous insects or reptiles from which it is difficult to protect the cave explorer. Class E caves should only be entered by qualified cavers with special equipment, and only if there is a real necessity for information which is deemed valuable in relation to the risk involved. The minimum party should consist of 6 cavers, with 2 remaining on the surface. Extra safety precautions should be taken and special communications and rescue capabilities available.



## II. Significance Classification.

- Class I: This classification will be applied to caves which contain formations of little or no importance.
- Class II: Class II caves are those which contain formations of the ordinary type, but which are not easily damaged.
- Class III: Formations in the Class III caves are of the ordinary type, but are susceptible to breakage and vandalism.
- Class IV: Class IV caves contain formations of unusual quality. Example of Class IV caves are those containing cave hair, gypsum flowers, etc.
- Class V: Class V caves contain items of scientific importance. The scientific value could either be archeological, biological or historical in nature, or very rare cave formations.



Fire Management Plan  
Carlsbad Caverns National Park

April 26, 1972

This plan summarizes the implementation of Carlsbad National Park Policy to allow naturally occurring fires to run their course.

Authority to let natural occurring fire burn is found in Administrative Policies for natural areas of the National Park System. Paragraph 2 under the subject of fire on page 17 states:

"Fires in vegetation resulting from natural causes are recognized as natural phenomena and may be allowed to run their course when such burning can be contained within predetermined fire management units and when such burning will contribute to the accomplishment of approved vegetation and/or wildlife management objectives."

The following procedures will be followed in implementing the plan:

1. Aggressive fire detection will be maintained by air reconnaissance, ground observation and through the United States Forest Service lookout on Dark Mountain. Naturally occurring fires in the management unit will not be suppressed.
2. Burning will be contained within the predetermined fire management unit. This management unit boundary, as outlined in black on enclosed map, was determined by ridges, natural barriers and sparse fuel conditions. Prevailing southwest winds and past fire incidence were also a factor.
3. Detected fires within the interior of the management unit will be analyzed and observed from aircraft. Potential of those fires along unit borders will be determined from aircraft and ground forces dispatched as necessary.
4. All fires outside the management unit, including those within mutual aid zones of adjoining agencies, and all man caused fires in or out of the management unit will be controlled and extinguished.
5. At any time, the Park Superintendent can order the fire suppressed or order and direct other appropriate suppression activity which will keep the fire within the unit or otherwise manipulate the fire to eventually limit its size by directing it against natural fuel breaks.
6. All natural fires allowed to run their course within this unit will have location and behavior recorded. Follow up observations will determine recovery rate of vegetation and effect on undesirable vegetation prior to fire occurrence.



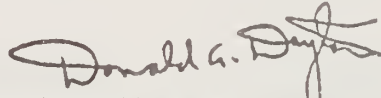


Relative to this plan:

1. We feel, from the character of this unit, all naturally occurring wildfire can readily be adapted and utilized as a resource management tool and can be contained within this unit. We also feel that this character will allow control or manipulation of wildfire if deemed necessary.

2. Representatives of the United States Forest Service, Bureau of Land Management and New Mexico State Forestry will be informed of fire action taken and results obtained to further our cooperative studies of vegetation in the Guadalupe.

Recommended:



Superintendent

Approved:







# United States Department of the Interior

## NATIONAL PARK SERVICE

Southwest Region  
P. O. Box 728  
Santa Fe, New Mexico 87501

MAY 30 1972

Superintendent	
Biologist	
Admin. Off.	
Maint. Supt.	
Chf. Tech. Services	
Interp. Spec.	
Engineer	
Res. Mgmt. Spec.	
Chf. V. & P. S., CACA	
Chf. Ranger	
Chf. V. S.	
Chf. Park Oper., GUMO	
Action By	

Y14

### Memorandum

To: Superintendent, Carlsbad Caverns

From: Associate Director, Southwest Region

Subject: Fire Management Plan

I approved the subject Plan after discussing it with members of the staff here. It is a bold step in any park, but we believe the merits outweigh the undesirable points. The original is returned signed for your files. We have retained the two copies for files here.

This Plan should be incorporated within your Resources Management Plan when it is written.

We are certain you will urge continued training of employees to be used in firefighting. We will need their skills for fires outside the management zone and for use at other parks or with other agencies.

Funding plane flights for observation of natural wildfire within the zone may seem to be a problem. We can see many complications in reporting of fires which are not fought but which have expenses. Then there are those which may cross into the zone of control after several days and must then be controlled. Reporting elapsed time from discovery to control may look peculiar, to say the least.

We suggest detection flights be made of both zones under the Emergency Presuppression account which can be justified when there is a going fire and danger is high or extreme. The going fire is also a reportable fire and if, upon the decision of the Superintendent, control action is needed then costs would be under suppression.



National Parks Centennial 1872-1972



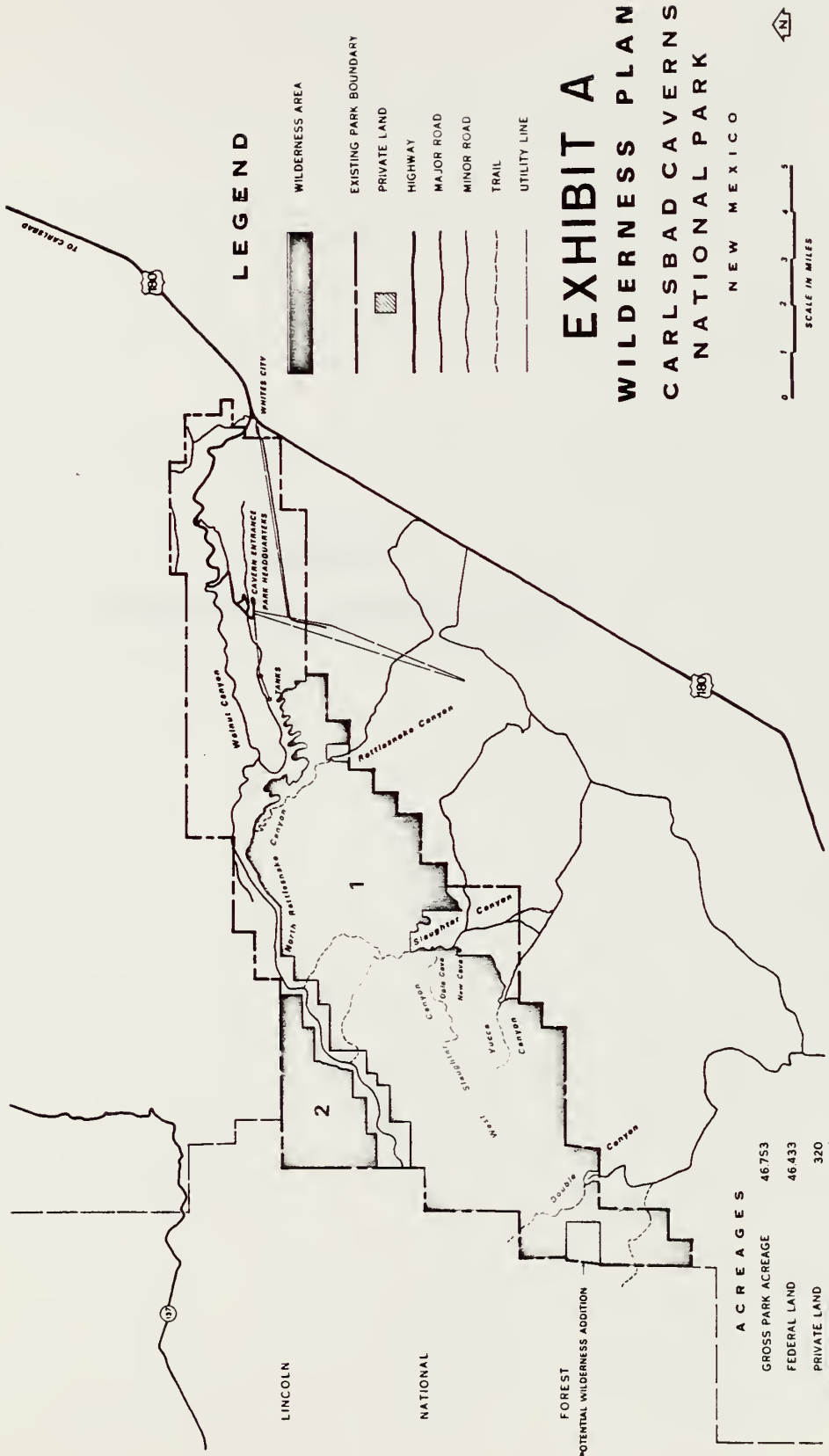
In the event a fire has burned for considerable time under observation and is suddenly a threat to neighbors in the control zone, suppression would be advocated. Report time would start when the suppression action is ordered. Please remember that a good narrative statement will be required to explain any odd or atypical situations.

If you have any questions on these matters feel free to call Tom Ela or Henry LaSala.

A handwritten signature in dark ink, appearing to read "J. P. Thompson". The signature is fluid and cursive, with a large initial "J" and "P".

Enclosure





# LEGEND

- WILDERNESS AREA
- EXISTING PARK BOUNDARY
- PRIVATE LAND
- HIGHWAY
- MAJOR ROAD
- MINOR ROAD
- TRAIL
- UTILITY LINE

## EXHIBIT A WILDERNESS PLANS CARLSBAD CAVERNS NATIONAL PARK NEW MEXICO



### ACREAGES

GROSS PARK ACREAGE	46,753
FEDERAL LAND	46,433
PRIVATE LAND	320

WILDERNESS	
UNIT 1	26,860
UNIT 2	3,350
TOTALS	30,210

POTENTIAL WILDERNESS ADD 320





## APPENDICES

### APPENDIX E

#### ANNUAL REVIEW, CHANGES AND DATES



## OVERVIEW

The following is a review of all actions proposed within the Carlsbad Caverns National Park Natural Resources Management Plan, and outlined within the four categories described within the Management Program.

### I. THOSE ACTIONS WHOSE IMPLEMENTATION WILL HAVE A SIGNIFICANT AND MEASURABLE EFFECT ON THE ENVIRONMENT.

No such actions are planned. Each project included in the Resource Management Program was considered on its own merit and, in every case, those actions planned do not have a significant and measurable effect on the environment. All of the actions fall into categories II or IV.

### II. THOSE ACTIONS WHICH WILL CONTINUE EXISTING MAINTENANCE.

1. Natural Science Project # 6 - WATER RESOURCES ANALYSIS: The monitoring of groundwater levels and spring flow at strategic locations is deemed necessary for management of the water resources of the park. Threats of potential water deficiencies and water pollution will be evaluated.
2. Natural Science Project # 11 - POISONOUS ANIMAL CONTROL: Whenever practical, rattlesnakes found within the areas of concentrated public use will be captured and released unharmed on National Park Service lands with less visitor use. This action has been standard operating procedure for many years.

### III. THOSE ACTIONS WHICH WILL INITIATE NEW MAINTENANCE.

There are no actions proposed that will initiate new maintenance.

### IV. THOSE ACTIONS WHICH ENTAIL RESEARCH.

1. Natural Science Project # 1 - INVENTORY OF NATURAL RESOURCES: This project calls for an inventory of natural resources not already inventoried, and is thought to be necessary for wise planning in the park. This project will inventory and list the hydrological features, major soils, significant geological features and processes, and plant and animal species.
2. Natural Science Project # 2 - CAVE INVENTORY, PROTECTION, AND USE: There is at present only a sketchy idea of the extent of the caves in the park, and many basic data are required to provide safety to the public and preserve the unique underground resource. This project will be carried on in cooperation with three other federal agencies (BLM, USFS, and USGS) and will provide information on cave resources throughout the geographic region.



3. Natural Science Project # 3 - MICROCLIMATE OF CARLSBAD CAVERNS: The development and public use of Carlsbad Caverns has led to a loss in the absolute quantity of water in the cave. Much of this loss has been stemmed by the installation of revolving doors near the elevator shaft, although some moisture laden air still escapes from the cave through the elevator shaft. The current research project will determine the stratigraphic variation in temperature and continue to monitor the parameters (relative humidity, carbon dioxide concentration, airflow, pool levels, etc.) studied previously.
4. Natural Science Project # 4 - VEGETATIVE COVER AND EFFECTS OF GRAZING: This project is designed to eliminate occasional trespass grazing by domestic stock, initiate research to study vegetative dynamics, establish benchmarks to monitor recovery of vegetation, and provide a warning system of future vegetative changes.
5. Natural Science Project # 5 - BASIC CLIMATOLOGICAL DATA: Basic climatological data are needed for formulation of sound management planning and decisions, to fulfill interpretive needs, and to comply with Natural Science Activity Standards.
6. Natural Science Project # 7 - USE OF FIRE AS A MANAGEMENT TOOL: There is abundant evidence that fires have been a component of grassland ecology since long before the advent of the European. This project proposes to initiate research to determine the role of fire in the Chihuahuan ecosystem and to help determine if fire can be a useful tool in grasslands management at Carlsbad Caverns.
7. Natural Science Project # 8 - BASIC DATA FOR UNGULATE MANAGEMENT: Since deer are the greatest single factor affecting the maintenance of natural ecological conditions within the park, continued research is planned to determine patterns of use of park land, carrying capacities for the major habitat types within the park, and browse species which can be used in maintaining optimum conditions within the park lands.
8. Natural Science Project # 9 - FACTORS AFFECTING RELICT PLANT SPECIES: This project is designed to study the ecological relationships of relictual plant and animal species that exist on the fringe of the Chihuahuan desert.
9. Natural Science Project # 10 - FAUNAL FACTORS: A faunal study should include the following: data gathering, analysis of distribution and abundance of animal species, population dynamics, migration and immigration, and should be coordinated with faunal inventories included in Projects 1 and 8. Included in this study will be research to determine the feasibility of re-introducing



three extirpated species, the Montezuma quail (Crytonyx montezumae), the desert bighorn (Ovis canadensis mexicana), and the blacktail prairie dog (Cynomys ludovicianus).

10. Natural Science Project # 12 - POPULATION DYNAMICS OF MEXICAN FREETAILED BAT: Recurring mortality among the seasonally resident colony of Mexican freetail bat (Tadarida brasiliensis mexicana) ranged up to 100 percent of the young of the year in 1971. A massive research project to ascertain the cause of this mortality is underway. Although the mortality is not limited to Carlsbad Caverns, the Service will cooperate with other agencies, diagnostic facilities, and Universities in an attempt to find the cause of this region-wide decline of bats.
11. Natural Science Project # 13 - ECOSYSTEM ANALYSIS: This is an all-inclusive analysis of all phases of the area's natural resources. This project cannot be completed until considerably more data are accumulated. Essentially, an ecosystem analysis involves the measurement of the primary energy into the system and the energy flow of that system.
12. Natural Science Project # 14 - AIR POLLUTION FROM BIRDS NESTING IN CARLSBAD CAVERNS: The cave swallow (Petrochelidon fulva pallida) was considered a rare species in the United States as recently as 1962. These birds colonized the mouth of the cave in 1966 and their accumulated droppings (guano) are now posing an untenable level of air pollution and possibly a hazard to public health. Research is planned to determine the presence or absence of human health hazards, to determine the maximum population that can be sustained consistent with visitor use, to determine the feasibility of using other caves in the park as nesting sites, and a variety of other factors relating to the ecology of these birds.
13. Natural Science Project # 15 - RESTORATION OF DISTURBED AREAS: An ecologically sound program to restore those natural areas which have been disturbed by removal of structures and associated man-made intrusions is needed. This project will initiate research to best determine how sites should be prepared for revegetation and which native species are best suited for hastening recovery of disturbed areas.





DETERMINATION: It is determined that all actions above are maintenance and research in character and do not significantly effect the environment or cause controversy. Therefore, in accordance to the following paragraph of "Guidelines for the Preparation and Review of Environmental Assessments and Statements" (National Park Service, July 29, 1974, pg. 6),

"Based on an overview of all actions affecting the environment, the Responsible Official may determine that many plans, projects, and operational decisions have negligible potential to cause controversial or significant environmental impact and therefore do not require preparation of environmental assessments."

No Environmental Assessment will be prepared.

Recommended by:	<u>Robert H. Warner</u>	<u>OCT. 2, 1974</u>
	Chief Scientist, Southwest Region	Date
Concurred by	<u>John W. Henneberger</u>	<u>OCT. 7, 1974</u>
	Associate Regional Director, Professional Services	Date
Approved by:	<u>HR Thompson</u>	<u>10-8-74</u>
	Acting Regional Director, Southwest Region	Date





