RESOURCES MANAGEMENT PLAN

AND ENVIRONMENTAL ASSESSMENT

FOR

GUADALUPE MOUNTAINS NATIONAL PARK

Recommended by: Karen Wade
Superintendent, Guadalupe Mountains National Park

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Date

Approved by
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Southwest Region

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INTRODUCTION

The Guadalupe Mountains are nationally significant because of a combination of outstanding geologic, scientific and scenic resources. The primary feature is a portion of the Capitan Reef, one of the most extensive non-coral fossil reefs in the world. The reef formed in the seas of the Permian period, 250-280 million years ago, was then uplifted to form a huge V-shaped plateau. The reef is a unique outdoor laboratory tracing the history of the earth and the origins of certain valuable mineral resources located in the adjacent Permian Basin such as petroleum, potash, sulfur, gypsum, dolomite, and limestone. Rising steeply from the desert floor, the reef contrasts sharply with the surrounding Chihuahuan desert, creating spectacular scenery and providing unique habitats for plant and animal species, many eligible for status as endangered and threatened. Presently, there are three plants listed as endangered and threatened, along with one endangered animal, the Peregrine falcon. The Guadalupes are recognized for the diversity of its vegetative communities and the unusually high number of sensitive plant species contained in these communities.

The park also contains important cultural resources, representing periods of human use by prehistoric peoples through the nineteenth century settlement and ranching operations. Several are on or eligible for the National Register of Historic Places. In recent years, the Pine Springs Cafe has been the center of political controversy between the National Park Service and family members of the now deceased owners. The Pine Springs Cafe and outbuildings were acquired by the National Park Service in 1972. A life estate was granted to the owners, Mr. and Mrs. Walter Glover. After the death of Bertha Glover, a daughter, Mrs. Mary Hinson, was authorized by the Secretary of the Interior to continue the operation. In 1986, when the National Park Service moved to close the cafe, one of the state's U.S. senators intervened, and Secretary of the Interior Donald Hodel decided to grant Mrs. Hinson one five-year extension on the authorization. The authorization will expire January 1, 1992.

Spectacular scenery is a major attraction for visitors. The Guadalupe escarpement rises steeply from the desert floor and is a major landmark along U.S. Highway 62-180. El Capitan, with its sheer thousand foot cliffs, is especially spectacular. Guadalupe Peak, just north of El Capitan, is the highest peak in Texas. The next three highest peaks in Texas, all over 8,000 feet above sea level, are also in the park.

The National Park Service has a clear mandate to protect and preserve the natural and cultural resources of the lands it administers. This mandate sharply differentiates National Parks from other federal lands, which are managed for the production or perpetuation of preferred resources. The establishing legislation and management policies of the National Park Service establish that resources management programs should be directed towards preserving dynamic natural systems and processes, rather than individual components; i.e. no single resource should be managed to the benefit or detriment of another.

The major challenge of preserving park resources is derived from the threats that human use and activities present to this goal. In addition to the seemingly dichotomous mission of the National Park Service to both preserve and provide opportunities for public use of resources within the parks, these resources are being subjected to increasing threats and disruption from activities occurring outside park boundaries. National Parks cannot be considered isolated islands, immune from outside interference; their fragility and ecological role within a local and regional context is becoming increasingly apparent.

The Resources Management Plan is one part of each park's General Management Plan, the primary document guiding the management of an individual park. The purpose of the Resources Management Plan is to provide a systematic course of action for protecting, preserving, and managing park resources. This course of action must conform to NPS Management Policies, legislative mandates, executive orders, zoning classifications, and related planning documents.

The Resources Management Plan documents and evaluates existing management, monitoring, and research activities, identifies deficiencies in existing programs or knowledge, and addresses current or potential problems requiring resolution or mitigation. A five-year program for dealing with significant resource management problems is clearly defined in the plan, providing a basis for allocating funds and personnel. The Resources Management Plan is a documented commitment to deal with resource problems; it constitutes a yardstick with which actual accomplishments can be measured against stated objectives and needs.

The Resources Management Plan is also closely related to the park's Statement for Management, which provides a current summary of the state of the park, its significant resources, and influences on management. The Statement for Management is updated annually to reflect more timely and specific guidance than the format of the General Management Plan allows. Specific management objectives form the heart of the Statement for Management, establishing a framework for achieving the park's legislated purpose. The following management objectives have been approved for Guadalupe Mountains National Park, and will guide the development and implementation of resources management programs:

(1) To preserve and maintain the natural and cultural features of the park.

(2) To provide visitors with an interesting, enjoyable, and enlightening park experience, so they gain enviromental awareness and insight into the cultural and natural features of Guadalupe Mountains National Park.

(3) To encourage a continuing research program, which will provide management personnel with guidance in what information is needed for accurate and informative interpretation and management of the natural and cultural aspects of the park in the long- and short-term operation of the area.

(4) To provide the necessary physical development and maintenance of facilities needed for the proper operation of the area and for the best possible visitor experience in the enjoyment of the natural and cultural features of Guadalupe Mountains National Park.

(5) To promote a harmonious integration of activities both within and outside the park by maintaining close cooperation with neighboring private landowners, Federal and State agencies, and local community-education organizations, in matters of mutually beneficial activities and services, and by encouraging public involvement in the planning programs and operations of the park.

Natural resources are constantly changing, both in response to natural forces and processes and directly, or indirectly, in response to human activity. Cultural resources are more static, but they also are affected by both natural and human-inducted factors, and are subject to changes in human values and perception. Recognizing these facts, the Resources Management Plan must be dynamic, rather than static. As additional threats to park resources are identified, new technologies are developed, and management needs and priorities shift, the plan must be revised to reflect these changes. Only in being responsive to change, will the park's Resources Management Plan remain a continually valid and effective management tool.

OVERVIEW AND NEEDS

Natural Resources Projects

Guadalupe Mountains National Park

Summary

While the park has made significant strides in its effort to manage and protect its natural and cultural resources, there remains much to be done. The importance of establishing a firm organization and support base for resources management, as described in the following plans is emphasized by the recent management reorganization separating the administration of Carlsbad Caverns National Park from that of Guadalupe Mountains National Park. As of November 1987, this move has become a reality, thus emphasizing the nature of Guadalupe Mountains National Park as a distinct unit of the National Park Service.

In keeping with the NPS Director's servicewide goals for national park management, the park staff is attempting to increase its emphasis on resource management as a basic function of park operations. Supporting this goal, a Resource Management Specialist (GS-9) position was established at the park in late 1986. The current version of the Natural and Cultural Resource Management Plan further describes a series of project statements and funding requests intended to support the Resource Management Specialist position specifically, and the resources management function in general. These projects include: including ungulate and mountain lion monitoring, abiotic monitoring, biocide use, backcountry management, fire management, information gathering and retrieval, and support services needed to implement the above programs.

The Statement for Management has been revised as of September 1987 and presently on the 30 day review period. Approval by the Regional Director should follow the 30 day review period. The Statement for Management provides an up-to-date inventory of the park's condition and current management practices, identifies major issues, and states management objectives.

OVERVIEW AND NEEDS

Natural Resources Projects

Guadalupe Mountains National Park

PARK PRIORITY	RMP REF. NO.	PROJECT TITLE	SUMMARY OF NEEDS FUNDING	MAN YEARS
1	N-15	Boundary Fencing	964	1.0

Of the total of 69 miles of boundary surrounding the park, only 21 miles are considered in satisfactory condition, 24 miles are in need of replacement or repair, and 24 miles have no fence at all. Funding will be used to secure the park boundary on a priority based upon resource sensitivity and threats from trespass livestock. Markers will also be used to remove internal fence lines constructed prior to the establishment of the national park.

PARK PRIORITY	RMP REF. NO.	PROJECT TITLE	SUMMARY OF NEEDS FUNDING	MAN YEARS
2	N-1-01	Fire Management	139	1.3

Funding will be used to purchase the manpower and equipment needed to implement the prescribed management fire program identified in the park's approved Fire Management Plan. This program involves a series of prescribed fires intended to reduce the present fuel-load inventory to preset levels. The management fires will involve approximately 1/4 of the 76,293 acre national park.

PARK PRIORITY	RMP REF. NO.	PROJECT TITLE	SUMMARY OF NEEDS FUNDING	MAN YEARS
3	N-23	Resource Management	25	2.0

Funding is needed to support the recently acquired GS-9 Resources Management Specialist position. Support services includes two 180 resources management seasonal positions, a GSA rental vehicle, supplies and materials, and travel needed by the RMS to conduct the routine business of the park.

PARK PRIORITY	RMP REF. NO.	PROJECT TITLE	SUMMARY OF NEEDS FUNDING	MAN YEARS
4	N-2-01	Backcountry Use Management	60	.1

The Backcountry Management Plan for the park was finalized in 1984. Funding is needed to implement the management recommendations of this document. This involves the stabilization and hardening of various campsites, the closure and rehabilitation of impacted areas, the removal of fences and material construction during the early ranching period, and the establishment of various monitoring transects to measure impacts.

PARK PRIORITY	RMP REF. NO.	PROJECT TITLE	SUMMARY OF NEEDS FUNDING	MAN YEARS
5	N-8-02	Monitoring Predator Populations (includes CACA)	10	.5

This work involves the inner-park monitoring of mountain lions as described in the 1986 Mountain Lion Management Plan. The initial package of funding will be used to purchase (through purchase order agreement) a plan identifying the techniques and methodologies to be used by the park staff in executing the monitoring program.

OVERVIEW AND NEEDS

Cultural Resources Projects

Guadalupe Mountains National Park

SUMMARY

Extensive archeological investigations in the area that is now the park have taken place in two distinct phases: the 1930's and the period from the mid-1960's to 1980. The archeological inventory of the park, as required by Executive Order 11593, is considered complete following a three-phase survey conducted in 1970, 1973, and 1975. There are 299 recorded sites in the park, including burned rock hearths and scatters, midden rings and mounds, lithic and ceramic scatters, rock shelters, caves, and pictographs. Twenty-nine of the recorded sites are considered eligible for listing in the National Register of Historic Places, but none has been formally nominated. The semiarid climate, the physical difficulty of gaining access to the park's high country, and the fact that the area was protected as private property until 1970, have probably contributed to a relatively high incidence of artifactural materials. Projectile points, stone tools, and pottery sherds are the principle artifacts found in the park.

In compliance with Executive Order 11593, an inventory of the park's historic resources has also been completed. The history of the park area is focused primarily on early settlement, ranching, mining, the Butterfield Stage route, and military campaigns against the Mescalero Apaches. As a result of these activities, numerous structures remain in the park. The Pratt Cabin in McKittrick Canyon and the Pinery, an old stage station on the Butterfield Stage route, are included on the National Register of Historic Places. The Wallace Pratt residence ("Ship of the Desert"), Frijole Ranch, and the Emigrant Trail to California/Butterfield Stage route have been nominated to the National Register, but no final action has been taken to list these sites. All structures associated with the Pinery, Pratt Cabin, Wallace Pratt residence, and Frijole Ranch, as well as the Williams Ranch house, are included on the List of Classified Structures for the park. The remainder of the park's historic structures have been informally classified as "discovery sites" and are being allowed to molder away naturally.

During 1987, regional office staff conducted an in-the-park study to determine and evaluate the exact route of the Emigrant Trail that passes thru the park for nomination to the National Register. A private contractor is writing up the nomination forms under a regional contract for this nomination and acceptance to the Register is pending at this time.

PARK PRIORITY	RMP REF. NO.	PROJECT TITLE	SUMMARY OF NEEDS FUNDING	MAN YEARS
1	C-14	Compilation of Cultural Resources Data	10	2.0

All available literature, field notes, reports, and maps providing information on the archeology and history of the area should be compiled. The output of such a compilation should be a complete inventory file of archeological and historic sites, and a cultural resource base map. A cultural resources overlay should be developed as part of the park's resource inventory map series. This action will be correlated with GUMO-N21-Natural Resources Information Base.

PARK PRIORITY	RMP REF. NO.	PROJECT TITLE	SUMMARY OF NEEDS FUNDING	MAN YEARS
2	C-1	Museum Collection	9.8	1.3

An affirmative program is needed to upgrade the park's museum collection to professional standards and to maximize its utility to park staff, researchers, and visitors. This program should incorporate the updating and improvement of museum records, and a comprehensive inventory of the present collection. Funding will also insure that staff assigned to curatorial duties will receive proper training and will be scheduled to work on a regular basis in the museum. Cataloguing of all accessioned items, improvement of temporary storage conditions, and organization of filing systems will receive top priority.

PARK PRIORITY	RMP REF. NO.	PROJECT TITLE	SUMMARY OF NEEDS FUNDING	MAN YEARS
3	C-2	Archeological Surveys of High Impact Areas	6	.5

Funds will be used to provide comprehensive archeological surveys of McKittrick Canyon, Dog Canyon, McKittrick Ridge, the Mescalero Campground and other areas of the park experiencing relatively high visitor use and having known archeological resources in close proximity.

PARK PRIORITY	RMP REF. NO.	PROJECT TITLE	SUMMARY OF NEEDS FUNDING	MAN YEARS
4	C-7	Historic Structures Report	3	.3

Historic Structures Reports should be prepared for the Pratt Cabin, Wallace Pratt residence, Williams Ranch house, and Frijole Ranch house. Each report should include a description of the structure, architectural and engineering data, structural materials, pertinent history, historic significance, administrative classification, accessibility and hazards to visitors, and proposed treatment.

PARK PRIORITY	RMP REF. NO.	PROJECT TITLE	SUMMARY OF NEEDS FUNDING	MAN YEARS
5	C-8	Historic Structure Preservation Guides and Cyclic Maintenance	155	.3

Historic Structure Preservation Guides should be prepared for the Pinery, Pratt Lodge, Wallace Pratt Residence, Frijole Ranch, and Williams Ranch. Maintenance requirements should be determined with the assistance of NPS historical architects and should include the extent of maintenance, frequency, type of materials to be used, etc. All maintenance accomplishments should be documented.

NATURAL RESOURCES MANAGEMENT PROGRAM

PROJECT STATEMENTS

GUMO-N1 Fire Management

Statement of Issue:

Lightning fire is a natural phenomenon in the mountainous areas and surrounding plains of west Texas. Guadalupe Mountains National Park is located in a region with high cloud-to-ground lightning occurrence which, together with drought cycles and fuel loading, results in a natural fire interval in the various fuel types.

Management of fire by native Americans increased the natural fire frequency in the region. The fire cycle interval probably increased with the advent of the Spanish Conquistadors and again, as early settlers pushed westward and began inhabiting the region. Then, through a combination of at least four decades of outright fire suppression activities and fuel reduction due to overgrazing and drought, fire occurrence has become less frequent and fires were probably smaller in size.

From 1960 to 1986, 51 fires were reported in the national park, 76 percent of which were under ten acres. Lightning has accounted for 39 fire ignitions. Several factors, however, have combined to greatly increase the potential for ignition and for adverse fire impacts to the ecosystem. First, grazing impacts have been removed from the park. As a result, fine fuel loading in all vegetation types has had approximately ten years to recover. In some areas, loading may be nearly as heavy as it might have been prior to overgrazing. Secondly, a maximum amount of heavy fuels has been allowed to accumulate due to lack of fires. When ignited, these fuels could result in much more intense fires than would have occurred naturally. Thirdly, visitation in the national park is escalating rapidly. It is highly probable that the park will be subjected to a notable increase in man-caused ignitions, many of which will occur under extreme environmental conditions, resulting in very large, intense, and fast-moving fires.

Several areas currently exist in the park where management fires are critically needed. Perpetuation of the relict mixed-conifer forest in the Bowl is dependent upon reducing understory fuels which have accumulated during a 50-year fire-free period. Extensive fire history research in the Bowl area, one of the park's noted features, revealed that the average interval between major fires for the period 1696-1966 was 17 years. Dense understory thickets now create the potential for catastrophic fire if ignition and critical fire weather coincide. Fuel loading reduction is also needed in the new developed campground at Pine Springs to minimize the ignition potential and provide for visitor safety. Restoration of natural grasslands in the low country west and east of the escarpment is also a concern. These areas have been invaded by dense patches of creosote bush (Larrea tridentata) and mesquite (Prosopis glandulosa) as a result of extensive livestock grazing prior to the establishment of the park. Finally,

the potential of wildfire occurring in the deciduous woodland of lower McKittrick Canyon presents a serious threat to this unique vegetation complex and to the water quality and biota of the creek, as well as to visitor safety. Additional research may be needed to determine the best means of utilizing fire as a management tool in these areas.

The Guadalupe Mountains present themselves as an outstanding topographic, climatic, and biotic phenomenon in west Texas. Elements of Rocky Mountain, Chihuahuan Desert, and Great Plains biotic communities are found within the park. Within these biota are a number of endemics as well as a variety of species either on, or proposed for inclusion on, the threatened and endangered species list. Many plants and animals represent relict populations or populations existing at the extremes of their range. Much of what is observed within the park communities may, in fact, be the result of climatic changes, which have been producing drying conditions and stress on a number of species associations. In such an environment, the proper management of fire may be crucial to the continued existence of many species and their habitat. Unnatural fire intensities and frequencies could produce impacts from which some species may not recover.

The park is presently operating under a Fire Management Plan approved in August 1985.

Alternative Actions and Their Probable Impacts:

1. No Action

Under this alternative, no fire management action would be taken. All ignitions, whether lightning or man-caused, would be allowed to burn. Such a program would be inconsistent with NPS policies, in violation of State regulations, and would pose a serious threat to human safety, park structures, natural and cultural resources. Conflicts could be expected when fires originating within the park burn across the boundary onto adjoining lands. Short fire return intervals and fires burning in heavy fuels under severe fire weather conditions may adversely affect vegetative communities, alter wildlife habitat, cause excessive erosion, and impair air quality.

2. Suppress All Fires

Attempts at continuing the suppression of all fires occurring in the park would perpetuate unnatural vegetation in ecosystems where periodic fire plays a natural role. Unnaturally high fuel loading would persist, increasing the potential for very hot, destructive fires. Suppression activities, including fireline construction and slurry retardant drops, would result in; visible scars where vegetation is removed, unnatural growth due to fertilization by slurry, soil erosion, and costly mobilization of trained fire personnel, equipment, and aircraft. Air quality impacts would probably be unacceptable if this alternative were adopted. Impacts on biotic communities and soils due to the inevitable occurrence of catastrophic fire would be unacceptable.

3. Allow All Natural Ignitions to Burn

All man-caused fires would be suppressed, but fires ignited by lightning would be permitted to burn, regardless of fuel, weather, or terrain factors. Suppression of natural fires would be initiated only to eliminate threats to human safety, developed areas, and cultural resources, or to insure that the fire stays within park boundaries. Fire would be restored as a natural component of park ecosystems. However, in areas where fuel loadings are unnaturally high, fires may burn very intensely, resulting in unnatural alteration of soil and vegetation cover. Without management consideration of fire weather and fuel loading factors, allowing all natural fires to burn could potentially result in some extremely hot, rapidly spreading fires which would be extremely difficult to control and which might impair local air quality, severely impact park ecosystems, and threaten public and private facilities and human safety.

4 Prescribe Conditions for Natural Fires

All man-caused fires would be suppressed, but fires ignited by lightning would be permitted to burn as long as they remain within the parameters of an approved prescription. Prescribed natural fires would be suppressed if they threatened human safety, developed areas, cultural or natural resources; or neighboring lands. Fire would be restored as a component of natural ecosystems, although the fire cycle interval would be controlled to some extent by human-imposed conditions. Most vegetative communities would not reflect the influence of natural fires occurring under severe fire weather conditions, since such fires would normally be suppressed. Without reduction of fuel loadings in areas of unnaturally high fuel accumulation, the potential would still exist for intensely hot, destructive fires. However, some lightning ignitions occurring under more extreme weather and fuel conditions might be allowed to burn under circumstances where fire spread could be contained by natural or man-made barriers, or other factors. Such an option would permit development of a more natural vegetative mosaic to include some areas impacted by more intense natural fire behavior. Natural prescribed fires would have short-term impacts on local air quality and may result in some soil erosion.

5. Use of Prescribed Fire to Meet Management Objectives

By adopting this alternative, the roles of fire would be restored to the park ecosystem using planned ignitions under prescribed conditions to meet management objectives. Prescribed fire would be utilized to reduce fuel loading, to restore native biotic communities, to manage fuel near facilities, park boundaries and other areas designated as critical; to manage endangered species habitat where appropriate, and to conduct fire research. Prescription parameters would include fire cycle interval, as well as other standard parameters. Fire would be quickly returned to the ecosystem, but not necessarily as a natural process. Since intervals between prescribed burns would be determined by man rather than nature, long-term natural vegetative changes related to fire return interval would be altered. In

consideration of manageability and human safety, prescribed burning would probably be conducted under less variable conditions than those in which natural fires occur. The emission of gases and particulates from prescribed fires would have a minimum impact on local air quality. Portions of the park would be closed to visitor use during periods of prescribed burning. A prescribed burning program would require a substantial increase in seasonal personnel and equipment costs.

Recommended Course of Action:

The recommended course of action is incorporate alternatives 4 and 5 into a sound fire management program.

(N-1-01) Management: Fires of natural origin and prescribed fires will be utilized as a management tool as long as they burn within approved prescription parameters. Prescribed fire will be utilized to reduce fuel loading, to manage fuel near the park boundary and developed areas, to supplement prescribed natural fires in areas where prescriptions are often exceeded, to manage endangered species habitat where appropriate; to restore natural biotic communities, and to conduct fire research. Fires burning within prescription will be suppressed only to insure human safety, to protect cultural resources and developed areas, or to contain fires within park boundaries.

In order to implement a program utilizing prescribed natural fire and prescribed management fire, the park will be divided into fire management, units based on vegetation types and geographic features in various areas of the park. A map designating the units will be part of the park's approved Fire Management Plan. The objective in managing natural fire units will be to eventually reestablish and maintain a natural fire regime. Although prescribed fire; may be used initially to restore fuels to a more natural condition or to reduce fuel loadings, eventually only natural prescribed fire will be utilized within appropriate natural fire units. Because of topography, and potential impacts on prime park features or lands outside the park, some units will have more restrictive prescription than others for prescribed natural or management fires. Such prescriptions shall consider the need to keep fires within park boundaries and the goal of eventually redesignating appropriate portions of these units as natural fire zones; as protection of key park resources can be assured. Suppression, containment, and use of prescribed fire will be management options in all units. A buffer zone will be established to protect lands outside the park, developed areas, and natural and cultural resources. Prescribed burning for fuel reduction or research purposed may be permitted in the buffer zone when conditions assure that lands outside the park boundaries will not be adversely affected.

Prescriptions will include variables such as fuel type, fuel loading, temperature, dew point temperature, relative humidity, wind speeds, soil moisture, duff moisture, time interval since last precipitation, fuel stick moisture values, fire return interval, and National Fire Danger Rating indices. Fire danger indices will be calculated from daily weather

observations at designated weather stations. Maximum use will be made of AFFIRMS fire management programs. The park fire management staff will make maximum use of developing programs and state-of-the-art technology and equipment in managing fire within the park.

(N-1-02) Monitoring: All prescribed natural fires and prescribed management fires will be monitored until declared out in order to document fire weather and predict fire behavior. Monitoring will aid in determining whether a fire is burning within prescription. Fire effects, both during and after burning, will be monitored to determine whether management objectives are being met, to refine existing knowledge of fire behavior, and to revise prescriptions.

Vegetation recovery; in designated burned areas will be monitored using photopoints, transects and other appropriate methods. Aid in monitoring, documenting, and interpreting fire effects will be solicited by contract with appropriate research facilities.

(N-1-03) Research: Though such studies should not be delayed development of fire management program at the park, an inventory of fuel loads, natural fire breaks, and slope of terrain should be undertaken to provide information critical to development of a successful prescribed fire program, and to development of appropriate fire management units. The product of such research would be a detailed map, or series of maps, depicting natural and man-made firebreaks, fuel types and quantities, and slopes.

Succession studies should be conducted on prescribed burn plots to determine if management objectives are being met, and whether prescriptions need to be refined. Additional research contracts will be solicited, as appropriated, to meet park fire management needs.

GUMO-N2-Backcountry Use

Statement of Issue:

The heart of the park - the high country and dissecting canyons of the Guadalupe escarpment - is rugged and undeveloped, providing outstanding scenery, diverse vegetation, and abundant wildlife. The approved Master Plan for Guadalupe Mountains National Park states the this area will be reserved for wilderness-type experiences including hiking, horseback riding, mountain climbing, and nature study.

In 1978, Congress established 46,850 acres of wilderness in Guadalupe Mountains National Park (60 percent of the total park acreage). The Wilderness Act of 1964, recognizes wilderness as an area "where the earth and its community of life are untrammeled by man." The Act specifies that wilderness areas will be administered to provide "outstanding opportunities for solitude or a primitive and unconfined type of recreation." The NPS Management Policies state that "in the management of wilderness resources and wilderness use, the Service will use the minimum tools necessary to successfully, safely and economically accomplish its management objectives." The specifics of backcountry management practices for the park, including the management of its designated wilderness, are detailed in the park's Backcountry Management Plan approved in 1984.

The park's backcountry includes approximately 73 miles of improved and unimproved trails. Prior to 1980, trails consisted largely of unplanned, unmaintained routes originating prior to the establishment of the park. Often these trails followed game paths or were the result of ranching and mining activities. Routes were frequently steep, narrow, and indistinct, and traversed fragile soil and vegetation zones, causing accelerated erosion. In 1979, a major development project to upgrade the park's trail system was initiated with the assistance of the Denver Service Center. By the end of 1984, approximately 60 miles of trail have been constructed and reconstructed. The work completed to date has been contracted to professional trail builders, and has focused primarily on ascent routes to the park's high country. The final phase of the park's trail development project, Phase IV, will be directed towards trails in the high country, and is scheduled for construction as soon as funding becomes available.

The Phase IV trail construction project is designed to be the final step in connecting the previous trail construction phases. Under this phase, the park will modify the present trail system, reroute some existing trails or delete those trails that are unmaintainable or unnecessary. Phase IV is designed to correct some existing problems with the present day trail system. These problems include:

(1) Trails that are impacting sensitive natural and cultural resources such as sensitive plants and archeological sites.
(2) Trails that are unmaintainable due to the terrain features, slope, and soil components. Some trails are built on solid rock, others are

very steep. Trails should met standards that state that 30 degrees is the steepest acceptable angle for safe visitor use. Switchbacks will be added to the trails to reduce steep angles.

(3) Trails that duplicate other routes or where the best views are not taken advantage of. Screening man-made scars and other trails should be considered.

(4) The establishment of designated campsites to protect the natural and cultural resources. This will reduce the number of campsites that are started by backcountry users who camp anywhere along the trail and impact the resources over a large area and through time.

At the completion of Phase IV, the park will have deleted approximately 18 miles of trail due to realignment, deletion and additions designed to upgrade the present trail system. The park will benefit from this by having a well maintained and safe trail system that can be used by backcountry hikers and horse travelers. The park will be able to properly maintain the trails at a higher level of maintenance, thus keeping the trail from being a massive rehabilitation project each time the trail is worked on.

There are currently three established trailheads in the park - Pine Springs, McKittrick Canyon, and Dog Canyon. A decision regarding the proposed establishment of an additional trailhead on the park's west side is pending, subject to the completion and approval of the recommendations identified in the 1980 Master Plan Supplement; one of which is the addition of approximately 10,000 acres on the park's west side.

Backcountry use has steadily increased in the park since 1971 when the area was first available, and it is anticipated that further increases will occur as a result of trail improvements. Backcountry opportunities, including day and overnight hiking, remain the major uses of the park. Although the rugged terrain, high summer temperatures, and absence of water serve as limiting factors, Guadalupe Mountains is becoming increasingly popular as a hiker's park. As is common in desert areas of the southwest, the Easter and Thanksgiving vacation periods are at least as popular as the summer months for backpacking activity.

Increasing numbers of recreational users concentrated in a limited area of designated trails and campsites will undoubtedly have some impact on physical and biological resources. Current park monitoring transects focus on quantifying indications of adverse impacts and overuse at campgrounds. In the late 1970's Dr. Ernest Fish, of Texas Tech University, established transects at various sites in the park to monitor the erosional impacts of recreational use and trail-related activities. Additional monitoring activities are needed to assess user impacts on vegetation, soils, and other critical resources.

Alternative Actions and Their Probable Impacts:

1. No Action

If no action is taken, policies and procedures established in the existing Backcountry Management Plan will not adequately address current problems, visitor use patterns, trail-related opportunities, and wilderness designations. Failure to implement specific policies for managing wilderness may lead to serious impairment of wilderness values, due either to employee ignorance or unintentional neglect. The impact of backcountry use on physical and biological resources will not be monitored, potentially resulting in disruption or change in natural ecosystem.

2. Complete Phase IV Trail Project

Complete Phase IV as described in the park's approved Backcountry Management Plan. Fully funded Phase IV would minimize damage to natural and cultural resources. It would provide for the easiest access and the best routes for both man and horse use. Scenic vistas would be part of the overall backcountry experience. Backcountry use would not impact such a large area, and use could be monitored. Man-made scars would not be as visible from certain points along the trail.

3. Update Backcountry Management Plan

The park's Backcountry Management Plan would be revised to reflect current visitation trends, problems, wilderness designation, and management direction. This would provide an up-to-date tool for managing backcountry use and protecting park resources, as well as a public document explaining park policies and procedures.

4. Establish Additional Visitor Use Monitoring Transects

Impacts of backcountry use on soils and vegetation would be monitored at additional locations throughout the park and at selected points along trails. Monitoring techniques would include transects, photopoints, and Code-a-Site inventories. Soil, wildlife, and vegetation would be critical indices in any monitoring scheme due to their susceptibility to impacts from concentrated visitor use. Data obtained from monitoring activities would be used to assess resource damage, determine restoration needs, evaluate management policies, and to revise the backcountry management plan, if needed. Such action would permit negative trends to be recognized before irreparable damage is done to park resources.

Recommended Course of Action:

The recommended course of action combines alternatives 2, 3, and 4.

(N-2-01) Management: (a) Complete the Phase IV trail construction project. A fully funded Phase IV would minimize damage to the resources, add a safe trail to the park trail system, and provide for a maintainable trail system. Scenic vistas would be added to visitor enjoyment. (b) Complete the routine update of the Backcountry Management Plan.

(N-2-02) Monitoring: A monitoring program to assess visitor use impacts should be initiated following the guidelines and objectives defined in the revised Backcountry Management Plan. Previously established erosion transects should continue to be monitored to evaluate long-term trends.

GUMO-N3 Backcountry Restoration

Statement of Issue:

An ecologically sound program is needed for restoring natural conditions in backcountry wilderness areas where evidence of ranching activity is still apparent. Metal tanks, pipeline, fencing, and abandoned equipment remain from prior ranching use of the high country before the park's establishment. Abandoned roads, trails, utility corridors, and construction sites also cause surface disturbance.

Alternative Actions and Their Probable Impacts:

1. No Action

If no action is taken to restore disturbed sites, natural recovery can be expected to be a very slow process due to the region's arid climate. Wind and water erosion on exposed sites may further aggravate disturbed conditions. Exotic plant species are likely to dominate. Failure to remove man-made objects would detract from the naturalness and aesthetic quality of the area.

2. Implement Site Reclamation Program

Man-made objects and debris would be removed, natural grades and soil layers restored, and native plant species transplanted or seeded in barren areas. This would reduce the likelihood of exotic vegetation and soil erosion, and hasten the return to a natural condition.

Recommended Course of Action:

(N-3) Management: Alternative 2 should be adopted to insure that disturbed areas are restored as quickly as possible to their natural condition. Metal tanks, water pipes, and cross-fencing should be removed. Soil and vegetation should be restored in disturbed areas if natural recovery does not occur within a reasonable period.

GUMO-N4 Cave Protection and Use

Statement of Issue:

The Guadalupe escarpment of southeast New Mexico and west Texas is known for its diverse and spectacular cave resources. Approximately 200 caves have been identified in the escarpment, and geological evidence indicates that more remain to be discovered. Currently, twenty-one caves are known to exist within Guadalupe Mountains National Park.

The caves of the Guadalupe Mountains are characterized by being large in volume but small in surveyed linear distance. Glori Cave is currently the largest known cave in the park with approximately 600 feet of surveyed passage. The park's caves are generally dry, but many are decorated with delicate speleothems. Cave resources are essentially non-renewable and are particularly susceptible to human disturbance. Conversely, there is tremendous potential for human injury due to slippery substrates, sharp rocks, deep pits, and pathogenic organisms associated with caves.

The National Park Service Management Policies state that:

> "The National Park Service will manage caves for the perpetuation of their natural, geological and ecological conditions, and historic associations.... Caves, or portions of caves, may be closed to public use or restricted to access by conducted tours when such actions are required for human safety and the protection of cave resources."

In the past, few park visitors have known that caves exist in the park, and discovery was unlikely due to remote cave locations and rugged terrain. However, with recent improvements in park trails, several caves are now relatively accessible. Improved access coupled with increased backcountry visitation may lead to a greater incidence of visitors discovering caves and wishing to enter them. Access to park caves has been prohibited, except for approved scientific or educational expeditions and for minimal administrative needs. In recent years, however, recreational cavers, caving organizations, and park visitors have expressed an increased interest in gaining access to wild caves administered by Federal land management agencies.

In May 1984, a Cave Management Plan was approved for Carlsbad Caverns and Guadalupe Mountains National Parks. The plan is based upon the following management objectives:

(1) Protect and perpetuate natural cave systems.
(2) Provide educational and recreational opportunities for a broad spectrum of park visitors (from the casually curious to the avid caver) to discover, study, respect, and enjoy the park's caves at their individual levels of interest.
(3) Provide opportunities for scientific study of cave resources and systems.

(4) Classify caves in management categories based on their resources and hazard characteristics.
(5) Establish regulations, guidelines, and permit stipulations that ensure maximum safety for the cave visitor and preservation of park resources.

The plan institutes a major new management direction by allowing public entry in designated wild caves. A classification system is used to specify the management category, resource class, and hazard rating of each known cave. Based upon these classifications, two wild caves in Guadalupe Mountains National Park will initially be opened to regulated visitor use. All wild cave trips will require a permit. The options remain for opening additional wild caves to public use and for requiring accompaniment by an NPS trip leader, depending on the success of the initial program.

The cave management plan also: establishes procedures for inventorying and maintaining files for all known caves, contains programs for monitoring, protecting, and restoring cave resources, outlines provisions for cave entry for research purposes, identifies training needed by staff involved in cave search and rescue, interpretation, and wild cave trips, and describes a delineation of staff responsibilities.

Recommended Course of Action:

(N-4-01) Management: Implement the Cave Management Plan. All known caves will be inventoried by the parks' Cave Specialist. A visitor information packet will be compiled for each cave designated for regulated public access. The packet will include access instructions, a cave map, safety warnings, and regulations. These packets will be provided to visitors upon approval of their cave use permits.

Complete annual revisions of the Cave Management Plan. The programs and policies established in the plan will be reviewed to determine their effectiveness and manageability. Data received from photopoint monitoring, trip reports, and case incident reports will be reviewed to assess problems and potential solutions. Recommended plan revisions will be developed and submitted to the Regional Director for approval.

(N-4-02) Monitoring: Fixed photopoints will be established in wild caves designated for regulated visitor entry. Photographs will be taken from these points prior to implementation of the wild cave access policy, and periodically thereafter, in order to detect cave alteration or disturbance resulting from visitor use.

GUMO-N5 Preservation of McKittrick Canyon

Statement of Issue:

The McKittrick Canyon area of the park is highly prized for its scientific, scenic, and educational values. Wallace Pratt's donation to the NPS of 5632 acres at the lower end of McKittrick Canyon served as the initial catalyst in the establishment of Guadalupe Mountains National Park.

McKittrick Canyon supports a unique and isolated aquatic ecosystem in the midst of an arid region. It is the most mesic and extensive system within the Guadalupe mountain range and includes representative populations of numerous rare and endemic species. The shaded, moist, secluded habitat provided by McKittrick Creek is especially significant because of the relative scarcity of perennial streams in the area. The aquatic fauna of McKittrick Canyon is generally typical of more northerly, spring-fed streams, supporting the theory that McKittrick represents a relict biota left in isolation by the northerly retreat of montane climates. McKittrick Creek and its several associated springs and seeps produce a moderation of the canyon climate, permitting the occurrence of more water-dependent terrestrial species.

In addition to its unique biotic associations, the geologic resources of McKittrick Canyon are one of the park's principal features. The canyon cuts squarely across the axis of the Capitan barrier reef, revealing a graphic display of the reef structure. Although there are other Permian-age fossil barrier reefs in the world, few are so well exposed and accessible. The classic reef exposure at the mouth of McKittrick Canyon attracts geologists from all over the world.

Extensive research has been conducted in McKittrick Canyon. Dr. Owen Lind of Baylor University has been conducting limnological investigations in McKittrick Creek since 1968. Dr. Ernest Fish and his associates from Texas Tech University have completed a comprehensive hydrological inventory of the McKittrick watershed. Vegetation studies by Frederick Gehlbach, David Northington and Tony Burgess have identified rare and endemic plant species. Limnological, hydrological, and botanical studies all reveal that McKittrick Canyon is particularly vulnerable to human impacts. Prior to the establishment of Guadalupe Mountains National Park, the isolation of McKittrick Canyon protected it from significant human disturbance. The area was maintained virtually as a wildlife refuge by its former owners. Now the canyon is highly susceptible to human disturbance due to its scenic appeal, accessibility, and the limited extent of its inviting riparian habitat. The steep canyon walls and narrow floor concentrate visitor activities in a relatively small area. Addressing this vulnerability, the approved Master Plan and Backcountry Management Plan state:

> "Use of McKittrick Canyon will be carefully controlled to ensure that this fragile biological area is not destroyed. Access will be by road

and private automobile to the mouth of the lower canyon. Only day use will be allowed."

The McKittrick drainage actually consists of three parts: South McKittrick Canyon, North McKittrick Canyon (which extends into the Lincoln National Forest), and below the confluence of the two, the main canyon. The most critical areas in terms of sensitivity to human impacts are South McKittrick Canyon between Turtle Rock and the Narrows, and the south fork of North McKittrick Canyon which contains a series of pools, seeps, and well-developed terraces. The principal water source of North McKittrick Canyon originates on the Lincoln National Forest. Recognizing that the park's limited riparian vegetation and aquatic habitat could be jeopardized by uncontrolled use or water diversions in the upper canyon, the U.S. House of Representatives' committee report recommending establishment of the park included the suggestion that:

> "...there be very close cooperation between the Forest Service and the National Park Service in preserving (McKittrick Canyon) as nearly as possible in its natural condition so that students of geology, botany, and zoology, as well as other visitors to the area, may have the full benefit of this bit of wilderness. Indeed, it would be highly desirable for the two agencies to provide a unified administration for this canyon area."

The park has entered into a Memorandum of Understanding with the Lincoln National Forest for joint management of North McKittrick Canyon.

McKittrick Canyon serves as one of three major access points to the park's high country. This draws increasing numbers of backpackers into the canyon, although camping is not allowed until one ascends to the ridge top. As part of the park's recent trail development program, the trail ascending from the floor of South McKittrick Canyon to McKittrick Ridge was relocated in 1980 to curtail hiking activity in the critical canyon bottom area. Visitors access to sensitive areas above Turtle Rock and in North McKittrick Canyon is restricted by the lack of designated trails.

The introduction of exotics to the delicate McKittrick ecosystem is a critical concern. Horse use is prohibited in the canyon to minimize potential sources of exotic seed, as well as to reduce vegetation trampling. It is reported that there were no fish in McKittrick Creek when it was first observed by Wallace Pratt in 1921. It is believed that since that time, and prior to the establishment of the park, three species of fish were planted in the stream: yellow-belly sunfish (Lepomis auritus), green sunfish (L. cyanellus), and rainbow trout (Salmo gairdneri). Although severe flash floods occasionally scour the canyon, demolishing the impermeable travertine floor and dikes, fish are still present in the larger pools.

Preservation of the natural integrity of the McKittrick drainage is dependent on long-term monitoring programs to detect changes associated with human use. Although much baseline information has been obtained since 1968,

opportunities for scientific discovery and increased knowledge of the ecosystem still exist.

Alternative Actions and Their Probable Impacts:

1. No Action

If no action is taken, existing management policies for McKittrick Canyon will continue. These include: controlled access to the canyon; day use only; prohibition of vehicle and stock use; limitation of developed trails to the higher areas of the watershed; visitor use monitoring; a resident ranger at the Pratt Cabin during the high use period; and cooperative management with the Lincoln National Forest. While these measures and policies will restrict the type of use that occurs in the canyon, they fail to provide a systematic means of detecting progressive or cumulative changes in the McKittrick ecosystem that may be associated with human activities.

2. Monitor Changes in Stream Community Structure

A program designed to monitor species composition and population densities would be initiated to detect changes in the natural stream ecosystem associated with human use. Community structural changes would provide a means of detecting stresses that may not be identified if only chemical or physical water parameters were monitored. Such a program would involve regular sampling of benthic insects, diatoms, and protozoans, as well as measurement of select water quality parameters. Effective monitoring would require a long-term commitment of manpower and funding, as well as technical training for the personnel involved.

3. Monitor Water Quality

Physical and chemical parameters would be monitored in McKittrick Creek to determine trends in water quality. This would provide general information on the quality of water for aquatic life and human consumption, and would indicate possible changes associated with increasing visitor use. However, it is possible that stresses on the aquatic ecosystem would be detected if biologic parameters would be monitored. This could be accomplished with a Hach kit using standardized methods, and the sampling procedure would require minimal technical expertise.

4. Remove Exotic Fish Species

If it is determined by ichthyologists that existing populations of yellow-belly sunfish, green-gill sunfish, and rainbow trout in McKittrick Creek are exotic, these fish would be removed from the stream in the most biologically acceptable manner. Efforts would then be made to determine the species composition of native fish and re-establish these wildlife to the stream if feasible to do so.

Recommended Course of Action

A program to preserve the unique resources of McKittrick Canyon should include alternatives 1, 2, 3, and 4. In addition, sound and carefully regulated research activities should be encouraged to aid in the knowledge and understanding of the aquatic ecosystem.

(N-5-01) Management: Existing policies governing visitor and administrative use of McKittrick Canyon should be continued. These policies should be formalized in the revised backcountry management plan (see GUMO-N2 Backcountry Use) to minimize incidents resulting from visitor or employee ignorance, or from selective enforcement of regulations. Cooperative management of North McKittrick Canyon with the Lincoln National Forest would continue, and a greater effort should be made to familiarize Forest Service personnel with visitor use and research activities, and significant resources in the joint management area.

(N-5-02) Monitoring: Water quality parameters should be monitored in McKittrick Creek using the sample sites and methodology established by D. H. Dasher in 1979, and continued in 1980 by Dr. Ernest Fish. The Hach DR-EL/4 field analysis water quality test kit should be utilized to measure the following parameters: temperature, pH, nitrate-nitrogen, orthophosphate, sulfates, chlorides, dissolved oxygen, total hardness, and calcium hardness. Monitoring should be viewed to detect significant changes or trends. Professional assistance should be contracted on a periodic basis, if needed, to analyze and interpret the accumulated data.

When funding and manpower permit, monitoring activities should be expanded to include biological parameters in order to detect structural changes in the stream community. Prior to the implementation of such a program, it will be necessary to complete additional research investigations.

(N-5-03) Research: A biological researcher should be contracted to develop a monitoring system to detect changes in stream community structures. Baseline data should be obtained to determine species composition and population densities, focusing on benthic insects, diatoms, and protozoans. A reference collection of major species should be prepared for the park. A sampling program should be developed, and a park employee trained to assume monitoring responsibilities upon termination of the research contract.

Contact professional ichthyologist to ascertain, within reasonable limits, the suspected exotic status of existing fish species (sunfish and trout). Remove these animals from the ecosystem if and when exotic status is established and reintroduce native fish species if feasible.

GUMO-N6 Surface Water Resources

Statement of Issue:

Water is a rare and valuable resource in the park. The park's water resources are in a fragile balance with the surrounding desert environment. Any activity or event that adds nutrients to the water or damages riparian communities may disturb this critical balance. Protection of limited water resources must be a primary consideration in the development and management of the park.

Surface water resources in the park include permanent and intermittent springs, seeps, and one perennial stream. The stream, McKittrick Creek, and its associated springs are addressed in a separate project statement (see GUMO-N5 Preservation of McKittrick Canyon). Natural aquatic system were significantly altered prior to the establishment of the park. Major springs were developed for domestic or ranching uses as evidenced by pipelines, earthen and metal tanks, guzzlers, and spring houses. There was also extensive development of artificial watering sources utilizing wells and rainfall to supply tanks for watering livestock. A few of these artificial sources have been maintained by the park for wildlife use; the remainder have been slowly disintegrating (see GUMO-N3 Backcountry Restoration).

An inventory of water resources was conducted in 1969 by the U.S. Geological Survey, and water quantity and quality of springs and wells was determined. Additional information on the chemical water quality of Smith, Manzanita, Choza, and Upper Pine Springs was obtained by Dr. Owen Lind in 1971. In 1975, the Texas Water Quality Board conducted a study of chemical and bacteriological quality of Frijole, Guadalupe, Smith, Manzanita, Choza, and Upper Pine Springs. An extensive sampling scheme for water resources was designed and implemented in 1979 by researchers from Texas Tech University. Sampling locations include nine sites in McKittrick Canyon and five major springs -- Smith, Manzanita, Choza, Frijole, and Upper Pine. Sampling methods and locations were designed to permit long-term monitoring of select water quality parameters. In 1980, sampling was continued at these sites by Texas Tech personnel. Water quality data collected in these studies indicate that visitor use is not currently resulting in a significant impact on park springs.

The natural chemistry of water in the park is closely associated with the sedimentary geology of the area. The park's limestone substrate is reflected in a well-buffered calcium carbonate-magnesium carbonate system. Decomposition of organic material also contributes significantly to the chemical character of the water, although nutrient levels of nitrate-nitrogen and ortho-phosphate have not been found to be excessive. Dissolved solids and nutrients resulting from flooding and erosion also affect the water chemistry.

Alternative Actions and Their Probable Impacts:

1. No Action

If no action is initiated, man-made or developed water sources will continue to interfere with natural ecological processes. Without a long-term monitoring program, changes in the water quality of park springs will not be detected, potentially resulting in alteration of aquatic ecosystems and in human health hazards. Impacts of increased visitor use on surface water resources would not be systematically evaluated.

2. Monitor Springs

Water quality and visitor use impacts at major park springs would be regularly monitored to determine seasonal and long-term trends. Sampling sites and methodologies established by Texas Tech University researchers would be utilized to insure comparable and reliable data. The information obtained would permit early detection of any adverse impacts or threats to the park's surface water resources and would aid in park planning and management. The long-term accumulation of water quality data would provide for a correlation of different levels of visitation with water quality parameters.

3. Restore Natural Aquatic Systems

Water sources which have been destroyed, modified, or developed for uses other than human consumption would be restored to as natural a condition as possible. This would mitigate human disturbance of aquatic systems, whether the disturbance results from current activities or remains from historic ranching operations. Such action may result in short-term stress or reduction of wildlife populations utilizing man-made water sources, but would eventually restore a natural ecological balance.

Recommended Course of Action:

Alternatives 2 and 3 combined with the monitoring program recommended in GUMO-N3 Preservation of McKittrick Canyon will provide a comprehensive program aimed at restoring and preserving natural aquatic systems.

(N-6-01) Management: Natural springs that have been disturbed, modified, or developed for needs other than human consumption should be restored to the extent feasible. Restoration activities should include removing or dismantling tanks, check dams, and artificial catchment basins that hold or impede water flow; removing debris and organic wastes originating from human sources; and imposing temporary closures to allow natural recovery in heavily impacted areas.

(N-6-02) Monitoring: Water quality should be monitored on an annual basis at Manzanita, Smith, Frijole, Choza, and Upper Pine Springs utilizing the sampling methodology established in the Texas Tech studies. Physical and

chemical parameters, including temperature, pH, nitrate-nitrogen, ortho-phosphate, sulfates, chlorides, dissolved oxygen, total hardness, and calcium hardness, should be measured with a Hach DR-EL/4 water quality test kit. Vegetative conditions around springs should also be monitored, utilizing photopoints and transects. Data should be recorded and reviewed annually to determine trends or significant changes in the measured parameters.

GUMO-N7 Monitor Ungulate Herds

Statement of Issue:

Mule deer (Odocoileus hemionus) have been the major forage consumer in the park since livestock use ended in the 1960's. There has been a longstanding concern about how to manage the deer population at an optimum level while minimizing damage to park vegetation. Indications of range overuse by deer in the early 1960's raised numerous questions about deer-range relationships, and led to a five-year research program designed to provide information on the status of the Carlsbad Caverns National Park deer population and to evaluate the effects of the deer herd on vegetation. Extended research resulted in the following determinations:

1. The park deer population had not reached such size as to seriously damage its range.
2. Choice browse species, while often heavily utilized, were not being destroyed by deer.
3. Climatic conditions generally have a greater effect on browse species in the park than deer do.
4. The narrow width of the park and scarcity of available water influence deer movement between the park and adjacent National Forest, BLM, and private lands.
5. Increased hunting pressure adjacent to the park boundary could play a significant role in control of the park deer population.

Additionally, 24 vegetation transects were established in both Carlsbad Caverns and Guadalupe Mountains National Parks as part of an interagency browse analysis begun in 1972. It was recommended that the browse transects should be read at five to ten-year intervals.

The status of the park's deer and elk populations are interrelated with a number of other resource management concerns, including: (1) the availability of water; (2) the impact of hunting outside the park boundary; (3) the balance of predatory animal populations; (4) the condition of browse species; and (5) competition for forage with other ungulate species.

From 1972 through 1986 the park has been engaged in a national controversy concerning the relationship of mountain lions and livestock depredations on adjoining lands. A basic contention of those seeking to kill lions in the park was that these animals had depleted their natural prey base, mule deer and elk were subsequently forced to feed on nearby livestock. Beyond the very general data gathered from pellet-group transects collected at Carlsbad Caverns (which, when graphed, showed a deer population trend peaking in the early 1970's and a subsequent decline which began to level off by the early 1980's) the park had no information to prove or disprove this contention.

In October 1985 the park completed its Mountain Lion Management Plan which described four management actions the NPS intended to implement in response to the lion issue. Principal among these was the establishment of an

ungulate monitoring program (methodology) which would enable the park staff to annually generate statistically reliable data to determine population trends for its deer and elk herds. Work on this project, developed under a cooperative agreement with Texas A&M University, began in early 1987 and is scheduled for completion in September 1988.

The status and management of an introduced herd of Rocky Mountain elk (Cervus elaphus nelsoni) in the park has also received considerable attention in recent years. These elk occupy a portion of the former range of the extinct Merriam's elk (C. e. merriami), a subspecies which evolved in the semi-arid evirons of the southwest. Merriam's elk was common in the Guadalupe Mountains in the 1890's, but was extirpated from its entire range by 1900. Hunting activities and the introduction of domestic livestock contributed significantly to the disappearance of this subspecies.

The herd of Rocky Mountain elk presently inhabiting the Texas and New Mexico portions of the Guadalupe Mountains are direct descendants of 45 elk released in McKittrick Canyon in 1929 by former landowner J.C. Hunter. The elk were transplanted from northern ranges in South Dakota and Wyoming. The mountains of northern New Mexico are considered the southern limit of the historic range of Rocky Mountain elk.

The introduced herd grew steadily from 1929 until the late 1950's, when the population peaked at approximately 350 animals. This was followed by a stable period until the late 1960's, when the population began to decline. Estimates obtained from extensive investigation of the herd by Texas Tech University researchers indicated a resident population of 125 elk in 1978 and a subsequent survey funded by the NPS indicated the 1984 population to be approximately 70 to 80 animals.

The decline of the elk population coincides with the establishment of the park and can be attributed to a variety of limiting factors, the most significant being the availability of water. Prior to the establishment of the park in 1972, the area was used for livestock grazing and ranching operations. Six earthen tanks were constructed and an elaborate system of pipelines and metal tanks was developed to pump and store water for livestock needs. Authorization of the park and subsequent acquisition of ranch lands led to a new land use pattern. Man-made water catchments and developments have generally not been maintained or operated by the park. The elimination of artificial watering sources is consistent with NPS Management Policies, which stress that "resources management must seek to avoid unnecessary alteration of the natural scene or interference with natural processes." Aside from the reduction in man-made water sources, an analysis of historic precipitation data reveals that the area has experienced a drying trend during this century. This trend may have eliminated the niche vacated by the extinction of Merriam's elk. Thus, the question is raised whether suitable habitat remains for the introduced elk without artificial manipulation.

In the past, public sentiment has played a role in the park's management of the resident elk herd. Local residents would understandably like to have the

herd restored to a status where it can be hunted again. A critical lack of understanding or acceptance of the NPS mandate to perpetuate natural ecological processes has been evident both among the public and, to a lesser degree, the state wildlife management agencies.

Alternative Action and Their Probable Impacts:

1. No Action

If no action is undertaken, it will not be possible to detect future changes in the park's mule deer and elk populations or browse conditions. This may eventually lead to habitat destruction if the ungulate population exceeds the carrying capacity of the range. The lack of a consistent deer and elk census technique would necessitate a reliance upon opportunistic observations and subjective judgments both in making management decisions, and in providing input to the State regarding hunting activities outside the park. Information needed to defend against future criticism of the lion management program will remain unavailable to park managers.

2. Continue Current Census Techniques

Semi-annual monitoring of deer and elk pellet-group transects, combined with monthly deer counts along an established route, would provide a means of monitoring general trends in the park's ungulate population at specific limited locations in the park. Although these techniques could not be used to establish specific numbers of deer and elk in the population, they would be useful in detecting changes in range use at the transects sites. Transect data would allow both a limited year-to-year comparison and a comparison of use trends in geographical sectors of the park. The supplementary data provided by monthly counts would indicate seasonal changes in range utilization in a more limited geographic area.

3, Implement Texas A&M Ungulate Monitoring Program

Provide manpower and funds to implement the monitoring strategies developed by Texas A&M researchers. This includes the establishment of various transects and the use of radio-telemetry equipment to monitor home range and movement patterns of the park's ungulate herds.

Recommended Course of Action:

Implement Ungulate Monitoring Program.

The methodologies and techniques developed by the Texas A&M research contract will be implemented by the park staff as an annual resources management effort. These techniques may include a combination of pellet-group transects, browse survey, time utilization transects and radio-telemetry monitoring. All monitoring data will be incorporated into an appropriate computer program and made available to all interested parties.

The NPS will provide the USFS, the BLM, the New Mexico Department of Game and Fish, and the Texas Parks and Wildlife Department with all information upon request and attempt to cooperate with all local agencies during each phase of the monitoring project. This will include informal contacts with representatives of these agencies and attendance at appropriate interagency meetings in order to share these data.

GUMO-N8 Predator Populations

Statement of Issue:

In 1986 the NPS completed a 10-year effort of managing the mountain lion "problem" at Carlsbad Caverns and Guadalupe Mountains National Parks. This effort culminated in the completion of a 3-year contract research project entitled: "Ecological Study of Mountain Lions in the Vicinity of Carlsbad Caverns National Park, New Mexico and Guadalupe Mountains National Park, Texas" and the subsequent release of specific NPS management recommendations in the Mountain Lion Management Plan and Environmental Assessment.

These documents summarized the lion issue (as it was interpreted by local individuals complaining about lion depredations on livestock) and presented the public with ecological data concerning home ranges and movements, sex and age information for the regional lion population, and an analysis of food habits for these animals. They further translated the research data into a set of four management recommendations the NPS would pursue in response to the lion issue. These recommendations included:

- The continued protection of mountain lions within the boundaries of the two national parks.
- The continuation of the parks' lion population monitoring effort.
- The initiation of an ungulate monitoring project.
- The recommendation for the development of an interagency task-force to share collected data.

As a result of public comments, the NPS has implemented all elements of the plan except the task-force recommendation. Outside the national parks, the destruction of mountain lions by ranchers, sportsmen, the New Mexico Department of Game and Fish, the Department of Agriculture's Animal and Plant Health Inspection Service, and illegal killing activities continues at unknown levels.

Alternative Actions and Their Probable Impacts

1. No Action

No action on the part of the NPS will result in a recurrence of the mountain lion issue as the population of this animal is influenced (raises and falls) by ecological and man-caused factors. The NPS will not have sufficient information to understand normal (natural) population fluctuations and to defend these animals against man-caused influences.

2. Continue Communication With All Parties Involved With the Lion Issue

The park staff needs to make a concerted effort to maintain communication with all parties in the lion issue including local ranchers, State and Federal land managers, the environmental community, and the regional media. This effort is needed to dispel rumors of possible secret activities being

conducted by the park and to solicit the sharing of information needed in NPS monitoring efforts.

3. Continue Monitoring Program

The NPS should implement the lion monitoring effort identified in the 1986 Mountain Lion Management Plan. This should include the continued monitoring of those cats fitted with radio-collars during the 3-year research project and the initiation of a comprehensive monitoring system to determine annual lion population trends. The population trend project will be designed and developed by a research institution qualified for this work. The park staff would be expected to conduct the annual field surveys once the project is accepted.

Recommended Course of Action:

(N-8-02) Monitoring: Carry out a monitoring program for those lions fitted with radio-telemetry collars as part of previous years' research efforts and implement the long-term population trend monitoring program in both national parks.

(N-8-03) Management: An affirmative effort should be made to improve communications with park neighbors, and to expand community education programs. Support and cooperation with State and Federal predator control programs should be demonstrated within the legal constraints and mandates of the NPS.

GUMO-N9 Vegetation Utilization by Ungulates

Statement of Issue:

One of the significant features of the park is its unique vegetative mosaic, containing relict plant species from both the Rocky Mountains and Chihuahuan Desert flora. A large number of these relict plant species are considered important forage plants for mule deer (Odocoileus hemionus) and elk (Cervus elaphus nelsoni) occurring in the park. Due to the uniqueness of the park ecosystem, the interrelationship of ungulate populations with vegetative resources is a critical concern.

Approximately 60 years of intensive livestock grazing prior to the establishment of the park resulted in serious deterioration of range conditions. An estimated 4,000 goats and sheep grazed the area at the peak of ranching operations. Most domestic livestock were removed by 1970, when NPS land acquisition was completed. However, vegetative recovery in the fragile, semiarid park ecosystem takes many years.

In 1973, a browse survey was conducted in the park to inventory and map vegetation types and to determine conditions and trends in key wildlife browse areas. Survey work was completed by park personnel utilizing procedures developed in New Mexico for interagency big game habitat and analysis. Forty-nine transects were established in the park, representing four wildlife ranges: the high country, the Dog Canyon area, the east escarpment, and the west side. Evidence of heavy livestock use was still apparent during the survey, but range condition was rated medium to medium-high and an upward trend was indicated.

From 1976 to 1979, researchers from Texas Tech University were involved in extensive field investigations of ungulate populations and habitat utilization in the park. As part of this research, 37 of the browse transects established in 1973 were re-surveyed in 1979. The survey revealed that preferred browse species were being heavily utilized by mule deer and elk, allowing poor browse species to increase in abundance and diversity. Good browse species near permanent water sources showed particularly heavy use, but condition improved as distance from water increased. Poor browse species showed only light utilization, representing a virtually untapped food resource. As a result, ungulate populations could deplete preferred browse plants and switch to the less desirable species without any apparent population decline. This poses a serious threat to the park's unique vegetation complex. Increased utilization of the less desirable browse species will provide an indication of progressive declines in the range conditions.

Pellet-group transects have been established in the park to provide information on mule deer densities and population trends. Twenty-nine transects were established in the 1960's and early 1970's. The use of pellet-group transects for monitoring deer trends was instituted by former park biologist Walter Kittams. Although it was recommended that transects be

read semiannually in April and October, actual monitoring activities in the park have been somewhat irregular. Currently there is some question of the value of continuing pellet-group monitoring. If monitoring is to be continued, a standardized schedule needs to be developed for reading the transects and reporting the results.

Alternative Actions and Their Probable Impacts:

1. No Action

If no action is undertaken, it will not be possible to correlate future changes in the park's ungulate populations with impacts to park vegetation communities. This may lead to habitat destruction around permanent water sources, vegetation change, and possibly an ungulate die-off if the forage becomes so depleted that population carrying capacities drop. In the long term, this would restore a natural balance between forage resources and ungulates. In the process, however, unique plant species may be lost and the aesthetic quality of the park impaired. The lack of systematic monitoring programs would necessitate a reliance upon opportunistic observations and subjective judgements in managing these resources.

2. Monitor Browse Transects

Periodic re-surveying of the browse transects established in 1973 would provide current information on the condition, trend, and use of various vegetative components of the park ecosystem. Such an analysis of browse utilization would provide data necessary to determine if ungulates have depleted preferred species and switched to less desirable forage resources. Browse survey analysis would provide a critical tool in determining whether control measures are necessary to reduce the park's mule deer population. Evidence of a progressively downward trend in range condition supports the need for a browse survey every 5 to 10 years. A re-survey of the established transects would require additional staffing or contract personnel on a short-term basis.

Recommended Course of Action:

(N-9) Management of ungulate populations should focus on continuous monitoring of vegetation conditions to detect possible browse over utilization (Alternative 2).

Monitoring: All established browse transects should be re-surveyed in FY 87-88 to determine current conditions, trends, and use of park vegetation. In addition, select transects located near critical wildlife water sources should be monitored annually to detect increased utilization of the less desirable browse species. Transect data should be evaluated to determine whether changes in the vegetation complex indicate a need for management action to regulate ungulate populations. Park staff should be trained to identify browse species and read transects near water sources, but the extensive survey of all transects should be accomplished with contract

personnel. All monitoring work will be coordinated with the on-going ungulate monitoring project identified in GUMO-N7.

GUMO-N10 Threatened and Endangered Species

Statement of Issue:

The existence, or possible existence, of federally listed threatened and endangered species in the park necessitates special management efforts beyond the broad objective of preserving natural ecosystems. The 1973 Endangered Species Act, amended in 1978, provides a single, notable exception to NPS policies of managing for the perpetuation of systems and processes, rather than individual components of ecosystems. The diminished numbers and often unstable existence of listed plant and animal species make them very susceptible to habitat alteration. Within the park, habitat alteration is generally a result of construction projects but may also be caused by visitor use, maintenance activities, or resource management programs (e.g. prescribed fire, expansion or deletion of unnatural floral or faunal populations).

The Endangered Species Act requires full protection of listed threatened and endangered species. Currently the park contains four endangered species: (1) the Sneed's pincushion cactus (Coryphantha sneedii var. sneedii) which grows on limestone ledges at relatively low elevations, (2) the Lloyd's hedgehog cactus (Echinocereus lloydii) which grows only at low elevations on the park's western side, and (3) the McKittrick pennyroyal (Hedeoma apiculatum) which grows on limestone ledges at higher elevations in the park. The fourth species, the Peregrine falcon (Falco peregrinus anatum) nests in higher elevations of the park (see GUMO-N11). The USF&WS has provided recovery plans for each of these species and the park is now working to implement the management recommendations in each of these plans.

In addition to officially designated threatened and endangered species, the NPS Management Policies state that, "Plant and animal species considered to be rare or unique to a park shall be identified also and their distribution within the park mapped." A list of restricted plant species in the park has been prepared to include: (1) species endemic to the park or surrounding area; (2) species with limited distribution in the state or the park itself; and (3) species near the geographical limits of their known occurrence. Although the park does not affirmatively manage for these species, they are given special consideration to insure that they are not adversely affected by park operations or unjustified collection.

In September 1985, the Federal Register listed over 3,000 plants "under review" for threatened or endangered status. These species have no legal protection afforded them as yet, but should be considered in biological assessments for any proposed development or construction projects due to the possibility of future protected status. At least twenty of the species "under review" have been identified in the park, but without a thorough field survey, it is not known whether additional species in this category also occur. Often species not previously known from a particular state are found in national parks because of the unique habitats they possess. Guadalupe Mountains National Park is known for its rare endemic, and unique plant species occurring in delicate habitats produced by diverse topographic

and edaphic conditions. In order to avoid future conflicts there is an urgent need for accurate, descriptive inventories of species "under review," "proposed," or "listed" as threatened or endangered, and for identification of critical habitat requirements.

Alternative Actions and Their Probable Impacts:

1. No Action

If an effort to identify species "under review," "proposed," or "listed" as threatened or endangered is not undertaken in the park, it will not be possible to accurately assess the impacts of construction or development projects on these species. If, at a later date, a legally protected species is found within a disturbed or developed area, the park would have to take action to mitigate any adverse impacts. In an extreme case, this could entail a closure, a change in construction plans, or timely delays in ongoing projects.

2. Inventory Rate Plant Species

A detailed field survey of the occurrence and distribution of species "under review," "proposed," or "listed" as threatened or endangered, would provide an accurate data base for management decisions and for the preparation of future biological assessments. Such an inventory would preclude the need to contract a field survey every time the park proposes a construction or development project.

3. Consultation with U.S. Fish and Wildlife Service

Initiation of USF&WS consultation proceedings as early as possible in the planning process for park construction and development projects will allow for a knowledgeable assessment of potential impacts on protected species without causing project delays. This action would fulfill the requirements of the Endangered Species Act.

Recommended Course of Action:

A management program for threatened and endangered species should combine alternatives 2 and 3.

(N-10-01) Management: Consultation with the USF&WS should be initiated as early as possible in the planning process for any park projects required to undergo endangered species clearance. This may entail the preparation of a biological assessment for "proposed" or "listed" species occurring in the project area.

(N-10-02) Monitoring: The status of known populations of threatened or endangered species should be monitored on a regular basis. Monitoring efforts should be most intensive during park visitation periods. If

continued monitoring indicates more adverse impacts are resulting from current management policies, protection measures should be initiated. All sightings of species "under review,' "proposed," or "listed" should be recorded.

(N-10-03) Research: A reputable botanist should be contracted to conduct a survey in the park to determine the occurrence and distribution of plant species "under review," "proposed," or "listed" as threatened or endangered, and to identify critical habitat requirements.

GUMO-N11 Peregrine Falcon Management

Statement of Issue:

The American peregrine falcon (Falco peregrinus anatum) has been officially recognized as an endangered species since the enactment of the Endangered Species Act in 1973. The precipitous decline of peregrine falcon populations since the 1950's has been linked to the widespread use of organochlorine pesticides, particularly DDT. Peregrines feed primarily on insectivorous birds and bats. Contaminated prey species cause high concentrations of DDE (a breakdown component of DDT) in the peregrine reproductive system which interferes with the deposit of calcium in peregrine eggshells. Subsequently, eggs are produced with thin shells that often break during incubation. Despite the 1972 ban on the use of DDT in the United States, many prey species pick up DDT when they winter in Central or South America, where it is still used in agricultural areas.

A recovery plan for the Rocky Mountain and Southwest population of peregrine falcons, prepared by a team of biologists appointed by the U.S. Fish and Wildlife Service, was approved in 1977. The plan describes the history, biology, status, and reasons for decline of the peregrine and provides specific objectives and a program for restoring the population. Since most peregrines in the region have historically nested on public lands, the plan designates the role and responsibilities of each State and Federal agency involved in the management of peregrine falcons. The recovery plan is a valuable and informative tool for guiding the park's management program.

The presence of peregrine falcons in the area which is now Guadalupe Mountains National Park was first recorded in 1938. From 1970 through 1979, a nesting pair occupied the Peregrine Palace eyrie in the same area. This was one of the most productive eyries recorded in the United States, having produced fourteen young in a four-year period (1975-1978). In 1979, the pair occupying the eyrie did not reproduce, and observations indicated that the female partner was a new bird. During both the 1980 and 1981 nesting seasons, only a lone male falcon was observed near the eyrie. From 1982 the park has monitored the Peregrine Palace eyrie location. In 1983, it was noted that a young female had paired with the male bird. These two birds failed to rear young during 1983, 1984, and 1985, but in 1986 the pair fledged a single young bird from the eyrie.

The park provides suitable and abundant habitat for peregrines, which utilize nest sites on high, sheer cliffs and need an adequate food source within a ten-mile radius. In addition to the Peregrine Palace eyrie, a breeding pair of peregrines formerly occupied a cliff on the park's west side. This site has not been occupied since 1975. An additional eyrie is located on the Lincoln National Forest just outside the park. This eyrie has a history of reproductive failure and was occupied by a lone adult male in 1980 and 1981. Although recent observations indicate that one or more peregrines are present in the park, continued occupancy is highly unlikely without a consistently successful breeding pair.

Monitoring of the Peregrine Palace eyrie was performed on a contract basis since 1975, with incidental observations by park employees appropriately recorded. Chihuahuan Desert Research Institute personnel conducted monitoring activities from 1975 through 1980. In April 1980, the park was included in an aerial survey of peregrine habitat conducted by the New Mexico Department of Game and Fish and partially funded by the NPS. Although no additional nesting areas were discovered during the flight, several canyons were recommended for further ground surveys. In 1981, independent researcher James Bednarz was contracted to monitor reproductive success at the Peregrine Palace eyrie and to search for potential new eyries. Since that time the park has conducted its own monitoring program using park staff.

DDT continues to threaten the existence of peregrines in the Guadalupe Mountains. Potential peregrine prey species were collected north of the park in Eddy County, New Mexico, in 1978, 1979, 1980, and 1982. Laboratory analysis revealed that DDE was present in the birds in sufficient quantities to cause peregrine reproductive failure. Further studies of prey species are needed to determine the extent of DDT contamination in the area. However, eggshells collected from the Peregrine Palace eyrie in the winter of 1984 showed no inordinate indication of eggshell thinning.

Human activities are also recognized as a potential threat to peregrines in the park. The literature shows that, although there are recorded instances of peregrines maintaining nest sites in the face of all sorts of activity, there are also instances where single incidents have caused birds to abandon their eyries. Public use closures were imposed in the park during the nesting season (approximately March 1-June 30) to restrict visitor activity in the vicinity of the Peregrine Palace eyrie as per the recommendation of Bednarz. These closures (the lower McKittrick Ridge Trail) were implemented on a 4 year experimental basis, and in 1985, it was determined by the park staff that the closures were no longer needed. The USF&WS concurred with this action.

An active management program is needed to protect and perpetuate the natural distribution and abundance of peregrine falcons. Since the prime habitat area encompasses NPS, USFS, and BLM administered lands, an interagency cooperative program would be most beneficial.

Alternative Actions and Their Probable Impacts:

1. No Action

If no affirmative management action is initiated, the continued expansion of peregrine falcons in the park is unlikely. The limited number of adult breeding pairs, the abandonment of historic eyries, and hazardous levels of DDE in prey species are all negative indices of the status of peregrines in the park. Without natural reproduction peregrines could be extirpated within a few years. The NPS will be violating its legal responsibilities, as mandated by the Endangered Species Act, if no action is taken to protect and restore the peregrine population.

2 Continue Monitoring

Continued monitoring of the Peregrine Palace eyrie and/or any new eyries in the park would provide documentation of peregrine activity and reproductive success. This information would be critical in assessing the status of the park's peregrine population. However, without supplementary management activities, monitoring alone would not serve as a positive step towards restoring the peregrine population.

3. Develop Cooperative Management Program

The cooperation of the Lincoln National Forest, BLM (Roswell District),USF&WS, New Mexico Department of Game and Fish, and Texas Parks and Wildlife Department would be sought in developing and implementing an interagency plan for managing the Guadalupe Mountains peregrines and their critical habitat. Cooperative activities would focus on actions recommended in the approved American Peregrine Falcon Recovery Plan. A pooling of staff and monetary resources by the diverse agencies responsible for peregrine management would eliminate piecemeal programs and duplication or overlap of monitoring and research activities, and would maximize the effective use of available funds, manpower, and information. Since the peregrine utilizes lands outside the jurisdiction of the NPS and is threatened by pesticide use on an international scale, the problem extends well beyond the limited confines of the park and must be addressed as such.

4. Supplement Wild Population

The release of captive bred peregrines into suitable habitat within the park would augment the existing wild population. The Peregrine Fund's captive breeding program at Fort Collins, Colorado, produces a number of young peregrines each year for reintroduction programs. Techniques such a hacking and cross-fostering (e.g. placing peregrine chicks in a prairie falcon eyrie) have been tried with some degree of success in other areas. Unfortunately, the technique of releasing an adult female for pairing purposes has not been successfully developed at this time. Although a captive release program may add to the existing population, there is no assurance that the released bird(s) would survive or remain in the park. Such a program would necessitate a serious commitment of funds and manpower, which may not be justifiable as song as the park's peregrine population continues to be threatened by DDT-contaminated prey.

5. Monitor Non-breeding Period Activity

Current monitoring activities would be expanded to determine whether peregrines inhabit the park during the non-breeding period. The park supports an adequate prey base throughout the year and Chihuahuan Desert peregrines are believed to be nonmigratory. However, little is known about the occurrence or activities of peregrines in the park during the fall and winter months. Information derived from such a survey would be extremely beneficial in formulating a peregrine management program.

6. Investigate Extent of DDT Contamination

A study would be initiated to further investigate the extent and level of DDT contamination in local prey species. Prey species would be collected and analyzed for pesticide residues. Sampling of prey species would ideally be stratified by geographic area, time of year, and migratory status in order to permit greater interpretation of the results. Collecting would probably necessitate the use of a 12-gauge shotgun both within and outside the park. Individuals involved in collecting activities would have to obtain appropriate permits from the NPS, USF&WS, and states. Collecting activities would be concentrated in the early morning and evening house, but may necessitate temporary closures of visitor use areas. Cooperation with neighboring land management agencies and private landowners would be essential. Profresional analysis of the collected samples would be fairly expensive. The information derived from such a study would help to clarify the extent of the pesticide problem and may indicate trends in pesticide levels as well as potential sources of DDT contamination. If the pesticide problem is not addressed, peregrine management efforts may be futile.

7. Initiate Study of DDT Sources

Research would be initiated to determine the cause of high DDT residuals in wildlife species collected locally. Native, nonmigratory species, and possibly soil and water samples, would be analyzed to determine if high pesticide loads are a local or regional phenomenon and not related solely to wintering in Central and South America. If DDT contamination is determined to be a local or regional phenomenon, the cause or source of contamination would be investigated. This research would be conducted primarily outside the park and would necessitate extensive cooperation with other government agencies and private landowners. Information gained from the research would be critical in assessing and/or resolving the threat that DDT poses to peregrine falcons and other resources.

Recommended Course of Action:

A comprehensive program to protect and perpetuate peregrine falcons in the Guadalupe Mountains should incorporate alternatives 2, 3, 5, 6, and 7. Research to investigate the cause of locally high DDT residuals is the most critical component and has been recommended for the FY 87 program in the Carlsbad Caverns National Park Resources Management Plan (see CACA-N5 Factors Affecting Free-tailed Bat Populations).

(N-11-01) Management: A cooperative interagency program to protect and perpetuate the natural distribution and abundance of peregrine falcons and their critical habitat should be initiated. Actions described in the approved recovery plan which are compatible with NPS management policies should be implemented. Management actions in the park should include recording observations, protecting known eyries by means of backcountry use restrictions, searching for additional eyries, identifying existing and potential habitat, and conducting information and education programs designed

to gain support for the peregrine recovery effort. A concerted effort should be made to coordinate management efforts with the Lincoln National Forest and to utilize the technical expertise of USF&WS and state raptor biologists.

(N-11-02) Monitoring: Annual monitoring efforts should be continued during the breeding season to provide a complete record of peregrine activity and reproductive success. If qualified park staff are not available to monitor peregrine eyries, the work should be contracted with a reputable raptor specialist.

An intensive effort to locate and record activities of peregrines during the non-breeding period should be initiated by park staff.

(N-11-03) Research: A thorough survey of DDE residuals in local peregrine prey species should be conducted. Using either contract, state agency or NPS personnel, a stratified sample of prey species should be collected in habitats both within and outside the park. A minimum of five individuals of each species should be included in each subsample. Collected specimens should be sent to the USF&WS or an approved laboratory for analysis. Laboratory results should be evaluated to determine factors correlated with high DDE residuals and to assess the hazard to peregrine reproduction.

GUMO-N12 Reintroduction of Desert Bighorn Sheep

Statement of Issue:

Historically the Guadalupe Mountains are known to have supported populations of desert bighorn sheep (Ovis canadensis mexicana). The last reliable sightings of bighorn in the park indicated that, in 1938, a herd of 15 to 19 sheep were utilizing the sparsely vegetated slopes in and around McKittrick Canyon. Bighorn utilization of the Dog Canyon area has also been documented. It is possible that the species was not totally extirpated in the area until the mid-1950's.

As in other areas of the southwest, the principle cause of decline in bighorn populations was the introduction of domestic sheep and goats on historic bighorn ranges. Over 20,000 domestic sheep were stocked on existing bighorn range in west Texas between 1939 and 1940. Several herds of over 1,000 goats were stocked in that area that is now the park. Competition for forage and transmission of diseases and parasites from domestic livestock to bighorn severely decimated the native herds.

The NPS Management Policies encourage the reintroduction of native species into parks provided that:

(1) adequate habitat exists to support the species;
(2) the species does not post a serious threat to park visitors or resources;
(3) the species disappeared because of direct or indirect human-induced change to the ecosystem.

In 1976, a feasibility study on the reintroduction of desert bighorn in the Guadalupe Mountains was conducted by wildlife biologists from Texas Tech University. A review of the habitat preferences and food requirements of bighorn indicated that the west side and the lower McKittrick drainage of the park provide ample suitable habitat and forage availability. The amount and distribution of water in the park was identified as a potential limiting factor. Both the limited availability of permanent water sources and competition with other species concentrated at these water points could jeopardize the survival of released bighorn. Although the study concluded that a reintroduction would be feasible, there are still serious questions concerning range and dietary overlap with deer, exotic barbary sheep, feral goats, and domestic sheep and cattle, predation by mountain lions, and transmission of diseases and parasites from domestic stock.

In 1979 and 1980, several reliable sightings of bighorn sheep were reported on the west rim of the Guadalupe Mountains in New Mexico, approximately 25-40 miles north of the park. In April 1980, the New Mexico Department of Game and Fish conducted an extensive helicopter survey of the Guadalupe and Brokeoff Mountains to confirm the existence of bighorn, but none were located. The question remains whether the bighorn sighted earlier were a small remnant population which has restricted itself to the most suitable and

isolated portion of its former range, or transients from 1973 release in the Sierra Diablo Mountains south of the park. The New Mexico Department of Game and Fish is interested in a reintroduction of bighorn on the west rim of the Guadalupe Mountains in the Lincoln National Forest, and is urging a cooperative effort with the Texas Parks and Wildlife Department, NPS, USFS, and BLM. State biologists acknowledge that a successful reintroduction will be contingent upon the removal of barbary sheep, domestic sheep, and feral goats from the vicinity of the release site.

Alternative Actions and Their Probable Impacts:

1. No Action

If no action is undertaken, desert bighorn, a native species, will not be restored to its historic range. The park ecosystem would be lacking one of its natural components and one of the most popular and elusive aniamal associated with remote, wildland habitats.

2. Release Desert Bighorn in the Park

A cooperative program would be developed with the state game departments to release desert bighorn in a suitable area of the park. If the released animals survive, this would restore bighorn to their historic range. However, the possibility of a successful reintroduction may be adversely affected by the abundance of deer in the park; the occurrence of barbary sheep, feral goats, feral mouflon sheep, and an active predator population; the limited availability of water; neighboring livestock ranching operations; and increasing backcountry visitation. A release program would necessitate an extensive allocation of park funds and manpower.

3. Cooperate in Reintroduction on Nonpark Lands

The park would cooperate with the New Mexico Department of Game and Fish, USFS, and other government agencies in the reintroduction of desert bighorn along the eastern escarpment of the Guadalupe Mountains, north of the park. Possible cooperative activities would include preliminary ground surveys, reduction of all barbary sheep, feral goats, and feral sheep found in the park, preparation of the release site, and monitoring the progress of the released herd. NPS participation in such an effort may enable the State to restore bighorn to their historic range, without requiring as extensive an involvement on the part of the NPS as would be necessary if bighorn were released in the park.

Recommended Course of Action:

(N-12) Management: Alternatives 2 and 3 are the recommended course of action. All barbary sheep, feral goats, and feral sheep found in the park should be eradicated (see GUMO-N14 Barbary Sheep Encroachment) so that a reintroduction of bighorn sheep within or north of the park can be initiated with some hope for success. NPS manpower and funding should be contributed

to the Texas Parks and Wildlife Department and New Mexico Department of Game and Fish reintroduction effort, based upon an evaluation of their requests for assistance. Any bighorn sightings in the park should be documented and reported to appropriate state personnel.

GUMO-N14 Barbary Sheep Management

Statement of Issue

The presence of a breeding population of exotic Barbary sheep or aoudad (Ammotragus lervis) in the park poses a serious threat to endemic wildlife species. The Barbary population, of undetermined size, originated from periodic escapes of sheep from a ranch in the Hondo Valley. Over the past 37 years, Barbary have dispersed southward 90 miles, but have only been reported in the southern Guadalupe Mountains within the past decade. The dispersal of wild Barbary in southeastern New Mexico exemplifies the broad adaptability and rapid range expansion potential of this ecologically aggressive species. Barbary sheep are very versatile in their food selection and utilization, and are able to survive in virtually any rugged terrain. The park continues to receive reports from hikers of "bighorn sheep" (most likely barbary sheep) being sighted in the backcountry. Some sightings are are recently as the winter of 1986.

Increased utilization of forage in the park by Barbary sheep will severely impact vegetative cover, resulting in potential competitive interaction with a variety of native wildlife species. Due to considerable dietary overlap, competition occurs between Barbary sheep and mule deer (Odocoileus hemionus). Interspecific competition with bighorn sheep (Ovis canadensis mexicana), a species which formerly inhabited the Guadalupe escarpment, is a major concern since reintroduction of bighorn sheep to their historic range is a long-term resource management objective.

National Park Service Management Policies state that:

> "Control or eradication of noxious or exotic plant and animal species will be undertaken when they are undesirable in terms of public health, recreational use or enjoyment, or when their presence threatens the faithful presentation of the historic scene or the perpetuation of significant scientific features, ecological communities, and native species, or where they are significantly harmful to the interests of adjacent landowners."

In 1979, a Barbary sheep management program and environmental assessment were approved for Carlsbad Caverns and Guadalupe Mountains National Parks.

Recommended Course of Action:

(N-14) Management: Within the park boundary, the Barbary sheep population will be controlled through direct reduction by shooting. If Barbary become firmly established in the park's rugged canyons, it will be extremely costly and difficult to remove them. All reported sightings of Barbary will be investigated and the animals dispatched, if possible. Shooting will be done only by qualified National Park Service personnel and only after the area has been temporarily closed to visitor access. Periodically, helicopter

operations may be necessary for Barbary reduction in remote and rugged terrain. Accurate records of all collected sheep will be kept in park files.

preventing the problem from reaching epidemic proportions both within and outside the park.

Recommended Course of Action:

(N-16) Monitoring: Park staff should be alert for any unusual insect or disease activity as they conduct their normal field activities. New or unusual signs of insect or disease outbreaks should be reported to the U.S. Forest Service, Region 3, Forest Pest Management Unit, using the detection forms and surveillance kits they have provided to the park. Forest Service entomologists and pathologists can then identify the responsible insect or disease pathogen, conduct additional investigations and aerial surveys if necessary, provide information on the life history and habits of the identified pest, and recommend management actions. First and foremost, the park will protect the ecology of the park and implement an integrated pest management approach to the insect or disease infestation. As feasible, training will be provided staff personnel in recognition of plant diseases and pests. Appropriate personnel will also be trained in proper application of pesticides if this is determined to be necessary.

2. Continue Current Pest Management Practices

A continuation of current practices would involve obtaining approval for all chemical pesticides used in the park and reporting annual usage. Although this alternative may provide short-term remedies to pest problems, it would not aid in the long-term prevention or mitigation of similar problems. Natural ecosystems may be adversely affected by the use of chemical pesticides.

3. Expand Efforts Towards Integrated Pest Management

This alternative would involve an increased awareness and utilization of integrated pest management strategies. The focus would be on prevention and early detection of pest problems, emphasizing mechanical and biological controls whenever possible. Chemical pesticides would be used as a last resort, and only when approved by the Director. This alternative would present the least potential harm to natural ecosystems and human health.

Recommended Course of Action

(N-17) Management: The park will develop and implement an Integrated Pest Management Plan as described in alternative 3. Upon detection of a pest problem or outbreak, it should be determined whether control measures are warranted. If the decision is made to attempt control, all possible alternatives should be carefully evaluated before a control technique is selected. If chemical control is determined to be the only feasible alternative, a request for approval will be submitted to the Director. All control programs should be monitored to evaluate their effectiveness in eliminating the target species, and their actual impacts on nontarget organisms.

GUMO-N18 Visibility Resources

Statement of Issue:

The National Park Service has the legal responsibility and authority to preserve and protect the lands and resources under its jurisdiction. One of the least tangible of these resources is visibility - the quality and clarity of park vistas. Air pollution has been recognized as a significant threat to many park values. Changes in the region's air quality can degrade the range, color, and clarity of vistas and cause damage to vegetation, geologic, and cultural resources.

The Clean Air Act, as amended in 1977, gives the National Park Service affirmative responsibilities for protecting the parks from adverse or significant changes in air quality. Guadalupe Mountains National Park is a mandatory Class I area, as defined in the Clean Air Act. Congress established as a national goal for Class I federal areas "the prevention of any future and remedying the existing, visibility impairments resulting from manmade air pollution." The Act also provides a role for the NPS in reviewing applications for major new emitting facilities outside the parks, and the authority to recommend denial of a new source permit if the facility will have an adverse impact on visibility within a Class I area.

In order to carry out the responsibilities of the Clean Air Act, it is first necessary to identify the park's air quality related values (including visibility) which warrant protection. An air quality related values inventory of the park was completed in 1980 by contract researcher Stephen Gibbons. This inventory identified scenic, cultural, biological, and recreational resources that are affected by air pollution.

In order to protect the park's air quality related values, there is a need to collect baseline data on existing air quality. The NPS has established a visibility monitoring network for this purpose which currently includes monitoring stations in thirty-five NPS areas. The network is primarily concentrated in the energy development area if the southwest. Visibility monitoring is accomplished by collecting and analyzing a sufficient number of samples to characterize the air quality of each area. This baseline data can then be used in: (1) evaluating potential impacts of proposed pollution sources; (2) determining the extent to which existing air pollution sources cause or contribute to visibility impairment; (3) identifying specific pollution sources; and (4) evaluating the long-term effectiveness of visibility protection programs. The NPS strategy is to establish visibility monitoring stations in each of the Class I areas. Guadalupe Mountains National Park is actively participating in monitoring visibility through the operation of an automated tele-radiometer taking readings on a fixed target outside the park boundary. The monitoring station has been established on land bordering the national park (Signal Peak, FFA Tracking Station) and provides an unobstructed view in the direction of El Paso-Juarez industrial area and the copper smelters of southern Arizona and New Mexico, a suspected area of pollution. Optical measurements of the visual contrast of distant

terrain features against a sky background are taken continuously of both the east escarpment of the Guadalupe Mountains and the lowlands of the Delaware Basin. The park also has a fine particulate sampler at this monitoring station that takes readings continuously and whose contents are analyzed by a major university. As of February 1987, the park will have prevention of significant deterioration (psd) equipment at Signal Peak which will expand NPS capabilities for monitoring ozone, sulphur dioxide, and nitrates.

In addition to the monitoring station at Signal Peak, the park is an active participant in the National Atmospheric Deposition Program (NADP). Acid rain has been monitored weekly in the park since June 1984 and provides the data needed to develop long-term trend analysis for the regional air shed.

Alternative Actions anad Their Probable Impacts:

1. No Action

If no action is taken, the NPS will be ignoring its legal responsibility to protect the park from air quality degradation. Current pollutant levels would be unknown and changes in air quality would be undetected. Changes in air quality may diminish the quality and visual range of park vistas, adversely affect the color and growth of native vegetation, discolor or corrode geologic resources and buildings, produce unpleasant odors, and cause, or intensify, human respiratory ailments.

2. Monitor Without Instrumentation

Changes in air quality would be monitored by use of human senses and perception. Certain concentrations of air pollution are detectable by the human eye, nose, or by taste. However, this response is subjective, depending on the individuals's physical makeup and value system. In addition, concentrations of pollutants detectable by the human senses are often well above the levels which may be harmful to human health or vegetation. This alternative would not provide accurate, scientific data upon which defensible decisions could be based.

3. Monitor With Physical Instrumentation

Participation in the NPS visibility monitoring network would provide a scientific means of detecting and measuring air pollutants in the park. Data derived from telephotometer measurements and fine particulate samplers could be utilized to determine existing concentrations of pollutants and to monitor trends in air quality. Continual review of these trends would allow a timely determination if air quality related values are being threatened, rather than waiting for detectable, and maybe irreversible, changes in these park values. Collecting accurate "before and after" air quality data, in conjunction with predictive modeling, is the only way a scientifically sound and legally defensible case can be developed to prove that a proposed new source and/or existing sources outside the park will have a significant impact on park resources.

4. Review Potential New Sources

Applications for new stationary sources of air pollution outside the park would be reviewed to determine their potential impact on air quality within the park. If it can be demonstrated that an adverse impact on visibility would occur in the park, the Clean Air Act prohibits the issuance of a permit. Prevention of future visibility impairment is dependent upon the new source review process.

Recommended Course of Action:

A comprehensive program to protect the park's air quality related values should incorporate alternatives 3 and 4.

(N-18) Monitoring: Continued operation of the park's monitoring station located at Signal Peak where unobstructed optical measurements can be taken in the direction of El Paso-Juarez. The time required to gain access to the park's high country, the management restrictions imposed by wilderness designation, and limited park staffing indicate that the Federal Aviation Administration's Guadalupe Pass remote communication outlet facility is the best location for a monitoring station.

An expanded effort should be made to review proposed new sources of air pollution that may affect park resources. Local reviews will be made by the Resource Management Specialist in consultation with the Area Manager and Chief Ranger.

GUMO-N19 Oil and Gas Development

Statement of Issue:

Oil and gas productions is a significant part of the regional economy of west Texas and southeastern New Mexico. Recent emphasis on U.S. energy development and self-sufficiency has been reflected in increased oil and gas activity in the local area. Although oil and gas exploration is prohibited within the park, oil and gas operations outside the boundary may directly affect park values and resources. Vistas from park view-points, air quality, wildlife, vegetation, water resources, and visitor activities could potentially be impacted by nearby exploration and extraction activities.

The Guadalupe Escarpment WSA contains several existing oil and gas leases which cover 200 acres within its boundary. These existing leases have a term expiration date of 1987. An additional 16 oil and gas leases are pending and would include essentially the entire WSA. Although neither the U.S. Geologic Survey (USGS) or the Bureau of Land Management (BLM) has verified occurrence of gas and oil deposits within the study area, it was classed as having "Inferred Identified Economic Oil and Gas Potential." i.e. it may be expected to contain deposits which could be explored within the next 10 years.

The USFS completed its review of the Guadalupe Escarpment WSA in the Lincoln National Forest Plan and Final EIS released in October 1986. The decision of that agency for the WSA was to recommend nonwilderness status but "protect its wilderness values pending a decision by Congress."

The majority of oil and gas leases in the vicinity of the park are issued by either the USFS, or BLM. The BLM approves surface use plans and prepares NEPA compliance documents for these operations. Monitoring proposed activities and establishing effective communications with these agencies are critical to assuring that park values are not impaired by oil and gas operations. In 1986, with the price of oil dropping, less drilling activity was noted in the area.

Alternative Actions and Their Probable Impacts:

1. No Action

Development of oil and gas resources will continue to increase in the area surrounding the park. If no action is taken to monitor or provide input during the review phase of proposed operations, it is probable that the park environment will be affected. Visibility, vegetation, wildlife, water resources, and visitor use patterns may be impacted by oil and gas operations.

2. Monitor and Review Proposed Operations

An on-going effort would be made to keep informed of all proposed oil and gas activities in the vicinity of the park. This would involve cooperative

relations with the BLM, USFS, and USGS. Operations involving access through the park would be reviewed and approved as provided in 36 CFR 9B and 43 CFR 3100. If it was determined that external operations might affect park resources, appropriate recommendations would be made to the USGS for mitigating actions. Such a monitoring program would minimize the likelihood that park resources will be impaired.

3. Evaluate Effects of Oil and Gas Development

If oil and gas leases are approved for Camp Wilderness Ridge, research would be initiated to evaluate the effects of drilling activity on the unique ecosystem of McKittrick Canyon. Information derived from such research would provide a better understanding of the impacts of oil and gas development on critical park resources, and would provide scientific data to support future recommendations regarding oil and gas leases.

Recommended Course of Action:

(N-10-02) Monitoring: The park should carry out a continuing program to review proposed oil and gas operations and to monitor approved operations which may affect park resources. This will entail an assertive role in maintaining communications with BLM, USFS, and USGS personnel involved in mineral leasing activities. NEPA compliance documents will be prepared for all operations requiring NPS approval.

(N-19-03) Research: If one or more oil and gas leases are approved at the head of North McKittrick Canyon, research should be contracted to determine the effect of such activities on the aquatic ecosystem of McKittrick Canyon. Research efforts should focus on chemical, physical, and biological water quality parameters.

GUMO-N21 Natural Resources Information Base

Statement of Issue:

Resource management practices can only be as good as the information upon which they are based. Adequate surveys or inventories of park resources not only provide information for planning and interpretation, but are also critical tools for recognizing changes in natural ecosystems and evaluating effects of management actions.

Scientific research is a vital component in the formulation of sound management policies and practices. Since the establishment of the park, an extensive research program has been conducted involving numerous studies contracted with Texas Tech and other universities, resource inventories conducted by NPS personnel and other government agencies, students, and knowledgeable individuals. Copies of all known park-related publications are maintained in the park library. The volume and scope of data available in these publications is so extensive that information can easily be overlooked because park personnel are not aware that it is available. An organized and effective information retrieval is critically needed if available information is to be utilized.

In addition to published materials, the park's information base also includes: maps, slides, photographs, and raw data obtained from various monitoring programs, visitor use surveys, and permit systems. Again, much of this information is not adequately organized, catalogued, or displayed to make it easily accessible.

The diverse resources available in the park are fairly well covered by the existing information base. New information is continually being added as a result of contracted studies, independent research, volunteer efforts, and opportunistic inventories by park staff.

Alternative Actions and Their Probable Impacts:

1. No Action

If no action is undertaken, the wealth of information available on the park's natural resources will continue to be under utilized due to lack of knowledge of its existence and lack of an effective information retrieval system. Management decisions may be made without the benefit of relevant resource information.

2. Develop ADP Capability

A computer system would be developed for storage and retrieval of natural and cultural resources inventory data. Use of the computer in the park by park personnel would be expanded to provide an efficient, organized information retrieval system. Such a system would allow more frequent and effective use of resource data in park planning and decision making. Time

consumed in searching for appropriate references or information would be greatly reduced.

3. Compile A Map Overlay Series

All resources that can be mapped would be recorded on transparent overlays at the same scale (1:24000). The mylar overlays could be used either separately or combined over a base map composed of USGS 7.5 minute quadrangles. This would provide a resource inventory map series that could be easily utilized for planning, management, or illustrative purposes. Mapping all resources at the same scale in an overlay format would permit ready comparison of map features. New or additional information could be added to the map series at any time. The accessibility and effective utilization of existing resource information would be greatly increased.

Recommended Course of Action:

(N-21-01) Management: A combination of alternatives 2 and 3 will provide an organized and efficient retrieval system for the park's baseline resource information. Use of an IBM compatible computer in the park by park personnel with a packaged or pre-tested computer program should be adopted. Publications,maps, checklists, photographs, slides, and raw data currently available in the park library or files should be evaluated to determine what should be included in the information retrieval system. All relevant data or references should be entered in the computer for storage. To remain viable, this system should be added to or updated as new research results become available. Selected park personnel should be trained to access the computer for information retrieval.

Resource inventory data which can be graphically depicted should be recorded on transparent map overlays. Mylar overlays should be constructed at a scale of 1:24000 to fit over a base map composed of 7.5 minute USGS topographic quadrangles. The map series will synthesize park resource information into readily accessible, organized, visual format. The following baseline information should be included on mylar overlays:

(1) soils - family, series, critical use-related areas
(2) geology - bedrock formation, physiographic features
(3) topography - elevation zones, slope
(4) hydrology - watersheds, springs, seeps, wells
(5) vegetation - plant communities, endangered, threatened, or restricted species
(6) wildlife - major habitats, endangered, threatened, or restricted species
(7) Caves- location
(8) land ownership and management zones - inholdings, wilderness
(9) developed facilities - roads, trails, boundary fence, buildings, parking areas.

(10) fire history - location, year, size, and cause of past fires
(11) fire fuels - fuel models (NFDRS) and loads
(12) transects and photopoints - pellet-group, browse, erosion, water quality, fire research, visitor use impact.
(13) cultural resources - archeological and historic sites

Much of this information can be derived from existing maps, of varying age, scale, and detail. Map overlays should be revised or new overlays constructed and added to the series as additional resource inventory information becomes available. Initial design and mapping of the overlays will require a considerable amount of time and should be undertaken by someone with, at least, minimal cartographic or artistic experience. Consideration should be given to utilizing a student intern or temporary employee to complete the initial series of overlays.

GUMO-N22 Exotic Plant Management

Statement of Issue:

Exotic, non-native plants pose the potential of becoming established in park ecosystems to the detriment of native vegetation and can ultimately disrupt natural systems severely. NPS Management Policies state that:

> "Manipulation of population numbers of exotic plant and animal species, up to and including total eradication, will be undertaken whenever such species threaten protection or interpretation of resources being prepared in the park."

At present the only known non-native plant posing a significant threat to park resources is saltcedar (Tamarisk sp.). This exotic species has become well established in riparian habitats and moist areas throughout the southwestern United States. It is well established in both the Rio Grande and Pecos River drainages near the park. Its impact on water resources and plant and animal communities is well documented. Efforts at control and eradication are difficult, costly, and to a large degree, ineffective once the tree becomes well established.

Currently, there are only a few specimens of saltcedar within the park. Those that do exist are associated with fragile springs and seeps or low points which tend to accumulate and hold moisture. Based upon empirical knowledge of the plants and its effect, it would probably take a very small concentration of trees to virtually dry up a number of park water sources with low flow rates. These water sources are considered to be of very great importance to the ecological balance in specific drainages and to park ecosystem in general.

Given the low numbers of occurrence of Tamarisk within the park, treatment, manipulation and total eradication appear possible at a minimum cost. Periodic surveillance and treatment of recruits could virtually ensure elimination of this pest species from the park.

Alternative Actions and Their Probable Impacts:

1. No Action

Established plants will probably continue to thrive, reproduce, and spread into habitats adequate to support the species. Well established "groves" could severely and irreversibly impact water sources resulting in changes to the native plant and animal communities. A significant, unacceptable change to park ecosystems would result.

2. Locate and Monitor Existing Stands/Individual Trees

Spread of the exotic would continue but park staff would have a documented record of the location of trees and could monitor impact to specific sites and spread of the tree.

3. Control/Eradicate Established Plants in the Park and Monitor for Recurrence

Using accepted techniques of chemical and mechanical control, undertake an effort to remove all trees established within the park. Set up monitoring stations to permit detection of any re-establishment of the tree and remove them as they recur. Feedback will permit evaluation of the success of the program.

Recommended Course of Action:

Implement alternatives 2 and 3. All areas of potential habitat will be surveyed for tamarisk. Photopoints and site descriptions will be developed. An eradication program, utilizing the least noxious techniques on individual trees will be undertaken. Follow-up at each site to evaluate the program and detect recurrence will be conducted annually until control is assured.

GUMO-N23 Resources Management Support Services

Statement of Issue:

Since the establishment of the national park in 1972 the number and complexity of natural resources management issues confronting park managers has increased dramatically. Currently the Natural and Cultural Resources Management Plan contains thirty-seven project statements dealing with the park's biotic, abiotic, and cultural resources. The complexity of the management actions responding to individual project statements is exacerbated by the need for park managers to recognize and abide by additional federal laws dictating the management of individual resource elements. These laws include: the Clean Air Act Amendments of 1978, the Clean Water Act, the Endangered Species Act, the Wilderness Act, and the Archeological Resources Protection Act.

Guadalupe Mountains National Park exists as a relatively small (76,400 acres) preserve representing only a portion of the region's ecosystem. As such the park is constantly influenced by the natural and man-influenced phenomenon occurring on neighboring lands. More often than not, man-caused impacts are a direct affront to the ecology of the park and pose a constant threat to the NPS's ability to preserve and protect its own resources. The geographical position of the park has created a situation where man-caused impacts can be generated by private ranching operations and State land managers in Texas and New Mexico, and the activities of U.S. Forest Service (USFS), and Bureau of Land Management (BLM) management operations in the State of New Mexico. In the case of air quality and visibility management, it has already been demonstrated that the park is being threatened by pollutant sources generated at considerable distance (Mexico, Arizona) within the regional airshed.

The number and complexity of issues threatening the resources of the park has forced the National Park Service to re-evaluate its administration and organizational response to these problems. It is becoming increasingly obvious that the complexity of the other workload elements in the national parks (maintenance, interpretation, visitor protection) makes it impossible for the historic "generalist" park ranger to effectively respond to this situation. The result has been the creation of specialists positions whose work time and effort is spent in a concerted response to the individual work load element. Guadalupe Mountains National Park now requires that a new approach be taken in addressing its natural and cultural resources management workload.

Alternative Actions and Their Probable Impacts:

1. No Action

The park will continue to deal with resource management issues using its present staff and organization structure. Basically this will involve the five existing generalist park ranger(s) being expected to accomplish resource

management tasks along with their visitor service and law enforcement responsibilities.

2. Reorganize the Existing Staff

The park has the prerogative of reapportioning duties to consolidate workload elements, including resources management, towards individual positions. In effect, staff specialists would be created whose time and effort would be spent almost exclusively on resources management. Guadalupe Mountains National Park could reorganize its existing staff and funding procedure to create one or more of these positions. The result would be a more intensive response to the resource management workload than is presently possible.

3. Provide Support to the Present Resource Management Specialist Position

A Resource Management Specialist Trainee (GS-9) was assigned to the park in October 1986. Funding to support (salary, vehicle, supplies, etc.) this position is needed as a basic increase to the park's current operating program to insure the continuity of the resource management function at the park. The position will become a permanent addition to the staff and will specialize in the management of natural and cultural resources issues.

Recommended Course of Action:

Provide a base increase (10-237 package) to support the current GS-9 Resource Management Specialist position. Funding is needed to provide salary, the annual rental of a GSA vehicle, two GS-5 seasonal positions (180 days), travel, and supplies and equipment.

GUMO-N24 Black Bear Survey

Statement of Issue:

Between July 1985 and June 1986 four black bears (Ursus americanus) were killed immediately outside the northern boundary of Guadalupe Mountains National Park. These animals were killed as a result of the on-going predator control program supervised by the New Mexico Department of Game and Fish (NMDG&F). The exact circumstances surrounding the deaths of these animals, a non-target, game species, has not been resolved to the satisfaction of the park staff although the park has requested this information from NMDG&F.

In January 1987 the Texas Park and Wildlife Department established the black bear as "endangered" on its State list of endangered and threatened species. Communications with this organization indicated a similar concern to that of the NPS regarding the deaths of the above four bears.

While these bear incidents did take place off park administered lands, the NPS concern about the fact of these deaths, and the interagency administration of the incident, is based upon two major concerns. First, while very few biological facts exist regarding the present population of bears in Guadalupe Mountains National Park, it is known that they inhabit the park area and that the locations of the killings would make it obvious that the dead bears could easily have spent part or all of their time on U.S. Forest Service lands and within Guadalupe Mountains National Park, Texas. The deaths of these animals becomes, subsequently, a major perturbation against a major component of the park ecosystem known to be extremely rare and, in fact, officially listed as "endangered" in the State of Texas.

The second concern of the NPS regarding these incidents is the almost total lack of responsibility for the incidents demonstrated by the land management agencies surrounding the park, and the apparent lack of records which would enable one to assess the reasons for the bear deaths and to take actions to prevent the re-occurrence of similar incidents. The NPS is concerned that the bear deaths situation closely parallels the early history of the recently completed mountain lion management program and has the capacity to reach similar proportions as an NPS resources management issue.

Alternative Actions and Their Probable Impacts

1. No Action

The NPS could elect to rely on Texas and New Mexico State land management agencies, and the USFS to develop the biological data base needed to monitor the regional bear population and respond to man-caused influences on this population. However, since the Texas Parks and Wildlife Department and the New Mexico Department of Game and Fish already has statuatory responsibility for game species in their respective states, and since budget and/or manpower limitations have prevented these agencies from being able to implement a

comprehensive survey of the regional bear populations, it is unlikely that these agencies will be able to assess the current bear population or the effects man-caused perturbations are having on the well-being of these animals.

2. Implement a Comprehensive Study of the Park Black Bear Population

The park could acquire the needed data base through a suitably designed study which would provide: (1) sex and age information, (2) food habit analysis, (3) home range and distribution information, (4) population trends analysis. These data would then be available to park managers to assess the well-being of these predators in the national park and effect a more responsible management program for managing black bears should the need arise. It would also provide needed information to effectively contribute to interagency efforts of managing the regional black bear population and respond to problem issues with these agencies.

Recommended Course of Action:

(N-24) The NPS should begin a comprehensive study of the black bear population in the park if it is to effectively respond to outside threats to this animal and understand the natural population fluctuations this species is likely to undergo. These data will be used to respond to future criticism that the black bear population is "exploding" or that animals are somehow being "dumped" into the national park, and/or similar accusations to those made against the park during the mountain lion management issue.

The research work should be accomplished by a suitable university or research institution capable to conducting a sound, scientifically based research study.

GUMO-N25 Cyclic Maintenance Work

Statement of Issue:

Cyclic or recurring maintenance work is carried out by the roads and trails crew in the park. This work is necessary to carry out proper maintenance and provide safe conditions for visitor enjoyment of the park.

Along paved roads, vegetation growing along shoulder areas must be removed to protect the blacktop road edge from being damaged by visitor traffic entering and exiting the roads. Damage to the road shoulders will result in costly repairs. Mowing takes place several times during the year to control vegetation and provide visitors and park personnel with better visibility. Concrete and metal culverts, as well as headers on both sides of the road are cleared of debris, sand, and silt several times a year, to facilitate better drainage.

Cyclic maintenance work is also carried out on all unimproved dirt roads in the park. This includes blading and compacting the roads up to four times a year, or as deemed necessary. If additional funding is available, base coarse is added to stabilized road surfaces, and drainage ditches are bladed and culverts are cleaned. Headers around the culverts are stabilized and vegetation is trimmed along the roadside.

The maintenance crew also performs cyclic maintenance work on backcountry trails. The work includes: replacing flagstone footing along major water crossings in McKittrick Canyon, picking up litter along the trail throughout the park, breaking up fire ring circles, repairing tent pads and trimming of vegetation along the trail, regrading trail surfaces as needed, building up rock cairns to identify trails and installing and maintaining water bars. Trimming of vegetation is more extensive along trails where horses are permitted as an aid to the horse and rider. Trail maintenance is intended to minimize the environmental impacts of the trails on plant, soil and riparian communities and to insure safe access for park visitors.

Cyclic maintenance along the boundary fence includes repair/replacing of fence posts and wire where it has either fallen or been cut. Drainages are checked for damage after heavy rainstorms to keep domestic livestock from crossing into park lands. Old ranch cross-fences are removed as time, manpower, and funding allows us to. This removal is needed to prevent trespass grazing and to eliminate hazards to park visitors and wildlife.

Alternative Actions and Their Probable Impacts:

1. No Action

Under this alternative, no cyclic maintenance in the park would take place. The result of this action would be that the safety of the visitor would be compromised and resource impacts from manmade facilities in the park would go unmitigated. Mowing would not take place, thus adding to visibility

problems and increased accidents due to collisions with wildlife. The lack of vegetation control along trails would result in increased injury to hikers from protruding branches and spines. Paved roads would deteriorate at a faster rate due to vegetation growth along the edges of the road. Erosion would take place along unimproved dirt roads that lead to siltation in drainages and unsafe driving conditions.

2. Limited Cyclic Maintenance

Under this alternative, limited cyclic maintenance work would take place and would be prioritized to help alleviate the damage to natural and cultural resources. Paved road maintenance would be limited to mowing once a year, vegetation would encroach in some areas on the road, leading to breakage and costly repairs in the future. Limited maintenance would prevent visitor access into the Williams Ranch area. Visitor accidents, tort claims, and complaints would increase due to poor maintenance and the decline of safety standards.

3. Complete Cyclic Maintenance

Under this alternative natural resource related maintenance projects would be fully funded and all cyclic maintenance would take place. All unimproved dirt roads wuld be maintained to levels that would provide year-around travel and access to all present sites in the park. All paved roads would be maintained leading to better visibility along the road during day and night. Vehicle collisions with deer and elk would be minimized. All trails would be maintained so that the backcountry hiker would be assured a safe trail access. All maintenance work would be carried out according to NPS guidelines. Both visitors and park personnel would benefit from the park experience. Properly maintained roads and trails would be less expensive to maintain in the future and impacts to natural resources would be mitigated.

Recommended Course of Action:

The recommended course of action is alternative 3. Under this alternative, properly maintained grounds, facilities, roads and trails would provide a safe and enjoyable visit by park visitors. Resource degradation caused by the road and trail system would be minimized.

CULTURAL RESOURCES MANAGEMENT PROGRAM

GUMO-C1 Museum Collection

Problem Statement:

A museum collection of approximately 450 accessions of natural and cultural items is maintained by the park. The collection provides reference materials, study specimens, exhibit items, and research documentation for use by park employees, scientists, educational groups, and other interested persons. It also is utilized to preserve and protect archeological artifacts and other rare specimens that would deteriorate if left "in situ."

Curatorial responsibilities, including accessioning, cataloging, inventorying, preparing, and preserving collection items, are assigned to the Chief, Division of Interpretation and Visitor Services. Curatorial work is performed in addition to regular assigned duties.

The major problem hampering effective management of the museum collection is the lack of an adequate temperature controlled environment and a fire and intrusion system. One room of 120 square feet in an old wooden frame structure is the repository for these artifacts that were moved into the building in April 1985. An operational headquarters/visitor service complex is planned for future construction, and the need for 600 square feet of curatorial space has been included in the planning package. This will provide controlled, stable, and secure environment necessary for preservation of museum items.

The lack of adequate storage space prevents the park from being able to accept additional museum items. Between 1978 and mid-1981, there was virtually no curatorial work accomplished in the park. Recent efforts to organize the collection have revealed that 16 percent of the catalogued items are missing, and a substantial number (up to 200 items) have not been accessioned. Attendance at NPS curatorial methods training sessions would provide the training needed to qualify park interpreters as certified museum curators.

Many biotic and abiotic specimens are collected annually through the park collecting permit program and are often stored at their sponsoring institutions. Records for those items on loan, or park specimens stored at universities and other institutions are, however, minimal. New Code of Federal Regulations (CFR 36) requires that the parks maintain suitable records for each of these specimens.

If curatorial standards specified in the NPS Field Manual for Museums are to be achieved and a functional museum collection is to be maintained, adequate facilities must be provided, and additional funds and staffing must be allocated for curatorial duties.

Alternative Solutions and Their Probable Impacts:

1. No Action

If no action is initiated, the lack of an adequate museum facility, incomplete cataloguing, and insufficient time allocated for curatorial responsibilities will continue to reduce the integrity of the park's collection. Improper storage, preservation, and inadequate records, will result in the loss of additional items. The functional value of the collection to park staff, researchers, and visitors will be minimal.

2 Develop Museum Facility

Structural facilities would be developed for collection storage and curatorial work. The provision of adequate storage and work space, proper humidity and temperature control, protection from insect and rodent damage, and physical security would greatly improve the park's ability to preserve and protect collection items. This action is necessary to achieve NPS standards for museum collections.

3. Update and Improve Record-keeping

Accessioning of unrecorded items, cataloguing of all accessioned items, establishment of accession folders, organization of an efficient filing system, and improved record-keeping on items loaned either on a temporary or indefinite basis are essential if curatorial standards are to be achieved and a functional collection developed. Such action would require an increase in staff hours allocated to curatorial duties, but only on a short-term basis.

4 Inventory Collection

A comprehensive inventory of the total collection would provide an opportunity to cross-check museum items with catalogue and loan records, de-accession and transfer inappropriate or duplicate items, clean all items, and determine additional preservation or repair needs. Both in terms of preventive maintenance and assessing the current status of the park's collection, such an inventory would be a critical step in providing a useful, well-preserved collection. Once a comprehensive inventory is complete, the task of conducting inventories on a periodic basis would be much less time-consuming.

Recommended Course of Action:

A affirmative program to upgrade the park's museum collection to professional standards and to maximize its utility to park staff, researchers, and visitors should incorporate alternatives 2, 3, and 4. Adequate space for collection storage and curatorial work should be provided as soon as possible and should meet established environmental criteria for preservation of museum specimens. Staff assigned to curatorial duties should receive proper training and should be scheduled to work on a regular basis in the museum.

Cataloguing of all accessioned items, improvement of temporary storage conditions, and organization of filing systems should receive top priority.

GUMO-C2 Archeological Surveys of High Impact Areas

Problem Statement:

Guadalupe Mountains National Park is still in the development phase. Extensive construction activities have occurred in the recent past and will continue to occur in the late-1980's. Facility development is affecting visitor use patterns and creating new areas of concentrated visitor use. The National Historic Preservation Act of 1966 and Executive Order 11593 require an up-to-date archeological survey of proposed development and high visitor impact areas. Systematic investigation of the total affected area is needed to determine potential adverse impacts on archeological resources and, if necessary, to develop mitigation measures.

Alternative Solutions and Their Probable Impact:

1 No Action

If no action is taken, the park will be violating Federal laws requiring archeological clearance. Archeological resources may be disturbed or lost as a result of construction or visitor activities.

2. Survey High Impact Areas

A comprehensive archeological survey would be undertaken in high visitor use areas proposed for park facility development. This would involve systematic investigation of the entire surface area plus test excavations and surface collection, if warranted. This action would fulfill legal requirements and would provide information necessary to mitigate the impact of visitor use and developments on archeological resources.

Recommended Course of Action:

Archeological surveys of proposed development and high visitor impact areas should be a management priority. Archeological clearance procedures will continue to be initiated as early as possible in the planning process for all proposed developments.

GUMO-C3 Protection of Archeological Sites

Problem Statement:

Affirmative action to protect and preserve archeological resources is mandated by various Federal laws and guidelines, including the Archeological Resources Protection Act of 1979 and Executive Order 11593. Due to the proximity of park roads, trails, and developed areas to archeological sites, it is important that a plan be established for protecting and preserving these resources. The need for such a plan is becoming more acute as visitation increases, particularly in the park's backcountry.

Currently park programs aiding in the protection of archeological sites include: non-disclosure of site locations, public education on the value and vulnerability of these resources, controlled access to caves containing archeological remains, and ranger patrols. In addition to protecting these resources from human impacts, measures are needed to prevent resource deterioration caused by natural events. The exact extent of impacts resulting from soil erosion, burrowing animals, grazing ungulates, and wildfire is currently unknown.

During the course of the archeological inventory of the park, it was discovered that many archeological sites are disturbed by roads and trails, most of which date prior to the establishment of the park. In fact, every road and trail existing in 1966 had archeological sites associated with it, revealing a basic fact of travel through the park, i.e. contemporary routes have been placed over historic roads and trails, which were placed over prehistoric routes, which presumably followed even older game routes. From the perspective of preserving cultural resources, this association has resulted in and will continue to cause problems. Measures are needed to mitigate these impacts and to prevent future construction and development activities from perpetuating these disturbances.

Alternative Solutions and Their Probable Impacts:

1. No Action

Without additional measures to protect the park's archeological resources, the potential will continue to exist for sites to be destroyed or disturbed by park visitors, wildlife, and weathering processes. Adherence to legal requirements for the preservation of archeological resources will not be complete.

2. Develop Archeological Sites Protection and Preservation Plan

A plan would be developed to provide better protection for archeological sites and guidelines for their preservation. Such a plan would provide a long-term management framework for carrying out the park's legal responsibilities to preserve archeological resources.

Recommended Course of Action:

An archeological sites protection and preservation plan should be developed to provide a consistent management approach to these resources. The plan should describe known archeological sites; determine existing or potential threats to them; evaluate alternative methods of site protection; and identify ways to mitigate current impacts. A photomonitoring program should be included in the plan to provide documentation of human-induced impacts, as well as long-term changes in representative sites.

GUMO-C4 Effect of Fire on Archeological Sites

Problem Statement:

Fire history studies indicate that natural and, perhaps, man-caused fires have burned over many of the park's archeological sites for hundreds to thousands of years. The precise impact to these fires is not known. Midden rings are probably the primary type of archeological site that would be affected by fire. The effects of fire in terms of damage and/or alteration of archeological resources need to be evaluated. This is particularly important since the park had adopted a new fire management policy involving prescribed burns and prescribed natural fire (see GUMO-N1 Fire Management). The park Fire Management Plan was approved in 1985.

Alternative Solutions and Their Probable Impacts:

1. No Action

If no action is initiated, the effects of fires burning over archeological sites will not be fully understood. This lack of knowledge will hinder enlightened decisions regarding the appropriateness of prescribed fire in areas where recorded archeological sites are located. Archeological resources may be damaged or altered by fire.

2. Evaluate Probable Effects of Fire on Archeological Sites from Research Done Elsewhere

To avoid duplication of effort, results from research by other agencies and park areas on the effects of fire on archeological sites in similar type terrain would be utilized. Archeological base maps would also be prepared and used to avoid damage during fire line construction or from subsequent erosion caused by fire line construction.

Recommended Course of Action:

Research results from other agencies and areas should be studied for possible local application. Copies of archeological base maps on 7 1/2-minute topographic maps should be made available to fire management personnel and used to avoid damage that would result from suppression activities.

Prior to any prescribed burning, an archeological survey of the burn area should also be conducted. This will allow for later monitoring of the effects of burning, or will facilitate the deletion of archeological site(s) from the burn area.

GUMO-C5 Prehistoric Use of Area

Problem Statement:

The extensive archeological survey of the park conducted in the 1970's raised many questions concerning prehistoric use of the area. Publications by Katz (1978), Katz and Katz (1979), and Bradford (1980) provide considerable information and analytical interpretation of prehistoric occupation; however, many related topics remain for investigation. Several specific areas in the park exhibit evidence of intense utilization on a short-term basis. It is hypothesized that park sites were utilized seasonally for hunting and foraging activities, but that the foragers returned to a base camp or village, possibly located west of the park in the Dell Valley. Controlled excavation or surface collecting at select sites may be appropriate to resolve questions, test hypothesis, and provide further interpretation.

Alternative Solutions and Their Probable Impacts:

1. No Action

If no action is initiated, new information will not be gained to aid our knowledge and understanding of prehistoric use of the park area.

2. Conduct Excavations and Surface Collecting

Controlled excavations and surface collecting would determine the presence of additional cultural material that may aid in our understanding of prehistoric occupants. Information obtained from these studies would be useful in developing informative and accurate interpretive programs. Surface disturbance would occur in select sites during such studies.

Recommended Course of Action:

Research would be conducted to provide further interpretation of the different types of archeological sites located in the park, site functions, specific subsistence activities, and environmental changes. Controlled excavation and surface collecting should be included in such studies. After testing, disturbed areas should be restored as much as possible to their natural condition.

GUMO-C6 Rock Art

Problem Statement:

Rock art in the park is characterized by pictographs generally located in rock shelters or under slight overhangs. Approximately four percent of the sites recorded in the park during the three-phase archeological survey included pictographs. A discussion of six pictograph sites in the park has been published by Clark (1974), who has been involved with the Texas Archeological Society in a previously unrecorded pictograph shelter in Pine Springs Canyon and offered an interpretation of its possible affiliation. Prehistoric rock art in the park seems to represent two distinctive stylistic traditions. The majority of the sites are representative of the Jornada Style, which is associated with the Southwestern tradition. Motifs include animals, human forms, and decorative patterns. These sites are commonly associated with midden deposits. Several sites on the east side of the escarpment, notably those in Smith and Pine Springs Canyons, are not consistent with the Jornada Style and have no archeological deposits associated with them. It is hypothesized that these more abstract motifs represents an older tradition, possibly the Archaic Period.

Rock art sites in the park are deteriorating as a result of natural and human factors. Potential threats to pictograph panels include freeze-thaw cycles, fire, acid rain, unintentional damage by visitors, and intentional vandalism. A research program is needed to analyze known rock art sites in the park and to determine specific preservation needs.

Alternative Solution and Their Probable Impacts:

1. No Action

If no action is taken, the park's rock art resources will continue to deteriorate due to weathering and vandalism. Some sites may eventually be lost.

2 Analyze Condition of Rock Art

An evaluation of specific preservation needs of pictograph sites would provide the necessary baseline information for initiating a program to protect these resources. Appropriate preservation treatment would allow these prehistoric resources to be maintained for future benefit and enjoyment.

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Recommended Course of Action:

Research should be initiated to determine current conditions, threats, and appropriate preservation techniques for the park's rock art resources. Following this study, preservation treatments prescribed by research should be applied. All sites should be documented with photographs to allow post-treatment monitoring.

GUMO-C7 Historic Structure Reports

Problem Statement:

The park-wide Survey of Historic Structures (Griggs, 1973), prepared through Texas Tech University, did not address several significant structures, including those listed or proposed for listing on the National Register of Historic Places. An Historic Structure Report (HSR) as described in NPS-28, Cultural Resources Management Guidelines, provides an important collection of data and research findings on a structure and its setting, and is necessary for determining and executing appropriate preservation, restoration, or re-construction. An HSR for the Pinery was prepared in 1973, prior to stabilization of the site. Additional reports are needed for the Pratt Cabin, Wallace Pratt residence ("Ship in the Desert"), Williams Ranch house, and Frijole Ranch house. The first of these is a National Register property and the other three either are, or have been, under consideration for inclusion on the Register. A great deal of information exists about some of these structures, while relatively little is known about others. Detailed reports, including architectural and engineering data, are needed to guide the use, preservation, and maintenance of each structure.

Alternative Solutions and Their Impacts

1. No Action

If Historic Structure Reports are not prepared for these buildings, it will not be possible to determine preservation needs, appropriate treatment and use, and necessary maintenance for these significant historic resources. Effective interpretation of these sites will be limited by the lack of detailed information.

2. Prepare Historic Structure Reports

Historic Structure Reports would be prepared for classified structures that have not previously been researched or documented. These reports would provide information necessary for determining appropriate use, preservation, and maintenance of significant structures. This information would benefit both management and interpretive efforts.

Recommended Course of Action:

Historic Structure Reports should be prepared for the Pratt Cabin, Wallace Pratt residence, Williams Ranch house, and Frijole Ranch house. Each report should include a description of the structure, architectural and engineering data, structural materials, pertinent history, historic significance, administrative classification, accessibility and hazards to visitors, and proposed treatment.

GUMO-C8 Historic Structural Preservation Guides and Cyclic Maintenance

Problem Statement:

The majority of the park's historic sites are of less than National Register significance. All backcountry structures and remains have been classified simply as discovery sites. Most of these sites are being allowed to molder away naturally, although those which conflict with wilderness values or pose a threat to human safety have been designated for removal. There are no plans to spend preservation funds on any historic structures except the Pratt Cabin, Wallace Pratt residence (Ship-on-the-Desert), the Pinery, and Frijole Ranch. A Historic Structure Preservation Guide has not been prepared for any of these significant sites and is critically needed before the park can undertake restoration or stabilization actions. In 1981, 10-238's were submitted for funds to stabilize the Frijole Ranch and Williams Ranch house, and for restoration of the Pratt Cabin outbuilding. This work was completed by 1985. In 1987, park management and the regional historian agreed to document Williams Ranch and go with Section 106 for benign neglect. In September 1987, the park re-priortized its list of maintenance needs, and structures which need preservation work. The new maintenance management system also went on line in 1987 and will help to track cyclic maintenance work needs for each of the structures listed above. This will greatly improve and make management aware of structure needs.

Management of Pine Springs Cafe poses management concerns because the building is owned by the federal government and the cafe is not operated under a concessioner contract. The Texas State Historic Preservation Officer has determined that the store is eligible for listing on the National Register of Historic Places; but, because the National Park Service has not been able to assume full control of the property, enforcement of laws, regulations, and policies governing historic preservation (and mitigation) have been left largely to the state of Texas. The State Historic Preservation Officer has agreed to review and approve all repairs or preservation work on the cafe.

Protection of historic sites is mandated by various Federal laws, orders, regulations and NPS guidelines. Protection measures currently employed in the park include routine ranger patrols, public education, and controlled access to significant historic structures.

Alternative Solutions and Their Probable Impacts:

1. No Action

If no action is initiated, preservation of the park's historic resources will continue to be haphazard and unsystematic. Management of these resources will be pursued without specific objectives or a true understanding of purpose.

2. Prepare Historic Structures Preservation Guides

Historic Structure Preservation Guides for the Pinery, Pratt Cabin, Wallace Pratt residence, Frijole Ranch, and Williams Ranch would be prepared

by an historical architect. These guides would provide information needed to ensure the orderly, timely, and proper inspection and maintenance of significant historic structures. Historic Structure Preservation Guides are necessary if a cyclic preservation maintenance schedule is to be established. Without such guidance the park does not have the capability or expertise to preserved these structures.

Recommended Course of Action:

Historic Structure Preservation Guides should be prepared for the Pinery, Pratt Cabin, Wallace Pratt residence, Frijole Ranch, and Williams Ranch. Maintenance requirements should be determined with the assisteance of NPS historical architects and should include the extent of maintenance, frequency, type of materials to be used, etc. All maintenance accomplishments should be documented.

GUMO-C9 Historic Resource Study

Problem Statement:

Guadalupe Mountains is a relatively young park and, while a number of reports are available concerning the history of the area, very few professional studies have been completed. The Guadalupe Mountains National Park Historical Resources Study prepared by Benjamin Levy in 1971, provides the most complete synthesis from late prehistory to the end of the ranching era. However, Levy's report was written primarily as a management document to provide background data for park planners, to identify themes for interpretive programs, and to recommend appropriate treatment and use of historic sites and structures. Although it provides a useful guide to the full range of historical developments in the Guadalupe Mountains, it was not intended as a thorough or definitive history of the area. A historical base map should be a part of the final product once a Historical Resource Study is completed.

Alternative Solutions and Their Probable Impacts:

1. No Action

If no action is initiated, there will be no single publication providing a thorough and definitive history of the area from the early historic period (early 1500's) to the present. Resources management, interpretive programs, and visitor enjoyment of the historical aspects of the park will be hampered by the lack of such a reference. Much information about the past will be lost as people who work in the park or are knowledgeable about the area's history die or move away, and as files and records are disposed of or misplaced.

2. Prepare Area History

Prepare an exhaustive study of all materials relating to the general history of the area, followed by the compilation of a written report, providing a detailed up-to-date source of information. An accessible synthesis of historical information would be useful in management decision-making and interpretive programs, and would contribute to greater understanding of the park's historical resources.

3. Prepare Specific Studies

Instead of a general history of the area, specific information needs would be identified and researched. This would produce detailed, well-documented historical accounts of subjects that have not been adequately addressed in current publications. Although this action would not provide a single document synthesizing historical information, it would allow for more detailed examination of specific subjects, and is less likely to become outdated since additional studies could be added in the future. The Ethnographic Studies should follow the pattern recommended by NPS-28.

Recommended Course of Action:

Specific history studies needed for park management, interpretation, or to fill voids in historical material currently available, should be identified and researched. These studies should be conducted by professional historians and should result in detailed, well documented written publications. Priority needs for history studies are addressed in GUMO-C10 through CUMO-C13. Preparation of a synthesis of the general history of the area should be postponed until these specific studies are completed in order to eliminate overlapping research efforts, and to permit more concentrated investigation of subjects that have not been documented previously. The general history should include the administrative and establishment history of the park.

GUMO-C10 Ethnohistory of the Mescalero Apaches

Problem Statement:

Mescalero Apaches occupied the Guadalupe Mountains both in prehistoric and historic times. Part of their final struggle against United States westward expansion took place within the park area. Prehistoric Apache use of the area has been addressed in several archeological studies (Shafer, 1970; Katz and Katz, 1974; Katz, 1978; Bradford, 1980), but only a brief, general account of their use of the area in the historic period is available (Biggers, 1979). The nature and extent of the Mescalero Apaches' use of the Guadalupe Mountains for economic, religious, and military purposes is largely unknown. Although their most extensive utilization of the area occurred in the nineteenth century, it is known that the Mescalero used the Guadalupe for religious purposes until very recently. Requests to collect sotol fruit for religious ceremonies have been received from tribal members living on the Mescalero Apache Reservation north of the park.

Alternative Solutions and Their Probable Impacts:

1. No Action

If no action is initiated, the extent and nature of Mescalero Apache activities in the area will not be fully known or understood. The lack of an accurate account of this aspect of the park's history may hinder the ability to make informed management decisions and to provide effective interpretive programs.

2. Conduct Study of Mescalero Apaches

A study would be undertaken to determine the extent and nature of the Mescalero Apaches' use of the Guadalupe Mountains for economic, religious, and military purposes during historic times. This historic activity should be correlated with available archeological data and interpretation of prehistoric utilization of the area. The conflicts that took place between the Mescaleros and the U.S. Army should be described. The research effort should encompass traditional documentary sources, military microfilm record, state archives, and oral histories with the Mescalero tribe. The study should be contracted or assigned to an ethnohistorian or a person skilled in researching Indian history.

GUMO—C11 Survey of Historic Roads and Encampments

Problem Statement:

William Griggs' 1973 Survey of Historic Structures, Guadalupe Mountains National Park, prepared through Texas Tech University, did not include the several encampment sites and historic roads that exist within the park. These sites represent the significance of the Guadalupe Mountains in the history of exploration, transportation, and military reconnaissance in the Trans-Pecos region. Military encampments, dating from the second half of the nineteenth century, were utilized when the U.S. Army made repeated forays into the area. U.S. expeditions seeking routes for westward expansion were an important part of the history of the area. The historic road that was used by government survey parties, emigrants, Forty-niners, military expeditions, the Butterfield Overland Mail, and others throughout the nineteenth century has not been completely located and mapped. Identified portions of this road on the park's west side have been nominated for inclusion on the National Register of Historic Places.

Alternative Solutions and Their Probable Impacts:

1. No Action

If a survey of history roads and encampments is not undertaken, there will continue to be a critical lack of information concerning these significant resources. Such information is needed to protect and interpret these sites, and to convey an accurate picture of the period of westward expansion to the public. The location of the entire extent of the historic Emigrant Trail/Butterfield State Route, as it passed through the present park area, will not be identified or protected from human disturbance.

2. Conduct Survey

The sites of nineteenth century military encampments and major overland routes would be located, identified, and mapped. This information is needed to adequately protect and interpret these historic resources. This action would also identify the entire extent of the overland Emigrant Trail/Butterfield Stage Route within the park.

Recommended Course of Action

A study should be undertaken to locate, identify, and map the sites of military encampments and historic roads, including the Emigrant Trail/Butterfield Stage Route. The site survey report prepared in conjunction with this study should include detailed, well-documented histories of each encampment site located, as well as a history of the use of the overland road.

GUMO-C12 History of Ranching

Problem Statement:

Ranching was a significant part of the area's history from 1876, when the Rader brothers built the first permanent ranch house near Frijole Spring, until 1972, when the park was established. The ranching industry has been briefly discussed by Levy (1971) and has been treated from a structural standpoint by Griggs (1973). In addition, some information has been collected through interviews and correspondence with early ranchers. A thorough narrative history is needed to document turn-of-the-century homesteading activity, the surge of sheep and goat ranching in the 1920's and 30's, consolidation of small ranches into one large-scale operation by Judge J. C. Hunter, the development of the high country watering system and line camps, etc.

Alternative Solutions and Their Probable Impacts:

1. No Action

If no action is initiated, the ranching history of the area will not be fully documented. Without this information, effective interpretation of this period of history will be limited, efforts to restore park vegetation to natural conditions may be thwarted, and the management and protection of historic remnants of ranching operations may be misguided.

2 Prepare History of Ranching

Ranching activities in the Guadalupe Mountains would be traced and documented from the 1870's until the establishment of the park. The compilation of this information would provide for better understanding and more effective interpretation of this period of the park's history and would benefit efforts to restore natural vegetative conditions and to manage historic remnants of ranching activities.

Recommended Course of Action:

A thorough narrative of the history of ranching in the Guadalupe Mountains should be prepared. The study should trace the industry from its beginnings in the 1870's with small operators, to the establishement of large-scale ranches in the 1920's and 30's, to the acquisition of ranch lands by the NPS in the 1960's. The study should include oral histories of individuals who were involved in early ranching operations in the area.

GUMO-C13 History of Mining

Problem Statement:

Early in the twentieth century, copper and lead mines were developed in the Dog Canyon area of the park. Copper was hauled from the mountain over a wagon road to a smelter in El Paso. Remnants of this road, an old miners' cabin, and six mine shafts, including one with a short section of rail and an ore cart, are evident near Lost Peak. Some of the shaft openings were gated in 1981 for visitor safety. Mining was never a major endeavor in the area due to the remote location and the distance from El Paso. However, this unique aspect of the area's history and development has not been addressed in any existing report.

Alternative Solutions and Their Probable Impacts:

1. No Action

If no action is initiated, little will be known about the duration and extent of mining activity in the area, quantities and value of ore removed, and the overall significance of historic sites and structures related to this activity. Lack of detailed information will hamper effective interpretation and management of these historic resources.

2. Prepare History of Mining

Copper and other mining activities in the Dog Canyon area would be researched and documented. This would provide greater knowledge and understanding of this aspect of the park's history, and would benefit interpretation and management of historic mine sites and structures.

Recommended Course of Action:

A thorough study should be prepared on the copper mining operation in Dog Canyon as well as any other mining activities in the present park area. The research for this study should include on-site investigation and photographic documentation of mine shafts, interviews with local people who remember the mining period, a search of legal documents and records of companies involved in this mining, and other documentation.

GUMO-C14 Compilation of Cultural Resources Data

Problem Statement:

Some management of the park's cultural resources requires a comprehensive and accessible data base. Currently archeological and historic site records are contained in various reports, field notes, and maps; there is no single volume or file containing this information. The park currently does not have a base map showing the location of known archeological and historic sites. This limits the retrievability and dissemination of cultural resource data critical to park planning and management.

Alternative Solutions and Their Probable Impacts:

1. No Action

Without action, available information concerning the park's archeological and historic resources will not be available in a comprehensive, up-to-date format. Inaccessible or missing data may lead to lack of consideration of cultural resources in management decisionmaking and to human disturbance of cultural sites.

2. Compile Cultural Resources Data

A up-to-date compilation of archeological and historical site data would provide a beneficial tool for park management, planning, and interpretation. Such a data base would synthesize all known cultural resource information in an accessible format.

Recommended Course of Action:

All available literature, field notes, reports, and maps providing information on the archeology and history of the area should be compiled. The output of such a compilation should be a complete inventory file of archeological and historic sites, and a cultural resource base map. A cultural resources overlay should be developed as part of the park's resource inventory map series. This action would be correlated with GUMO-N21 Natural Resources Information Base.

GUMO-C15 Administrative History

Problem Statement:

Guadalupe Mountains National Park, a relative new park does not have an administrative history. Various news clippings, magazine articles, interviews, legislative reports, planning documents, hearing records, and park files exist that need to be compiled into one single document. The administrative history of the park should be written to enable future park personnel the opportunity to make sound management decisions based on agreements made prior to their arrival. It will help them to better understand their surroundings and the local ranchers with whom they might have to deal.

Alternative Solution and Their Probable Impacts:

1. No Action

If no action is initiated, no definitive administrative history of the park will be available to future park staff and administrators. When information is requested, personnel will have to try to obtain it by looking up files, (if they are available), call, or write past park employees to find the answers.

2. Prepare an Administrative History of the Park

Contract an administrative history of the park to include a comprehensive report. This information will become invaluable in the future to park interpreturs, administrators, and other park employees.

Recommended Course of Action:

Preparation of a comprehensive administrative history of the park to aid park management, interpretation, or to fill the voids in historical material on the park. At the present time, contractor is working on finalizing an administrative history of the park. The final report is due in March 1988, regional and park staff will review and approve the final report.

RESOURCES PROGRAMMING SHEETS

The following five-year programming sheets list all resource management projects in priority order and identify funding and manpower needed to carry out the recommended course of action. The figures displayed do not necessarily reflect actual staff and funding available, but rather an estimate of what is needed to address identified problems effectively. Man-years include only park personnel; professional support from the Southwest Regional Office and Denver Service Center is not included. Funding estimates include salaries, equipment, and other park operating expenses; cyclic maintenance; and research development, and professional services packages funded through the Forms 10-237 or 10-238 multi-year programming system. The resources programming sheets indicate projects that have been addressed in 10-237 or 10-238 package proposals.

NATURAL RESOURCES X

CULTURAL RESOURCES ___

PARK: Guadalupe Mountains NP

REGION: Southwest

STATE: Texas

DATE: February 1987

NATIONAL PARK SERVICE

RESOURCES PROGRAMMING SHEET

RMP Ref. #	Project and Activity Title	Priority	Action	Support Package Number**	1987 Req.		FY 1988 Req.		FY 1988 Add. Req.		FY 1989 Budg. Req.		FY 1989 Add. Req.		FY 1990 Plan.		FY 1990 Add. Req.		FY 1991 Plan.		FY 1991 Add. Req.	
					WY	TH	WY	TH	WY	TH	WY	TH	WY	TH	WY	TH	WY	TH	WY	TH	WY	TH
N-15	Boundary Fencing	1	RM	A06 A22 106 107 157 160	.1	10 7	.1	50	.1	50	.1	50	.1	50 7	.1	50	.1	50	.1	50	.1	50
N-1-01	Fire Management	2	RM	185	.3	54	.5	50	0	0	.3	25	0	0	.1	5	0	0	.1	5	0	0
N-23	Resource Management Support Services	3	RM		1	20	0	0	.5	10	.5	10	0	0	0	0	0	0	0	0	0	0
N-2-01	Backcountry Use	4	RM	A74 110 A77 184 192	.1	60	.1	1	.5	5 0 0	.1	1	.5	5 0 0	.1	1	.5	10	.1	1	.5	10
N-8-02	Predator Populations	5	M	166	.5	10	.1	2	.4	3	.1	2	.2	3	.1	2	.2	3	.1	2	.2	3
N-24	Black Bear Survey	6	RE	197	0	0	0	0	.1	40	0	0	.1	5	0	0	0	0	0	0	0	0
N-7	Monitor Ungulate Herd	7	M	CACA 171	.1	15	.1	2	.1	2	.1	2	.1	2	.1	2	.1	2	.1	2	.1	2
N-5-01	Preservation McKittrick Canyon	8	RM	A70 167 135	.1	50	.1	10	.1	10	.1	5	.1	5	.1	3	.1	69	.1	2	.1	2

* RM = Resources Management M = Monitoring RE = Research

NATURAL RESOURCES X

CULTURAL RESOURCES ___

PARK: Guadalupe Mountains NP

REGION: Southwest

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NATIONAL PARK SERVICE

RESOURCES PROGRAMMING SHEET

RMP Ref. #	Project and Activity Title	Priority	Action	Support Package Number**	1987 Req.		FY 1988 Req.		FY 1988 Add. Req.		FY 1989 Budg. Req.		FY 1989 Add. Req.		FY 1990 Plan.		FY 1990 Add. Req.		FY 1991 Plan.		FY 1991 Add. Req.	
					WY	TH	WY	TH	WY	TH	WY	TH	WY	TH	WY	TH	WY	TH	WY	TH	WY	TH
N-10-01	Threatened and Endangered Species Management	9	RM	188	0	0	.2	30	.1	2	0	0	0	0	0	0	0	0	0	0	0	0
N-11-01	Peregrine Falcon Management	10	RM	163	.3	0	.3	42	0	0	.1	2	0	0	.1	2	0	0	.1	2	0	0
N-1-02	Fire Management	11	M	185	.1	2	.1	2	.2	5	.1	10	.1	30	.1	2	.2	30	.1	2	0	0
N-8	Visibility Resources	12	M	200 201	.1	5	.1	5	0	0	.1	5	0	0	.1	5	0	0	.1	5	0	0
N-6-02	Surface Water Resources	13	M	187 167	.2	20	2	10	.3	5	0	0	0	0	0	0	0	0	0	0	0	0
N-4-01	Cave Protection and Use	14	RM		0	0	0	0	.1	20	0	0	0	0	0	0	0	0	0	0	0	0
N-4-02	Cave Protection and Use	15	M		.1	5	.1	5	0	0	.1	5	0	0	.1	5	0	0	.1	5	0	0
N-1-03	Fire Management	16	RE	194	0	0	0	0	.1	20	0	0	.1	20	0	0	0	0	0	0	0	0
N-5-03	Preservation McKittrick Canyon	17	RE	165 199	.1	30	.1	30	0	0	0	0	0	0	0	0	0	0	0	0	0	0
N-10-03	Threatened and Endangered Species	18	RE	163	0	0	0	0	.1	20	0	0	.1	10	0	0	0	0	0	0	0	0

* RM = Resources Management M = Monitoring RE = Research

** Indicates 10-227

NATURAL RESOURCES X

CULTURAL RESOURCES ___

PARK: Guadalupe Mountains NP

REGION: Southwest

STATE: Texas

DATE: February 1987

NATIONAL PARK SERVICE

RESOURCES PROGRAMMING SHEET

RMP Ref. #	Project and Activity Title	Priority	Action	Support Package Number**	1987 Req.		FY 1988 Req.		FY 1988 Add. Req.		FY 1989 Budg. Req.		FY 1989 Add. Req.		FY 1990 Plan.		FY 1990 Add. Req.		FY 1991 Plan.		FY 1991 Add. Req.	
					WY	TH	WY	TH	WY	TH	WY	TH	WY	TH	WY	TH	WY	TH	WY	TH	WY	TH
N-6-02	Surface Water Resources	19	M	187 167	.2	20	.2	10	.3	5	0	0	.1	5	0	0	0	0	0	0	0	0
N-9	Vegetation Utilization Ungulates	20	M		0	0	0	0	.5	25	0	0	0	0	0	0	0	0	0	0	0	0
N-21	Natural Resources Information base	21	RM		0	0	0	0	.5	1 2 5	0	0	.5	5	0	0	0	0	0	0	0	0
N-17	Pesticide Use	22	RM	191	.1	.2	.1	.2	0	0	.1	.2	0	0	.1	.2	0	0	.1	.2	0	0
N-14	Barbary Sheep Encroachment	23	RM	191 164	0	5	0	0	0	5	0	0	0	5	0	0	0	.5	0	0	0	.5
N-19-01	Oil and Gas Development	24	M		0	.2	0	12	0	0	0	0	.2	0	0	0	.2	0	0	0	0	.2
N-19-02	Oil and Gas Development	25	RE	165	0	0	0	18	0	0	0	0	0	18	0	0	0	0	0	0	0	0
N-16	Insect and Disease Control	26	M	191	0	0	0	0	0	.5	0	0	0	.5	0	0	0	.5	0	0	0	.5
N-12	Re-introduce Bighorn Sheep	27	RM	185	0	0	0	0	.1	10	0	0	.1	5	0	0	0	0	0	0	0	0

NATURAL RESOURCES X

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NATIONAL PARK SERVICE

RESOURCES PROGRAMMING SHEET

RMP Ref. #	Project and Activity Title	Priority	Action	Support Package Number**	1987 Req.		FY 1988 Req.		FY 1988 Add. Req.		FY 1989 Budg. Req.		FY 1989 Add. Req.		FY 1990 Plan.		FY 1990 Add. Req.		FY 1991 Plan.		FY 1991 Add. Req.	
					WY	TH	WY	TH	WY	TH	WY	TH	WY	TH	WY	TH	WY	TH	WY	TH	WY	TH
N-22	Exotic Plant Management	28	RM	191	.1	20	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
N-3	Backcountry Restoration	29	RM	A27 A77	0	0	0	60	.1	10	0	0	.1	10	0	0	0	0	0	0	0	0
N-25	Cyclic Maintenance Management	30	RM	A06 A22 A19 A83	0	0	0	5	.5	15	0	5	0	10	0	5	0	10	0	5	0	10

* RM = Resources Management M = Monitoring RE = Research

NATURAL RESOURCES __

CULTURAL RESOURCES X

PARK Guadalupe Mountains NP

REGION Southwest

STATE Texas

DATE September 16, 1986

NATIONAL PARK SERVICE

RESOURCES PROGRAMMING SHEET

RMP Ref No	Project & Activity Title	Priority	Action Type*	Support Pkg No.**	FY 1987 Requested		FY 1988 Requested		FY 1988 Additional Required		FY 1989 Budgeted (Requested)		FY 1989 Additional Required		FY 1990 Planned		FY 1990 Additional Required		FY 1991 Planned		FY 1991 Additional Required	
					WY	$1000	WY	$1000	WY	$1000	WY	$1000	WY	$1000	WY	$1000	WY	$1000	WY	$1000	WY	$1000
C-14	Compilation of Cultural Resources Data	1	A	137	0	0	0	0	2	5	0	0	.1	3	0	0	.1	2	0	0	0	0
C-1	Museum Collection	2	A		0	0	0	0	.1	2.6	0	0	.1	2.2	0	0	.1	2.2	0	0	1	2
C-2	Archeological Surveys of High Impact Areas	3	A	190	0	0	0	0	.1	2	0	0	.1	2	0	0	.1	2	0	0	.1	2
C-7	Historic Structures Rept	4	C	168 151	0	0	0	0	.1	2	0	0	.1	1	0	0	0	0	0	0	0	0
C-8	Historic Structural Guides and Cyclic Maintenance	5	A/B	A38 151 179 180 181	.1	75	0	50	.2	10	0	0	0	0	0	0	1	25	0	0	0	0
C-4	Effect of Fire on Archeological Sites	6	C		0	0	0	0	0	0	0	0	.1	5	0	0	0	0	0	0	0	0
C-3	Protection of Archeological Sites	7	A/B		0	0	0	0	.1	1	0	0	.2	3	0	0	.1	1	0	0	.1	1
C-11	Survey of Historic Roads and Encroachments	8	C	171	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	.1	15
C-10	Ethnohistory of the Mescalero Apaches	9	C	169	0	0	0	0	0	0	0	0	0	25	0	0	0	0	0	0	.1	0
C-12	History of Ranching	10	C	170	0	0	0	0	0	0	0	0	0	25	0	0	0	0	0	0	1	0
C-13	History of Mining	11	C	172	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	.1	25
C-5	Prehistoric Use of Area	12	C		0	0	0	0	0	0	0	0	0	0	0	0	2	25	0	0	0	0
C-9	General Park History	13	C	129 196	0	0	0	0	0	0	0	0	0	0	0	0	.1	15	0	0	0	0

*A = Resources Management B = Monitoring C = Research

**Indicates 10-237

NATURAL RESOURCES __
CULTURAL RESOURCES X

PARK Guadalupe Mountains NP
REGION Southwest
STATE Texas
DATE September 16, 1986

NATIONAL PARK SERVICE

RESOURCES PROGRAMMING SHEET

RMP Ref No	Project & Activity Title	Priority	Action Type*	Support Pkg No.**	FY 1987 Requested		FY 1988 Requested		FY 1988 Additional Required		FY 1989 Budgeted (Requested)		FY 1989 Additional Required		FY 1990 Planned		FY 1990 Additional Required		FY 1991 Planned		FY 1991 Additional Requi	
					WY	$1000	WY	$1000	WY	$1000	WY	$1000	WY	$1000	WY	$1000	WY	$1000	WY	$1000	WY	$1(
C-6	Rock Art Study	14	C	152	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	.1	1
C-15	Administrative History	15	C		0	0	.2	$2,000	0	0	0	0	0	0	0	0	0	0	0	0	0	0

*A = Resources Management B = Monitoring C = Research
**Indicates 10-237

ANNUAL REVIEW AND PLAN REVISION

The Resources Management Plan will be reviewed annually. Prior to the beginning of each fiscal year, and before submission of an operating budget, the Area Manager, Chief of Resource Management and Visitor Protection, and Staff Resource Management Specialist will meet to evaluate progress in accomplishing the previous year's resources management objectives, determine necessary revisions in the resources programming sheets, and assess additional resources management needs. Recommended changes in the Resources Management Plan will be drafted and submitted to the Superintendent for concurrence.

Plan revisions must be approved by the Regional Director, with the exception of the following: (1) grammatical corrections, (2) page numbering corrections, (3) deletion of completed projects, (4) deletion or addition of appendices, (5) correction of the table of contents, (6) park priorities, and (7) programming sheets. Copies of all changes initiated at either the park or regional office will be promptly forwarded to the other office so that all copies of the plan are identical. Revised pages will be dated in the lower right corner of the page. Annual revision will be documented with Regional Director's signature and date of approval on the cover sheet of the plan.

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Resources Management Plan Coordinator
Southwest Region

ENVIRONMENTAL ASSESSMENT MATRIX

An Environmental Assessment Matrix sheet has been prepared for each project statement. Each matrix sheet details impacts which are either expected or foreseen as a probable consequence of each project. Environmental impact elements considered included: air quality, water quality, vegetation, wildlife, endangered and threatened species, soils, cave resources, and socio-economic factors. If specific environmental elements are <u>not</u> contained in the Environmental Assessment Matrix, the NPS expects these elements will not be impacted by the proposed project. Only those elements listed on the matrix sheets are expected to receive impacts from the proposed project.

ENVIRONMENTAL ASSESSMENT MATRIX

PROJECT STATEMENT TITLE: GUMO-N1-Fire Management

NEED FOR PROPOSAL: This project is needed to reinstate fire to its ecological role in the park.

Alternative Action / Impact Categories	PROPOSED ACTION Implement a Fire Management Plan Including a Fuel Reduction Program Through Prescribed Burns and a Prescribed Natural Fire Program	ALTERNATIVE 1 Suppress All Fires	ALTERNATIVE 2 No Action
Vegetation	Approximately 20,500 acres of the park will be subject to either wildfires or prescribed burns. These fires will alter the existing plant communities toward those more closely resembling communities that would exist, had man not intervened through the suppression of natural fires. In the higher elevations both heavy and fine fuel loading will be reduced and the threat of catastrophic fires will be eliminated. Plant communities such as the relict mixed conifer forest in the Bowl will be perpetuated. In the low country restoration of natural grasslands will occur when the dense patches of creosote bush (Larrea tridentata) and mesquite (Prosopis glandulosa) are removed by fires and brushy shrubs are replaced by faster growing native plants adapted to normal fire succession.	Unnatural succession of plant communities will continue to develop at its current rate. A heavy growth of dense, woody shrubs will cover moister areas of the park and dense patches of coarser bunchgrasses will grow on exposed slopes. Fires burning in this accumulation of heavy fuels will burn at high temperatures. This amount of heat kills the seeds and roots of those plants adapted to survive less intense fires. The soil is sterilized and generates new growth only after several years.	All fires would be allowed to burn in the park, including man-caused fires. Some benefit would be gained from naturally occurring fires which are ignited under proper atmospheric conditions. These would probably occur most frequently. Other natural fires could start during extreme heat and dryness and be too hot due to an unnatural fuel buildup. Soil sterilization would result. Man-caused fires would possess the same benefits and problems. The erratic pattern and number of fires would not allow the park to manage them effectively or monitor their ecological impacts.
Wildlife	A return of plant community species and densities to natural levels will benefit associated wildlife communities. As habitat increases because of fire management programs, some species will become more abundant. Those species adapted to heavier, denser plant communities will decline	Most wildlife species decline as vegetation becomes denser. Range ungulates (deer and possibly bighorn sheep) will move to areas where fires have created mosaics of young and old vegetation. The net effect will be a reduction of species populations and diversity.	All wildlife will move from are experiencing extreme fire temperatures. Those fires burning within native habitat tolerance levels will facilitate recreation of habitat most suited to native wildlife species thus promoting their increase.

ENVIRONMENTAL ASSESSMENT MATRIX

PROJECT STATEMENT TITLE: GUMO-N1-Fire Management

NEED FOR PROPOSAL: This project is needed to reinstate fire to its ecological role in the park.

Alternative Action / Impact Categories	PROPOSED ACTION Implement a Fire Management Plan, Including a Fuel Reduction Program Through Prescribed Burns and a Prescribed Natural Fire Program.	ALTERNATIVE 1 Suppress All Fires	ALTERNATIVE 2 No Action
Wildlife (cont)	Although species numbers within the park will shift, the overall existence of wildlife in the park will not be affected by the fire management program.	Some rodents increase when better protection is offered by thicker vegetation. Some predators adapt to this condition (snakes, foxes, Cooper's hawks) but others move to preferred open area habitats.	Similar loss-benefit impacts would result from man-caused
Soils	Relatively cool fires will burn under proper prescriptions. Severe impacts on soil nutrients and organisms will not occur. Soils will remain stable and be capable of supporting new growth almost immediately Nutrients locked in plants will be released through ash and soot and return to the soil for use in new plant growth.	The fires that eventually burn over the park will be intense. Soil nutrients and organic components will be destroyed by the heat. Drying will make these soils more susceptible to erosion, especially during heavy rains.	Fires burning under these conditions will vary in intensity and impacts on soil communities "Hot" fires will destroy soils as in Alternative 1. "Cool" fires will benefit soils as in the Proposed Action.
Air Quality	Smoke and ash from prescribed fires will temporarily degrade air quality in the vicinity of the park. Although this impact will cause poor visibility and breathing problems (an estimated 10 tons of sulfates, phosphates carbon, and carbon monoxide) it will be much less than that generated during uncontrolled wildfires. All fires will be coordinated with the State Environmental Improvement Division.	Fires in the park are inevitable when fuels reach a critical mass. Smoke and ash released from uncontrollable, intense fires will be thrown high into the air and be unavailable to park vegetation. The smoke will travel for miles in the direction of the prevailing winds and be visible throughout Southeastern New Mexico and West Texas These fires will be impossible to predict.	Air quality impacts will be mixed as fires vary in intensity. Small, cool fires will have little impact. Large, intense fires will radically degrade the area's air quality

ENVIRONMENTAL ASSESSMENT MATRIX

PROJECT STATEMENT TITLE: GUMO-N1-Fire Management

NEED FOR PROPOSAL: This project is needed to reinstate fire to its ecological role in the park.

Alternative Action / Impact Categories	PROPOSED ACTION	ALTERNATIVE 1	ALTERNATIVE 2
	Implement a Fire Management Plan, Including a Fuel Reduction Program Through Prescribed Burns and a Prescribed Natural Fire Program	Suppress All Fires	No Action
Water Quality	Some ash will settle in scattered water sources throughout the park. The small amount involved will be temporary and not significantly degrade either water quality or availability. Controlled fires will not cause any soil condition changes that would lead to water quality degradation.	Heavy amounts of ash will contaminate nearby water sources. Soils baked and loosened by loss of organic components will also wash into nearby water sources	This alternative will result in varied water quality impacts. The degree of variability will be similar to that described under "Air Quality."
Socio-economic	Persons interested in maintaining natural ecological balances in the national park will be pleased with restoration of fire to its natural role. Those believing all fires are innately "bad" will object to NPS efforts to restore fire to its natural role.	Persons understanding fire's ecological role in the parks will object to an NPS failure to manage the park under its own policy edicts and sound ecologic principles. All will lament the ecosystem loss resulting from inevitable wildfires.	Persons with extreme opposite views of park fire management will object to the NPS "doing nothing" about fires, i.e. either establishing an active management program or extinguishing all fires.
Endangered and Threatened	Return of the park habitats to more natural conditions will enhance these species (peregrine falcons, McKittrick pennyroyal, and pincushion cactus) ability to survive. All such management will be coordinated with appropriate officials of the U.S. Fish and Wildlife Service, Endangered Species Office.	These species will be adversely impacted, first by unnatural conditions created by suppression of wildfires (see "vegetation" impacts above) and secondly, by the impact of holocaust wildfires.	Impacts will depend upon individual characteristics of fires burning in the critical habitat of threatened and endangered species. Regardless of the ignition source, cool fires will either have little impact or be beneficial to the species. Holocaust fires may destroy both the individual species and their habitat.

ENVIRONMENTAL ASSESSMENT MATRIX

PROJECT STATEMENT TITLE: GUMO-N2-Backcountry Use

NEED FOR PROPOSAL: This project is needed to insure all uses of park backcountry areas are within the parameters established by the Wilderness Act of 1964 and NPS Management Policies.

Alternative Action / Impact Categories	Proposed Action	ALTERNATIVE(S)
	Revise the Park Backcountry Management Plan to Provide a Foundation for Monitoring Backcountry Resources and Visitor Use Impact and to Improve Backcountry Use Opportunities	No Action
Plants and Wildlife	The proposal will have no adverse impact on backcountry biota. Monitoring of visitor use and impact will enable the park to predict and detect any population fluctuations from backcountry use.	"No action" will result in continued current levels of backcountry use without fully understanding its effects on endemic plant and animal populations.
Endangered Species	No direct physical impact from this proposal is foreseen. Increased knowledge of the frequency and range of particular species will aid managers in protecting critical habitats.	Decisions will be made without an adequate data base regarding critical habitats for listed species. Inadvertent disturbances of these populations could lead to their extinction.
Soils	Improvement of park trails would reduce current erosion on poorly designed and located trails.	Failure to establish a Backcountry Management Plan will result in accelerated visitor impact levels with increasing visitation.
Cave Resources	This proposal could increase backcountry use and cause greater demands to be placed on known, and yet undiscovered caves.	Current backcountry visitation indicates no significant impacts.
Socio-economic	Visitors will be affected by the ability to experience the backcountry as an area of solitude and primitive recreation. These resources will be protected and perpetuated under the provisions of the Wilderness Act.	

ENVIRONMENTAL ASSESSMENT MATRIX

PROJECT STATEMENT TITLE: GUMO-N3-Backcountry Restoration

NEED FOR PROPOSAL: This project is needed to insure that areas disturbed by human activity are restored to their natural condition.

Alternative Action / Impact Categories	Proposed Action	ALTERNATIVE(S)
	Establish Site Reclamation Programs to Speed the Return of Disturbed Areas to Their Natural Conditions	No Action
Soils	Erosion will be diminished by seeding and transplanting in barren areas. Natural grades and soil layers will be restored where necessary.	Soil communities will recover at a slow rate, possibly 50 to 100 years.
Vegetation	Areas will be either seeded or transplanted to speed the return of a natural vegetative community. Thus, exotic species will be less likely to be dominant.	Unaided recovery will occur at a very slow rate. Exotic plants will dominate the impacted areas.
Socio-Economic	Areas will be viewed by visitors as more aesthetically pleasing and natural. Visitors will see fewer areas impacted by man's activities. Previously distubed park areas will be restored to natural balances of plant and animal communities.	Failure to initiate such a program will result in considerable detraction from the park's "naturalness.

ENVIRONMENTAL ASSESSMENT MATRIX

PROJECT STATEMENT TITLE: GUMO-N4-Cave Protection and Use

NEED FOR PROPOSAL: A cave management plan is needed to preserve cave resources and provide visitor use opportunities.

Alternative Action / Impact Categories	Proposed Action	ALTERNATIVE(S)
	Put Approved Cave Management Plan into Operation	No Action
Cave Resources	Cave resources will be inventoried throughout the park. This information will provide basic data from which park managers can develop management practices that offer maximum protection of cave resources and optimum carrying capacities.	Failure to implement the approved Cave Management Plan will hinder the park's ability to preserve and protect the fragile resources of the caves. Speleothems will be irreparably damaged by inappropriate use of the caves.
Socio-Economic	Cave visitors will benefit by having up-to-date interpretation of the cave resources and information about protection of these resources. Visitors will benefit by having cave resources protected while enjoying limited recreational use of the caves. Some visitors, perhaps 50-100 per year, will be denied access to specific areas which have been designated as too fragile for public use. The monitoring program will insure that cave resources are being managed within their ability to withstand public use pressures. Some activities, such as research or collecting, will be denied in specific areas that have been designated as either too fragile or irreplaceable.	The public will be adversely impacted by degradation of a natural area considered to be of international significance.

ENVIRONMENTAL ASSESSMENT MATRIX

PROJECT STATEMENT TITLE: GUMO-N5-Preservation of McKittrick Canyon

NEED FOR PROPOSAL: The project is needed to insure preservation of the natural integrity of the McKittrick Canyon drainage.

Alternative Action / Impact Categories	Proposed Action	ALTERNATIVE(S)
	Establish Long-term Monitoring Programs to Detect Changes Associated with Human Use	No Action
Biotic Resources	Species composition and population densities will be monitored under this proposal. Changes in community structures will be detected and changes in the management of the area will be initiated to mitigate all negative impacts.	If "No Action" is taken, existing management policies will continue. These policies are not effective in providing a systematic means of detecting progressive, or cumulative, changes associated with the increased human use of the area.
Water Resources	Trends in water quality will be determined by monitoring selected aquatic parameters such as the biological, physical, and chemical components. The data will be used for directing future management policies and decisions to preserve and protect these resources.	Failure to implement a water monitoring program will result in an inability of the park to detect, and correct, man-caused pollution problems.
Socio-Economic	The proposal will have no direct adverse impact on the visiting public. The monitoring program will insure that the canyon resources are being managed within their ability to withstand public use pressures.	The public will be adversely impacted by the degradation of this unique natural area.

ENVIRONMENTAL ASSESSMENT MATRIX

PROJECT STATEMENT TITLE: GUMO-N6-Surface Water Resources

NEED FOR PROPOSAL: This project is needed to restore and preserve natural water resources.

Alternative Action / Impact Categories	Proposed Action	ALTERNATIVE(S)
	Develop a Program to Restore the Park's Natural Aquatic Systems and Monitor and Review the Water Quality Annually	No Action
Water Resources	Park aquatic systems will not be adversely impacted by this proposal. Data obtained through annual monitoring will insure the protection and perpetuation of these systems.	Changes in water quality will be undetected. An insufficient data base will result in alterations or interferences with the natural aquatic systems.
Biotic Resources	Removal of artificial impoundments will restore vegetative and wildlife populations to their natural diversity and densities around given water supplies.	"No Action" will result in the loss of information needed to evaluate population fluctuations.
Socio-Economic	The public will be assured that natural water sources within the park are free of man-caused pollutants. These systems will flow at rates and quality levels determined only by natural conditions.	Failure to implement a monitoring program will prevent the NPS from being able to detect man-caused influences on water resources and current problems.

ENVIRONMENTAL ASSESSMENT MATRIX

PROJECT STATEMENT TITLE: GUMO-N7-Introduced Elk Herd

NEED FOR PROPOSAL: This project is needed to insure that the introduced elk population in the park is regulated only by natural population controls.

Alternative Action / Impact Categories	Proposed Action: Implement a Monitoring Program	ALTERNATIVE(S): Develop a Management Policy to Increase the Park's Elk Population
Elk Ecology	This proposal will temporarily compromise NPS mandates and allow natural populations and ecological processes to operate unimpeded. The park's elk herds will continue to respond to natural population fluctuations without interference from park managers. The number of elk in the park will most likely drop from its present level (100 animals) to approximately 50-75 animals.	This action would have a major impact on the elk population as well as on other interdependent species. Short-term population increases would lead to long-term disturbances and alteration of the natural ecosystem. NPS mandates to perpetuate natural ecological processes would be violated.
Water Resources	No adverse impact from this proposal.	Water resources would be manipulated and/or developed to increase the availability of this limiting factor to the elk.
Socio-Economic	The aesthetic values of seeing this animal in a natural setting will be provided to those who visit the park. Decreasing population levels will slightly lower the prospect of viewing these animals.	Some visitors will enjoy the increased opportunities to view this species despite their unnatural status. A small portion of the public will enjoy the possibilities of increased hunting opportunities on lands adjoining the park.

ENVIRONMENTAL ASSESSMENT MATRIX

PROJECT STATEMENT TITLE: GUMO-N8-Predator Populations

NEED FOR PROPOSAL: This program is needed to insure the protection of animals in the current environment of heavy depredation hunting by neighboring ranchers.

Alternative Action / Impact Categories	Proposed Action: Continue the Present Monitoring Program and Improve Communication with Local Ranchers	ALTERNATIVE(S): No Action
Wildlife (including mountain lions)	This program will have long-term benefits to the mountain lion population, and ecologically related wildlife, by insuring a firm data base for developing NPS management decisions. It will aid the park in countering outside pressures which could jeopardize the natural balances of these animals.	The failure of the NPS to obtain adequate data concerning the ecology of mountain lions will lead to the development of management decisions based on incorrect or poor information.
Socio-economic	This proposal insures natural ecological balances within the park and the subsequent enjoyment of these processes by the visiting public. People will be assured that mountain lions do exist within the park and that these animals are being protected in perpetuity. The development of a sound data base also insures that management programs developed in response to lion depredation problems are handled in an expeditious manner and offering neighboring ranchers maximum allowable cooperation, while assuring the stability of lion populations in the park.	The park will be unable to respond to depredation complaints by neighboring ranchers due to the need to insure total protection of the lions until suitable information is obtained.

ENVIRONMENTAL ASSESSMENT MATRIX

PROJECT STATEMENT TITLE: GUMC-N9-Vegetation Utilization by Ungulates

NEED FOR PROPOSAL: This project is needed to evaluate the interrelationship of ungulate populations with the park's vegetative resources.

Alternative Action / Impact Categories	Proposed Action	ALTERNATIVE(S)
	Re-Survey Browse Transects, Establish a System to Monitor Vegetative Conditions to Detect Trends and Use of Park Vegetation by Ungulates	No Action
Wildlife	Ungulate populations will not be directly impacted by this action. The accumulation of data from this proposal will insure a natural balance between forage resources and ungulates.	Failure to implement a monitoring effort will result in the park managing these animals and associated plant communities, without an adequate information base.
Plants	The maintenance of natural levels of deer in the park is interdependent with the naturalness of local vegetation communities. Controlling deer populations will insure that park vegetation is maintained in a natural condition.	A "No Action" alternative would result in the possible over utilization and deterioration of vegetative resources by ungulate populations.
Socio-economic	The proposal will insure that park visitors experience a national park area in proper ecological balance.	The inability to detect changes in either the ungulate populations or browse conditions will ultimately result in a loss of the aesthetic quality a visitor would expect to experience in a naturally balanced ecosystem. The park will be unable to respond to possible influences from outside hunting pressures on its deer herds.

ENVIRONMENTAL ASSESSMENT MATRIX

PROJECT STATEMENT TITLE: GUMO-N10-Threatened and Endangered Species

NEED FOR PROPOSAL: This project is needed to meet the edicts of the Endangered Species Act and to afford maximum protection to these plant and animal species.

Alternative Action / Impact Categories	Proposed Action	ALTERNATIVE(S)
	Inventory Listed Species and Continue Consultation with the U.S. Fish and Wildlife Service. Initiate a Survey of Numbers and Distribution of these Specimens Within the Park	No Action
Endangered and Threatened Species	The implementation of this proposal will have no direct physical impact on any endangered or threatened species or their critical habitat. These organisms will be better protected, through field survey work and "Section 7" consultation with the U.S. Fish and Wildlife Service, and by insuring that no management activities threaten them.	A "No Action" alternative will result in park managers operating without the data base needed to protect these organisms. The result would be the inadvertant disturbance of these plants and animals. This disturbance could ultimately contribute to the extinction of these species.
Socio-economic	The park will continue to serve as a refugium for threatened and endangered species. These populations will be afforded every management option in protecting existing populations and increasing their existences. Visitors will continue to be afforded an opportunity to witness these forms of wildlife.	"No Action" violates the intent of the Endangered Species Act and compromises the existence of these forms of wildlife.

ENVIRONMENTAL ASSESSMENT MATRIX

PROJECT STATEMENT TITLE: GUMO-N11-Peregrine Falcons

NEED FOR PROPOSAL: This project is needed to protect and perpetuate the natural distribution and abundance of peregrine falcons

Alternative Action / Impact Categories	Proposed Action Develop a comprehensive program to protect and perpetuate peregrine falcons in the Guadalupe Mountains National Park	ALTERNATIVE(S) No Action
Peregrine Falcon Population	This proposal will have no direct impact on the park's peregrine falcon population. An analysis of critical habitat requirements, in cooperation with the U.S. Fish and Wildlife Service, will assure the protection of these areas during the development of the various backcountry programs, i.e. visitor carrying capacities and trail use limits. The overall effect of this action will be the long-term protection and preservation of the existing peregrine population. Studies involving pesticide concentrations in prey species and the possibility of "hacking" chicks will have no direct impact on the existing population. Information gained from these studies will result in the development of possible methods of controlling pesticide ingestion and the stimulation of breeding success, respectively.	Failure to implement a comprehensive population census and pesticide research program will result in the inability of the park to monitor the well-being of this endangered species. Populations will decline as outside influences cause egg breakage and destruction. Eventually the bird will disappear from the park.
Socio-economic	Those persons interested in the well-being of this endangered species will support park efforts to learn more about decimating factors and develop protective management programs. The chances of a visitor seeing one of these endangered species will increase as the population stabilizes and begins to increase to normal levels.	Failure to adequately protect the falcon will have no significant impact on the economic well-being of the region. Persons interested in the protection of this predator species will lament its demise in the national park. Other visitors will be unconcerned. The park will fail to abide by established laws requiring Federal agencies to preserve and protect these species.

ENVIRONMENTAL ASSESSMENT MATRIX

PROJECT STATEMENT TITLE: GUMO-N12-Reintroduction of Desert Bighorn Sheep (Ovis canadensis mexicana)

NEED FOR PROPOSAL: This project is needed to meet NPS wildlife management policies concerning the reintroduction of native wildlife.

Alternative Action / Impact Categories	Proposed Action	ALTERNATIVE(S)
	Develop a Plan to Reintroduce Desert Bighorn Sheep to the Park	No Action
Wildlife	Reintroduction of desert bighorn sheep to the park will have no adverse impact on either park wildlife or other natural resources. Reintroduction of this species will restore a natural component of the park and adjacent land's ecosystems, and augment their wildlife values.	If no action is taken, this endemic species will not be restored to its former habitat.
Socio-economic	A more complete ecologic display for the park and surrounding lands will be presented to the visiting public. The aesthetic value of seeing this animal in its natural setting will be provided to those who visit the park and expect an opportunity to view native wildlife.	If no action is taken, a complete ecological picture can never be presented to the visiting public. Aesthetic values enjoyed by persons wishing to experience natural ecosystems in in the park will be diminished.

ENVIRONMENTAL ASSESSMENT MATRIX

PROJECT STATEMENT TITLE: GUMO-N14-Barbary Sheep Management

NEED FOR PROPOSAL: This proposal is needed to remove the influence of this exotic species on the park's native ecosystem.

Alternative Action / Impact Categories	Proposed Action	ALTERNATIVE(S)
	Remove All Barbary Sheep from the Park by Shooting	No Other Alternative Considered
Barbary Sheep	All sheep will eventually be removed from Guadalupe Mountains National Park. An estimated 2 to 3 sheep will be shot each year until the population is eliminated.	The NPS policy on exotic species requires their elimination where practical. The cost of various live removal methods are prohibitive for barbary sheep. Therefore, the park views a direct reduction program as the environmentally preferred method for solving this problem.
Wildlife	The exotic barbary sheep will no longer compete with native wildlife for available food and habitat. These sheep will also be eliminated as a disease vector for native wildlife species.	
Plants	Removal of these sheep will permit native plants to recover their natural abundance. Since few sheep remain in the park, the impact of their removal is expected to be slight.	

ENVIRONMENTAL ASSESSMENT MATRIX

PROJECT STATEMENT TITLE: GUMO-N15-Boundary Fencing

NEED FOR PROPOSAL: This project is needed to insure that trespass grazing in the national park is eliminated.

Alternative Action / Impact Categories	Proposed Action	ALTERNATIVE(S)
	Increase Boundary Patrols and Fence Park Boundary as Needed	No Action
Wildlife	Habitat and vegetation currently impacted by trespass livestock will begin to recover once these animals are removed. The livestock's preferred grasses and forbs will become slightly more abundant and more available to native wildlife. Boundary fence construction will not impede wildlife species movement.	Wildlife populations will continue to respond to continuing deterioration of native plant communities. Some rodent species will increase in response to the modified habitat, others will decrease with the elimination of preferred food sources.
Plants	Approximately 10 square miles of native vegetation on impacted lands will cease deteriorating and begin to return to normal species density and frequency levels.	Grasses and forbs on the 10 square miles of impacted park lands will decline in species density and frequency.
Soils	Soils compacted and exfoliated by trespass livestock hooves will return to normal densities. Loss of soils by erosion will slow as vegetative communities return to normal levels.	An accelerated loss of soils through erosion will continue as livestock removes preferred forage. The thin soil crust will eventually disappear from the impacted area. Hundreds of years will be required to replace this soil.
Socio-	Removal of trespass livestock from park lands will not impact the economy of the region. Visitors will be able to view normal displays of Chihuahuan Desert plants and wildlife.	No significant impact to the local economy. Livestock will continue to deplete park vegetation. Visitors to the park will witness the deterioratio of vegetation in the impacted area.

ENVIRONMENTAL ASSESSMENT MATRIX

PROJECT STATEMENT TITLE: GUMO-N16-Insect and Disease Control

NEED FOR PROPOSAL: This project is needed to insure insects and diseases existing under natural conditions are adequately monitored so corrective and timely action can be taken when control in required as set forth by the NPS Management Policies.

Alternative Action / Impact Categories	Proposed Action	ALTERNATIVE(S)
	Monitor Insect and Disease Activity and Report Unusual Signs of Activity to the U.S. Forest Service	No Action
Biotic Resources	No adverse impact will result from this activity. Early detection and management will minimize the potential adverse effects of an outbreak of exotic insects and diseases and prevent problems from reaching epidemic proportions. The possible loss of native plant species can be averted and damage to unique, fragileecosystems can be either minimized or mitigated.	Undetected and/or unreported infestations may either cause or contribute to loss of native vegetation and wildlife. Human health and safety could be endangered and natural ecosystems altered by exotic organisms or inappropriate human activit i.e. biocide use.
Socio-economic	Aesthetic aspects of the park biota will be preserved in a natural state for both visitor enjoyment and scientific study. Potential outbreaks of exotic infestations damaging to lumber, livestock, and other economic activities will be prevented from spreading to lands adjacent to the park.	Failure to implement an adequate monitoring program will result in an inability to respond to outside pressures to spray natural insect irruptions. There will also be a delay in responding to exotic species outbreaks.

ENVIRONMENTAL ASSESSMENT MATRIX

PROJECT STATEMENT TITLE: GUMO-N17-Integrated Pest Management

NEED FOR PROPOSAL: This project is needed to insrue that pesticide use is conducted in a discerning, informed manner and in accordance with both Departmental and NPS guidelines

Alternative Action / Impact Categories	PROPOSED ACTION Expand Efforts Toward Integrated Pest Management Techniques	ALTERNATIVE 1 No Action	ALTERNATIVE 2 Continue Current Pest Management Practices
Biotic Resources (Wildlife and Plants)	Some impact is likely to occur since pesticides seldom have a discriminating effect on the target species. The park objectives will be to implement biological and mechanical controls before using biocides.	Undetected and/or unreported infestations may either cause or contribute to loss of native plants and animals, human health and safety hazards, and the spread of infestations to surrounding lands. Natural ecosystems may be altered by either exotic organisms or inappropriate human activity.	Native biota may continue to be adversely affected by use of chemical pesticides and short-term management practices.
Socio-economic	Use of pesticides only as a last resort will lessen the potential human and ecological hazard.	Visitors will experience areas damaged by infestations of harmful organisms which may detract from the area's natural qualities. This damage could spread to areas adjacent to the park and cause economic loss to the lumber, livestock, and farming industries.	The public will be adversely impacted by the degradation of a natural area considered to be of international significance.

ENVIRONMENTAL ASSESSMENT MATRIX

PROJECT STATEMENT TITLE: GUMO-N18-Visibility Resources

NEED FOR PROPOSAL: This project is needed both to meet the requirements of the Clean Air Act of 1977 and to afford maximum protection to the park's related air quality values.

Alternative Action / Impact Categories	PROPOSED ACTIONS Collect and Monitor Baseline Air Quality Data with Instrumentation and Review Potential New Sources of Air Pollution Outside the Park	ALTERNATIVE 1 No Action	ALTERNATIVE 2 Monitor Air Quality Without Instrumentation
Air Quality	This project will affirm the park's responsibilities to monitor and protect current air quality standards. Remedies will be sought for adverse changes in air quality.	The park will not carry out its legal responsibilities to protect park resources from the adverse effects of air pollution.	Air quality changes will often have to reach levels harmful to human health or vegetation before they are detected by human senses.
Vegetation	Maintenance of Class I air quality levels will insure that air pollution is not affecting the color or growth of native vegetation.	The amount of damage to plant species by air pollution will be impossible to determine.	Enforement of air quality standards will be handicapped by the lack of reliable scientific data.
Socio-economic	This proposal will have no adverse physical impact on visitor uses or expereinces. Long-term monitoring will insure continued Class I visibility status. Scenic landmarks, color and growth of native vegetation, geologic resources, and other related values will not be subjected to further degradation.	Changes in values related to air quality will be unquantified. The quality of park vistas, and related values, will diminish. Uncontrolled pollutant levels will produce odors and intensify potential human health hazards.	Same as above.

ENVIRONMENTAL ASSESSMENT MATRIX

PROJECT STATEMENT TITLE: GUMO-N19-Oil and Gas Development

NEED FOR PROPOSAL: This project provides for basic monitoring of the area oil and gas operation to insure that park values are not impaired.

Alternative Action / Impact Categories	Proposed Action	ALTERNATIVE(S)
	Monitor and Review Proposed Operations and Evaluate Effects of Oil and Gas Development Through Research	No Action
Wildlife	Under this proposal, efforts will be made to minimize the impacts of access roads and boundary activities on native wildlife. Open communications with cooperative agencies will allow for pre-planning strategies that will mitigate negative impacts.	Wildlife populations will be modified by the disruptive nature of oil and gas operations.
Air Quality	Appropriate communications and recommendations will be made to minimize the possibility park air quality and visibility factors will be impaired. Continual review of trends will yield timely knowledge of threatened air quality values.	Legal responsibilities to protect the park from air quality degradation will be compromised.
Soils	Use of park roads by heavy equipment required in oil and gas operations will cause exfoliation and compaction of the soils. Keeping communication channels open and obtaining timely knowledge of planned operations will permit mitigating actions to be implemented.	Exfoliation and compaction of soils will produce erosion of the irreplaceable top soils.

ENVIRONMENTAL ASSESSMENT MATRIX

PROJECT STATEMENT TITLE: GUMO-N21-Natural Resources Information Base

NEED FOR PROPOSAL: This project is needed to develop an efficient, more effective method for retrieving baseline resources information.

Alternative Action / Impact Categories	Proposed Action	ALTERNATIVE(S)
	Develop a Computer System to Store and Retrieve Natural and Cultural Resource Inventory Dats. Data Will be Graphically Depicted on Mylar Map Overlays	No Action
Natural Park Resources	No direct physical impact to any park resource. This proposal's ease of information access will permit more educated management decisions. Decisions affecting park resources will be based on thorough and accurate inventories of the park's natural resources.	Failure to start an efficient baseline resource information system will result in park managers operating without the data needed to protect the park's natural resources. This will result in inadvertant compromises to park resources as well as possible outside influences negatively impacting the park.

ENVIRONMENTAL ASSESSMENT MATRIX

PROJECT STATEMENT TITLE: GUMO-N-22-Exotic Plant Management

NEED FOR PROPOSAL: This project is needed for control of Tamarisk (Saltcedar) an exotic species capable of radically impacting the park's riparian zones.

Alternative Action / Impact Categories	Proposed Action	ALTERNATIVE(S)
	Develop a Management Program to Control the Impact of Tamarisk on Natural Springs and Seeps	No Action
Vegetation	The current inventory (40 to 50 trees) of exotic Tamarisk would be physically removed (grubbed) and, possibly, treated with an appropriate herbicide if stumps cannot be extracted. The biocide will be brushed on cut surface to allow absorption into the plants root system. Careful application of the chemical treatment will minimize the effect of chemicals near riparian ecosystems and will not impact native plant species.	Tamarisk will slowly expand to replace native vegetation around springs and seeps. Habitat variability brought about by native species/ diversity will be lost on approximately 2 acres of park administered lands.
Wildlife	Insects utilizing exotic tamarisk as habitat will be temporarily disturbed by the physical removal process. Other park wildlife will not be effected by the removal of these exotic trees.	Insects and vertebrates depending upon existing inventory of native vegetation will be displaced as Tamarish replaces this vegetation. Total numbers and species of displaced biomass is unknown.
Soils	Proper application of an appropriate herbicide will have a temporary sterilizing effect on soils immediately surrounding root systems. This sterilization will fade within 3 to 3 months as the herbicide oxidizes.	No Impact.
Air Quality	No Impact.	No Impact.
Water Quality	Water previously lost to trans-evaporation through Tamarisk will be preserved through elimination of these exotic trees.	Quantity of water available at seeps and springs will be reduced further by the transporation and evaporation efficiency of Tamarisk. Water available for wildlife will be reduced or eliminated at smaller water sources.

ENVIRONMENTAL ASSESSMENT MATRIX

PROJECT STATEMENT TITLE: GUMO-N22-Exotic Plant Management

NEED FOR PROPOSAL: This project is needed for control of Tamarisk (Saltcedar) an exotic species capable of radically impacting the park's riparian zones.

Alternative Action / Impact Categories	Proposed Action	ALTERNATIVE(S)
	Develop a Management Program to Control the Impact of Tamarisk on Natural Springs and Seeps	No Action
Socio-economic	No Impact.	No Impact.
Endangered & Threatened Species	No Impact.	No Impact.

ENVIRONMENTAL ASSESSMENT MATRIX

PROJECT STATEMENT TITLE: GUMO-N24-Black Bear Survey

NEED FOR PROPOSAL: Population data for the black bear is needed to effectively monitor the status of this endangered species (Texas State only) and to enable the NPS to defend the population against human threats

Alternative Action / Impact Categories	Proposed Action	ALTERNATIVE(S)
	Initiate a Comprehensive Population Survey of GUMO Black Bear Population	No Action
Vegetation	No Impact.	No Impact.
Wildlife	The study itself will have no direct impact on the bear population. Data gathered from the study will enable the NPS to monitor the natural population and protect these animals from unwarranted influences by outside management actions, i.e. unauthorized and illegal destruction of these animals on lands adjoining the park.	The lack of reliable information concerning the numbers and distribution of park bears will make it difficult if not impossible for the NPS to respond to special interest group accusations that the bear population might be "exploding" or that bears are being introduced into the national park. The NPS will also lack basic information needed to effectively monitor a major component of the park's ecosystem.
Endangered & Threatened Species	No Impact.	The Texas Parks and Wildlife Department classed the black bear as an endangered species on the Texas State Endangered-Threatened Species List in January 1987. Failure to obtain adequate data for the black bear population will have impacts as described above.
Soils	No Impact.	No Impact.
Air & Water Quality	No Impact.	No Impact.

ENVIRONMENTAL ASSESSMENT MATRIX

PROJECT STATEMENT TITLE: GUMO-N24-Black Bear Survey

NEED FOR PROPOSAL: Population data for the black bear is needed to effectively monitor the status of this endangered species (Texas State only) and to enable the NPS to defend the population against human threats

Alternative Action / Impact Categories	Proposed Action	ALTERNATIVE(S)
	Initiate a Comprehensive Population Survey of GUMO Black Bear Population	No Action
Socio-economic	Persons interested in the protection and well-being of all native wildlife species within the national parks will support NPS efforts to obtain the data needed to manage and defend this animal. Those people objecting to either the presence of the national parks and/or the protection these lands afford native wildlife will view the study as unnecessary. The State and Federal land management practices on lands outside the national parks will be unaffected by the study. The NPS will continue to request cooperation from these agencies as their individual laws and policies allow.	The on-going land management practices of State and Federal land managers will continue as present laws and policies dictate. The NPS will lack adequate information to formulate cooperative management requests with these agencies.

ENVIRONMENTAL ASSESSMENT MATRIX

PROJECT STATEMENT TITLE: GUMO-C1-Museum Collection

NEED FOR PROPOSAL: This proposal is needed to insure safekeeping and proper care of the park's natural and cultural museum specimens

Alternative Action / Impact Categories	Proposed Action	ALTERNATIVE(S)
	Upgrade Curatorial Staff and Facilities, Update and Improve Record Keeping, and Inventory the Collection	No Action
Museum Specimens	The park museum collection will be afforded both the care and preservation techniques necessary to insure proper storage. Fragile, irreplaceable archeological specimens will be available for further study, as well as use, either in exhibits or for other public viewing. This proposed action will have no adverse impact on the collection or any of its specimens.	Failure to properly manage the existing museum collection will result in deterioration of individual specimens through improper handling and normal degeneration.
Socio-economic	The increased knowledge obtained by a professional study of individual items, will help provide a well managed museum collection that benefits the public through better, more accurate park interpretive programs.	Loss of individual specimens can create gaps in the cultural, historic, and ecological records of the park.

ENVIRONMENTAL ASSESSMENT MATRIX

PROJECT STATEMENT TITLE: GUMO-C2-Archeological Surveys of High Impact Areas

NEED FOR PROPOSAL: This project is needed to insure a proper inventory of cultural resources that will help prevent their being damaged by current and future developments.

Alternative Action / Impact Categories	Proposed Action	ALTERNATIVE(S)
	Complete Parkwide Archeological Site Inventory and Survey of All High Impact Areas	No Action
Cultural Resources	A complete cultural resource site inventory will afford sites maximum protection from park management activities and projects. The survey will minimize damage from wildfires, road and trail construction, and facility development. No damage to any cultural resource will result from this project. About 20,000 acres of the park will be surveyed.	Failure to perform this parkwide inventory will result in the possible destruction of these sites as visitor facilities are developed.
Socio-economic	A survey of all high impact areas will insure that current visitor use patterns throughout the park will cause no impacts greater than those now occurring, and provide sound interpretive material for these sites.	A failure to survey all high impact areas will limit the park's ability to respond to existing threats to cultural resources from current use patterns. This will result in further deterioration and destruction of these sites.

ENVIRONMENTAL ASSESSMENT MATRIX

PROJECT STATEMENT TITLE: GUMO-C3-Protection of Archeological Sites

NEED FOR PROPOSAL: This proposal is needed to insure that all cultural resource sites are provided maximum protection from visitor use and park facility development

Alternative Action / Impact Categories	Proposed Action	ALTERNATIVE(S)
	Develop an Archeological Site Protection and Preservation Plan	No Action
Cultural Resources	The protection afforded by this action will benefit park archeological resources. It will slow or stop the current destruction of existing resources easily accessible to the public. No cultural resource will be adversely impacted by this plan.	Failure to develop and use a sound Archeological Site Protection Plan will result in a continuing destruction, however slow, of these resources through mismanagement and vandalism.
Socio-economic	The preservation of these unique archeological resources will please those interested in preservation and protection activities. A few, possibly less than 20, will be unhappy about the eventual removal of these sites from topographic maps and other references.	Continued listing of such sites on USGS topographic maps will provide uncontrollable access to these sites. It is not known how many people will visit these sites each year, but vandalism, as well as non-malicious damage, can result in site destruction of up to 5% each year.

ENVIRONMENTAL ASSESSMENT MATRIX

PROJECT STATEMENT TITLE: GUMO-C4-Effect of Fire on Archeological Sites

NEED FOR PROPOSAL: This project is needed to evaluate the effects of wildland and management fires on archeological sites.

Alternative Action / Impact Categories	Proposed Action	ALTERNATIVE(S)
	Study Fire Effects on Archeological Sites	No Action
Cultural Resources	Knowledge of fire impacts at specific archeologic sites will help prevent loss of archeological resources and provide information needed to evaluate the prescribed fire management program. The study will have no adverse impact on cultural resources within the park.	Failure to properly evaluate the impact of fire on cultural resources will lead to their possibl loss during management fires. Materials suscep- tible to burning will be destroyed. Ceramic and lithic criteria may be physically altered and lose their value for research dating.
Socio-economic	These data will serve to preserve archeological resources and provide for their interpretation and enjoyment by park visitors.	A lack of this data will limit the park's ability to protect and interpret cultural resources in the park. A portion of the cultural history of the area will therefore be irretrievably lost to the park visitor and the scientific community.

ENVIRONMENTAL ASSESSMENT MATRIX

PROJECT STATEMENT TITLE: GUMO-C5-Prehistoric Use of the Area

NEED FOR PROPOSAL: This project is needed to acquire facts and insights into the prehistoric use of the area by early man and to differentiate the various cultures that lived in the area.

Alternative Action / Impact Categories	Proposed Action	ALTERNATIVE(S)
	Conduct Test Excavations to Determine Prehistoric Use	No Action
Cultural Resources	Little is currently known about prehistoric man in the park. Excavation and examination of midden rings and debris piles in selected caves will yield new information about cultural resources not previously available. Better data for interpreting the cultural patterns of these people will become available. No known adverse impact is expected to result from these studies.	Failure to conduct test excavations will limit our knowledge of prehistoric man and the park's ability to protect archeological sites.
Socio-economic	The data gathered will be useful in developing more informative, accurate interpretive programs.	A lack of this data will serve to improvish the interpretive program and hinder scientific knowledge.

ENVIRONMENTAL ASSESSMENT MATRIX

PROJECT STATEMENT TITLE: GUMO-C6-Rock Art

NEED FOR PROPOSAL: This project is needed to protect known and future discoveries of rock art from deterioration due to natural processes and human activities.

Alternative Action / Impact Categories	Proposed Action	ALTERNATIVE(S)
	Inventory and Analyze Rock Art	No Action
Cultural Resources	This project will provide basic information needed to preserve and protect these cultural resources. This action will insure that these resources are available to the scientific community and the visiting public. No adverse impact will result.	"No Action" will result in continued deterioration and the eventual loss of many of these sites.
Socio-economic	Preservation of these resources will enable studies to be made that can contribute to a better understanding of our cultural heritage and enhance the park's interpretive programs.	Neglect of such sites will result in a loss of both irreplaceable interpretive resource material and the ability to interpret our cultural heritage.

ENVIRONMENTAL ASSESSMENT MATRIX

PROJECT STATEMENT TITLE: GUMO-C7-Historic Structure Reports

NEED FOR PROPOSAL: These reports are needed to address significant structures not included in the parkwide Survey of Historic Structures (Griggs, 1973) and to provide data for determining and executing appropriate preservation, restoration or reconstruction of all classified historic structures.

Alternative Action / Impact Categories	Proposed Action	ALTERNATIVE(S)
	Prepare Historic Structure Reports	No Action
Cultural Resources	No adverse impacts will result from this project. Historic structure reports will be prepared for classified structures not previously researched or documented. These reports will then be used with existing data to determine the appropriate use, preservation, and maintenance of historic structures.	A lack of historic structure reports will prevent determination of appropriate use, treatment, and preservation needs. This could result in irreversible deterioration of these
Socio-economic	Proper preservation and maintenance of historic structures will insure that those used for interpretive purposes will present no hazards to those who visit them. Irreplaceable examples of our cultural heritage will be retained for future generations.	No Action will result in a gradual deterioration of these structures and eventually deprive future generations of examples of their cultural heritage.

ENVIRONMENTAL ASSESSMENT MATRIX

PROJECT STATEMENT TITLE: GUMO-C8-Preservation of Historic Sites

NEED FOR PROPOSAL: A Historic Structure Preservation Guide has not been prepared for significant historic sites. This document is needed before the park can undertake restoration or stabilization actions. Protection of these sites is mandated by various Federal laws, orders, regulations, and NPS guidelines

Alternative Action / Impact Categories	Proposed Action	ALTERNATIVE(S)
	Develop a Historic Site Preservation Plan to Provide Systematic Preservation Measures for the Park's Historic Sites	No Action
Cultural Resources	This study will have no adverse impact on cultural resources within the park. A historical architect will prepare a Historic Structure Preservation Guide for significant sites. This will provide information needed to insure the orderly, timely, and proper maintenance of these sites. It will also establish a cyclic preservation maintenance schedule to preserve the site structures.	"No Action" will result in haphazard, unsystematic historic structure maintenance. This will result in the loss of these structures through natural deterioration.
Socio-economic	A historic preservation plan will help insure that historic resources will be available for interpretation to the visiting public.	See "Cultural Resources" input.

ENVIRONMENTAL ASSESSMENT MATRIX

PROJECT STATEMENT TITLE: GUMO-C9-General Park History

NEED FOR PROPOSAL: This project is needed to insure that management decisions are formulated only after a thorough consideration of the park's legislative mandates and policies.

Alternative Action / Impact Categories	Proposed Action	ALTERNATIVE(S)
	Prepare a Park History	No Action
Cultural Resources	This project will have no adverse impact on park resources. A readable synthesis of information from books, letters, reports, monthly and annual superintendent's narrative reports, newspapers, legends, legal documents, interviews, and general park files will provide easy access to information for use both in the administration and interpretation of the park.	"No Action" will result in an irretrievable loss of information as files and records are either disposed of or misplaced.
Socio-economic	The knowledge gained from this history will enable the park to present better, more comprehensive interpretive programs. The project will also enhance the probability that the park is managed in keeping with the goal of preserving all resources.	Resource management, interpretive programs, and visitor enjoyment of the historical aspects of the park will be hampered by the lack of a thorough understanding of the park's history.

ENVIRONMENTAL ASSESSMENT MATRIX

PROJECT STATEMENT TITLE: GUMO-C10-Ethnohistory of the Mescalero Apaches

NEED FOR PROPOSAL: The extent and nature of the Mescalero Apaches' activities in the park area needs to be more fully understood to develop informed management decisions and effective interpretive programs.

Alternative Action / Impact Categories	Proposed Action	ALTERNATIVE(S)
	Conduct a Mescalero Apache Study	No Action
Cultural Resources	No adverse impact to any cultural resource will result from this project. A study will be made to discover the nature and extent of Mescalero Apache use of the area during historic times. This will provide information concerning a significant aspect of the park's history.	The extent and nature of the Mescalero Apache will not be understood. This lack of information may hinder informed management decisions and effective interpretive programs.
Socio-economic	Information obtained would benefit park management and interpretive programs.	See "Cultural Resource" input.

ENVIRONMENTAL ASSESSMENT MATRIX

PROJECT STATEMENT TITLE: GUMO-C11-Survey of Historic Roads and Encampments.

NEED FOR PROPOSAL: This survey data is needed to protect and interpret historic roads and encampments.

Alternative Action / Impact Categories	Proposed Action: Locate, Identify, and Map Military Encampment and Historic Road Sites, Including the Emigrant Trail/Butterfield Stage Route	ALTERNATIVE(S): No Action
Cultural Resources	Acquisition of this historic resource material will have no adverse effect on the cultural resources of the park. The resulting report will include detailed, well-documented histories of each encampment site as well as identify the entire extent of the Overland Emigrant Trail/Butterfield Stage Route within the park.	"No Action" will result in a continuing lack of information about these resources and will prevent their protection from human disturbance.
Socio-economic	This study will facilitate more informed management decisions, offer better site protection from human disturbance and insure more accurate interpretation of these historic resources.	Management activities could damage these sites irreparably. Protection from human disturbance will be minimal and effective interpretation will be greatly diminished.

ENVIRONMENTAL ASSESSMENT MATRIX

PROJECT STATEMENT TITLE: GUMO-C12-History of Ranching

NEED FOR PROPOSAL: An in-depth study of the park's ranching history is needed to establish a priority for preserving and interpreting this resource and to gain needed information for restoration of park vegetation to natural conditions.

Alternative Action / Impact Categories	Proposed Action	ALTERNATIVE(S)
	Review Available Literature and Records, Conduct Interviews with Survivors of the Era and Compile a Thorough History of Ranching in the Park Area.	No Action
Cultural Resources	This study will have no adverse impact on cultural resources within the park. A ranching history will increase our understanding of this portion of the park's history and help determine which ranching artifacts should be preserved and which can best be interpreted to the public.	Failure to compile this history will result in an inability to properly present and interpret this resource to the park visitor.
Socio-economic	This history will contribute to visitor understanding of the role ranching played in the area and how it related to current conditions in the park.	No action will result in an inability of the NPS to explain the part this activity played in the park's history. An important aspect of the park's history will be lost.

ENVIRONMENTAL ASSESSMENT MATRIX

PROJECT STATEMENT TITLE: GUMO-C13-History of Mining

NEED FOR PROPOSAL: An in-depth study of the park's mining history is needed to establish priorities for preserving and interpreting this resource.

Alternative Action / Impact Categories	Proposed Action	ALTERNATIVE(S)
	Review Available Literature and Records, and Compile a History of Mining Activities	No Action
Cultural Resources	This study will have no direct impact on cultural resources within the park. A mining history will increase our understanding of this portion of the park's history and help determine which mining artifacts should be preserved and which can best be interpreted to the visiting public.	Failure to compile a history of mining activities in the park will result in an inability to properly present and interpret this resource to the park visitor.
Socio-economic	This history will contribute to visitor understanding of the role mining played in the park's history.	"No Action" will result in an inability of the NPS to explain the vital part this activity played in the park's history. An important aspect of the park's history will be lost.

ENVIRONMENTAL ASSESSMENT MATRIX

PROJECT STATEMENT TITLE: GUMO-C14-Compilation of Cultural Resources Data

NEED FOR PROPOSAL: This project is needed to assemble all cultural resource reports, books, maps, and field notes into a convenient, accessible format.

Alternative Action / Impact Categories	Proposed Action	ALTERNATIVE(S)
	Synthesize all Archeological Information Into a Convenient Accessible Format	No Action
Cultural Resources	No adverse impact to any cultural resource will result from this project. A synthesis of all written and illustrated materials related to cultural resources data in the park will provide ready access to relevant data.	Failure to synthesize existing data will make it difficult to obtain all the available information on a given subject and impair both the consistency and accuracy of the data used.
Socio-economic	A good synthesis of all existing cultural resource information will allow for easier access to data required for sound, accurate interpretive programs. Better knowledge of the park's cultural resources will enhance the the ability to protect and preserve these resources.	Failure to obtain an adequate data base will limit the park's ability to analyze and interpret cultural resources. The public will be deprived of this aspect of their cultural heritage.

References, Bibliographies, and Addenda

For the Natural and Cultural Resources Management Plan

Guadalupe Mountains National Park

The following information serves either as a reference used in the development of the Natural and Cultural Resources Management Plan (N&CRMP) or is considered as addenda to the plan itself. The bulk of these documents precludes their being physically attached to the N&CRMP. Copies of this material are available at the Park Headquarters building located in Carlsbad, New Mexico or at the administrative offices within the park itself. This information includes:

I. Bibliographies

- A. Geology
- B. Caves
- C. Flora
- D. Fauna
- E. Fire
- F. Hydrology and Aquatic Systems
- G. Paleontology
- H. Archeology
- I. History
- J. Miscellaneous Publications
- K. Planning Documents
- L. Legislation

II. Information Base Checklist

- A. Specific Resource Maps
- B. Narrative Files on Resource Issues

III. Action Plans

- A. Fire Management
- B. Cave Management
- C. Backcountry Management
- D. Water Resources Management Profile
- E. Others (Wildlife, IPM, etc.)

IV. Policies and Guidelines

- A. Museum Management
- B. Research Certification and Collecting Permits
- C. NPS Management Policies (pertinent sections)
- D. Cooperative Agreements, Memorandums of Agreement (pertinent to resource management issues)