

PRELIMINARY DRAFT
RESOURCES MANAGEMENT PLAN AND
ENVIRONMENTAL ASSESSMENT

FOR

WHITE SANDS NATIONAL MONUMENT

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FIG. 1. BARCHAN DUNE. NPS Photo. (Mang).

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I. INTRODUCTION

A Resource Management Plan (RMP) documents a park's resources and describes a comprehensive management monitoring and research program for dealing with important cultural and natural resource problems.

The RMP describes and evaluates the current resources program, identifies inadequacies in activities and knowledge and provides for the resolution of the inadequacies based on NPS Management Policies, approved Park Management Objectives, Land Classification, and Management Constraints.

The plan includes both a "Natural" and a "Cultural" Resource section. Each section contains a comprehensive summary component (Overview and Needs) and a series of Project Statements which define individual problems and proposed actions. Also included are five year resource programming sheets which: (1) rank projects in order of overall priority of importance, (2) propose a schedule of accomplishment and (3) identify funding and manpower needs required to carry out the recommended actions.

The plan constitutes a contract with and by the Superintendent to deal with the important resource problems of his/her area.

It will be used as one of the fundamental elements in preparing budgets and deciding how to allocate funds and staffing resources to parks.

Because activities proposed in this plan are subject to NEPA compliance, a separate Environmental Assessment component is also included.

A. MANAGEMENT OBJECTIVES

STATEMENT FOR MANAGEMENT AND PLANNING

Purpose of the Park

White Sands National Monument is an ecological island of gypsum sand lying in the almost flat Tularosa Basin between the rugged parallel ranges of the San Andres and Sacramento Mountains in south-central New Mexico. It was established by Presidential Proclamation in 1933 under the provisions of the Antiquities Act of 1906, in order to preserve the unique geology of the gypsum sand dunes and to protect all of its other scenic, scientific and educational values.

Management Category

Natural Area

Management Objectives

General :

Eliminate all roads not essential for the proper public use and management of the monument, when no longer essential for missile recovery.

Restrict use of motorcycles and four-wheel-drive vehicles to established roads.

Continue to look to the local business community adjacent to the monument for motel accommodations and major food services.

Expand opportunities for school children to use the monument as an environmental study area.

Continue to assist the military under the terms of the cooperative use agreement in missile recovery, minimizing the ecological impact of this activity.

Stress the three major themes of the area -- geology, biology, and esthetics -- with history, archeology, and recreation as secondary.

Strengthen the interpretive program by upgrading and expanding visitor facilities at the monument entrance, interpretive trails and exhibits to better communicate the value of White Sands.

Complete land transactions through acquiring private and State inholdings; exchange, transfer, or sell Dog Canyon property. Exchange National Park Service lands with the Bureau of Land Management to improve management of the Garton Lake area.

Rehabilitate headquarters by providing adequate office facilities, rest-rooms, housing, and landscaping.

Retain present form of concession operation and contract; consider some expansion of operation to meet visitor needs and provide adequate storage facilities for the concession.

Continue to provide for backcountry camping within the monument. Look to other public agencies and the private sector to continue to provide automobile and trailer camping in the general vicinity of the monument.

Visitor Use;

Study means by which additional numbers of people can experience the monument without detriment to the resource.

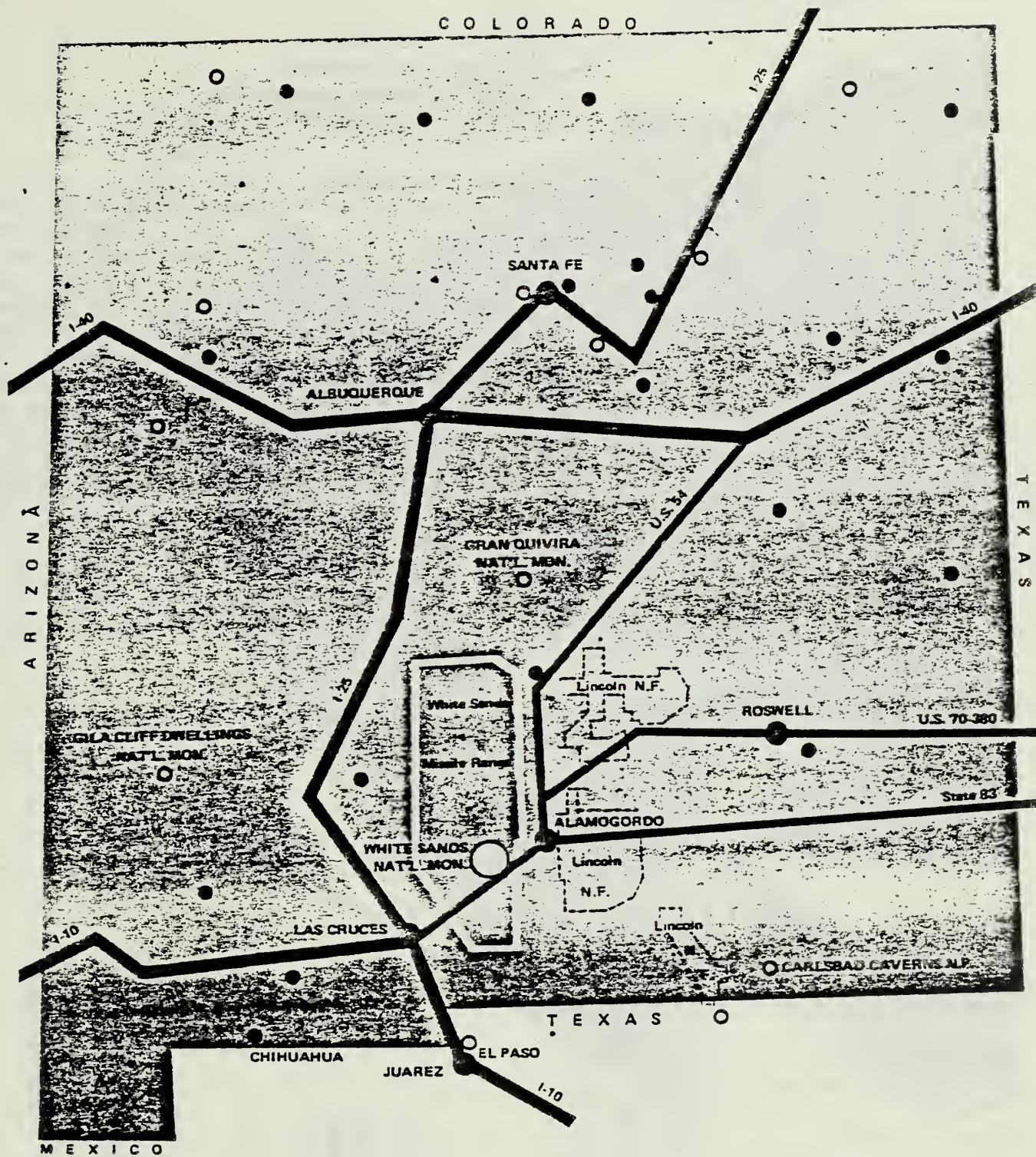
Continue to provide for recreational use, such as sand surfing and playing on the dunes, within designated areas.

Continue to provide picnic facilities in the Heart of the Dunes area.

Continue to provide automobile caravan tours to Lake Lucero.

Resource Management;

Continue ongoing research studies to develop a resource management plan for the monument and to strengthen the interpretive program.

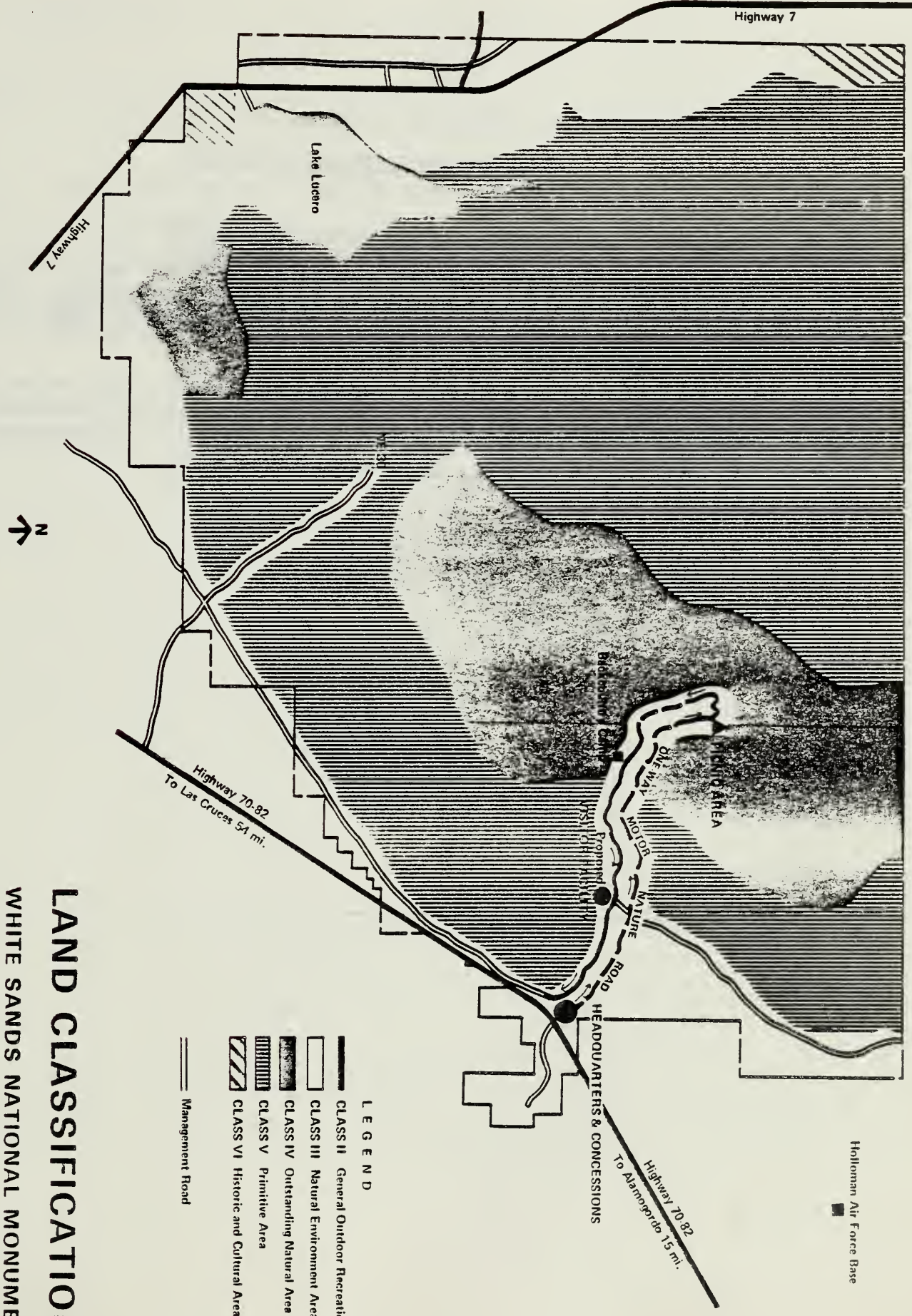


THE REGION

B. Land Classification

The land classification plan for White Sands is based, first, upon establishing as Class IV those lands containing the outstanding natural features for which the monument was principally set aside. Two such areas are indicated on the map: the outstanding Selinite Crystal Beds in the Lake Lucero area, and the spectacular barchan and transverse dunes. A Class II designation is indicated for the motor nature road that leads into the heart of the dunes area, as well as for the picnic and recreation site off the main loop system, the existing headquarters site, and management roads. Class III lands are shown along the periphery of the sand dunes, on the west boundary, the east boundary, the south boundary, and in the Garton Lake area. Class VI lands are indicated in the two Mogollon and Apache remnant sites along the western boundary. The remainder of the monument, which includes the vast alkali flat area, the superb embryonic dunes, and the parabolic dunes, is classified as Class V.

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LEGEND

- CLASS II General Outdoor Recreation Area
- CLASS III Natural Environment Area
- CLASS IV Outstanding Natural Area
- CLASS V Primitive Area
- CLASS VI Historic and Cultural Area
- Management Road

LAND CLASSIFICATION
WHITE SANDS NATIONAL MONUMENT
NEW MEXICO

C. Annotated Management Constraints

1. Cooperative Use Agreement, White Sands Missile Range

The agreement restrains the NPS from development and use by visitors in that part of the monument termed the Zone of Cooperative Use. This Master Special Use Agreement is supplemented by a Memorandum of Understanding which is updated yearly.

2. Public Land Order 703, Federal Register Document 51-3314, filed 3/8/51, published 3/14/51. Withdrew for military purposes the lands now included in the missile range, which includes all lands embraced within the boundary of the White Sands National Monument.

II. RESOURCE MANAGEMENT PROGRAM

This is the heart of the RMP and includes two parts:

- A. Natural Resource Management Program
- B. Cultural Resource Management Program

Each of which contains an Overview and Needs section and a series of Project Statements.

A. Natural Resource Management Program

1. Overview and Needs Section

A great deal of research into the geology and biology of White Sands has already been completed (See Appendix B). These studies have made evident some areas which need further study and other areas that now require action. In these times of budgetary restraint some worthy projects which may have yielded valuable additions to our understanding of the park ecosystem have had to be bypassed in order to allocate limited funds to preserving resources which are in more immediate danger.

The most serious threats facing White Sands include 1) impact to the backcountry by missile/military operations and exotic fauna, 2) water resources problems, and 3) potential air quality degradation.

Oryx, exotic African Gemsbok have been establishing home range within the monument. A fence needs to be constructed along 60 miles of the parks south and west boundary. Cost, \$1,000 per mile. This fence will also greatly control illegal access from neighboring military lands and do a great deal to protect archaeological sites and backcountry resources. This project is currently being reviewed at Southwest Regional Office.

Water resource studies have been programmed to ascertain water rights and to monitor water levels within the park. Since water plays such a paramount role in the maintenance of the dunefield system, plans to utilize Tularosa Basin groundwater for electrical power or desalinization projects have always attracted National Park Service attention.

Current plans call for the expenditure of \$71,000 in FY84 for these projects. However, there is some speculation that a University project may be able to offset some of this cost.

Air quality monitoring has been in progress at White Sands for several years. This is expected to continue at the present rate for the next few years also. The funding is based on amounts currently earmarked for the project.

All other RMP projects are of an "ongoing" nature. Control of exotic plants could develop into a more concentrated effort if acceptable methods of control can be uncovered. In this event a continuing program utilizing one MY over the next five years will be employed.

The bat control project is expected to be complete by FY82 at a cost of \$2,500.

2. Natural Resources Project Statements (**Listed in Priority Order**)

<u>Item</u>	<u>Park Code & Project Number*</u>	<u>Project Title</u>
1.	WHSa - N16	Control of Exotic Fauna
2.	WHSa - N17	Air Quality Monitoring Project
3.	WHSa - N3	Water Resources Analysis Project
4.	WHSa - N12	Backcountry Impaction
5.	WHSa - N10	Protection of Cacti and Habitat
6.	WHSa - N15	Noise Pollution
7.	WHSa - N8	Control of Exotic Plants
8.	WHSa - N18	Bat Control

* Project Numbers from the 1969 Natural Sciences Study Plan and 1974 Resource Management Plan have been retained if the project was listed in those documents. A list of all projects contained in those plans, along with their appropriate numbers, is included in Appendix B.

4/12/82

1.1 WHSA - N16 - Control of Exotic Fauna

This project has been previously discussed briefly in the 1974 WHSA RMP under item N-5. Because it is a more singular problem now, however, it has been given a new number and title.

1.2 Statement of Problem

Considerable data has been obtained which indicates that feral dogs and the African antelope, Gemsbok (*Oryx gazella*) are impacting the monument resources. Feral dogs pose a threat to the badger and kit fox by disrupting their burrows and competing for resources. The Oryx, transplanted onto the adjacent missile range by the State of New Mexico, beginning in 1969, now graze the western portion of the monument and have begun to move eastward into the dunes. There are an estimated 40 - 50 Oryx regularly using the monument.

Research study under contract PX702900311 has recently been completed by UTEP on Oryx activity within the monument. This report indicates that the Oryx are establishing home ranges within the monument, have no natural impediment to increasing utilization of the monument resources and are expected to spread eastward. The office of the Regional Scientist and the monument Superintendent must determine a means of eliminating this exotic as dictated by NPS management policies.

1.3 Alternative Actions and Their Probable Impact

1. Continue to Document Specific Sightings Only

This would do nothing to eliminate the problem but would keep management abreast of any deterioration in the condition. This should continue.

2. Allow Public Hunting of the Oryx on the Monument

This would violate NPS policies. If public hunting were allowed, special permits would be required and State Game Officers would have to accompany all hunters.

3. Have the Animals Destroyed by Park Service Employees

This would involve a great deal of cooperation from state officials and probably produce considerable public reaction. It would also be a continued process since nothing would keep new animals from entering along the western park boundary.

4. Have the State Remove the Animals From the Entire Area and Relocate Them Elsewhere

This would involve a tremendous effort since the herd now numbers 300 - 400 individuals which are scattered across a 6,000 square mile area.

It is also unlikely that the state would be sympathetic to this plan since the Oryx were transplanted as a game species and the program is strongly supported by the state.

5. No Action

The Oryx will continue to spread further eastward into the monument. Their numbers will continue to increase. They have already been reported in the picnic area of the heart of the dunes. They will continue to utilise resources making them unavailable to native species. Eventually, if left unchecked, they could have the same effect on the vegetation as would a herd of grazing cattle.

1.4 Recommended Course of Action

Feral dogs should be eliminated from the monument whenever they are encountered in the backcountry. In the visitor use areas, a concentrated effort should be made to trap and remove when possible.

As for the Oryx, at present, the only feasible plan appears to be to fence the western and southern monument boundary and then herd the trapped animals out by helicopter. Close coordination with the New Mexico Department of Game and Fish and White Sands Missile Range is essential.

There will also need to be some research into the type of fence which will be most effective. This fence will also go a long way to lessen some of the other resource problems discussed in later projects. However, care must be taken to ensure that native species such as Mule Deer and Pronghorn are not hindered in their movement by this obstacle.

Additional recording of sighting of these animals in the monument should continue.

2.1 WHA - N17 - Air Quality Monitoring Project

2.2 Statement of Issue

The Clean Air Act, amended 1977, has designated the monument as a Class II area. Studies by NPS have resulted in recommendations for redesignation to Class I. The State of New Mexico, however, is responsible for changing the class designation. Because the area exceeds 10,000 acres in size, it cannot be redesignated below Class II monitoring which consists of both visibility and particulate measurements. In order to document the status of the area's air quality, a monitoring project using a telephotometer was begun in July, 1978 and one using particulate samplers was initiated in April, 1981. These two projects will establish valuable base-line data. Funding for monitoring presently comes from WASO Air Quality Division through the Office of Natural Resources in the NPS Southwest Regional Office.

2.3 Alternative Actions and Their Impact

1. No Action

This would negate efforts which have been in progress since July, 1978 and severely inhibit the Superintendents mandated legal obligation to protect the air quality related values of his area.

2.4 Recommended Course of Action

Continue to monitor air quality with the photometer and samplers and supply data to EPA. Continue to remain alert and politically involved to be forewarned of any local events which may have an impact on air quality, such as U.S. Highway 70 construction, activities at Holloman Air Force Base and White Sands Missile Range, local saw mill operations and projects involving development of energy resources and water resources. Try to influence the State of New Mexico to accomplish necessary studies for redesignation of monument to Class I status. Make contacts with Holloman Air Force Base to gain their support for redesignation to Class I.

3.1 WWSA - N3 - Water Resources Analysis Project

This project statement includes a combination of water related problems previously addressed in the 1974 WWSA RMP under project N3, N11 and N14.

3.2 Statement of Issues and Problems

A thorough analysis of the water resources of the monument is necessary for sound management and to comply with requirements of a Basic Ecosystem Survey, NEPA-1969 and Water Quality Acts.

Activities on the adjacent White Sands Missile Range and Holloman Air Force Base may cause pollution of the water within the monument or may disrupt the flow necessary to monument ecology. Several gullies feed runoff water from the Sacramento Mountain slopes into ponds on Holloman Air Force Base where a wide range of pollutants are introduced. Materials include, but are not limited to, rocket engine fuels, grease, oil sludge, concrete and metal debris. An intermittent stream - Lost River - carries water from one pond toward the Alkali Flats and Lake Lucero, flowing on the surface near the northern boundary of the monument for a short distance and then going underground. The habitat of the rare species Limonium limbatum, sea lavender, may be being affected in this area. The area is also habitat of the White Sands pupfish. Currently a causway is interrupting this natural flow near the Holloman Air Force Base boundary with White Sands National Monument.

In addition, regular overflows of the sewage lagoon system on Holloman Air Force Base allows treated sewage waters to enter onto Monument property near Garton Lake.

Both military installations are involved in research programs which generate various amounts of debris from missiles, drone aircraft, spent boosters and warheads. Some of these items possibly contain radioactive or toxic substances. Most warheads are recovered within hours after their impact by military recovery crews; however, much metallic debris remains. Though precipitation in the area is low, moist gypsum sand is highly corrosive and iron alloy metals are rapidly etched. Components thus released are entering the ground water system with unknown effects on the environment.

Maintenance activities within the park may have an effect on the hydrological system also. Wind blown sand creates a continuing road maintenance problem. Removal of sand by heavy equipment is required, and this activity may not only cause aesthetic impaction of the local environment but also disturb the natural hydrological system through soil compaction.

To compound matters, the Office of Water Research and Technology as authorized by Public Law 95-84 has authorized the construction of a demonstration desalting plant to be located in Alamogordo, NM. The plant is to produce 1.1 million acre-feet of usable water from brackish ground water. The effect of such wholesale withdrawals of ground water is unknown. It could lower the water table at the monument and adversely affect replenishment rates of gypsum sand and alter the vegetation and wildlife of the dunes. Several new wells will be drilled as a part of this project. Projects to produce energy in large amounts using ground water are also currently being studied by various government agencies.

3.3 Alternative Actions and Their Probable Impacts

1. Continue present course of action to remain alert and politically active to be aware of any new developments. Continue to work with the military to divert planes and missiles onto other sections of the range, and speed recovery of new debris and recovery of older materials. Continue to assure that surface water flows into the monument are not interrupted. Continue to maintain the roadway into the dunes to allow visitors access into the heartland of the monument. Through the Maintenance Foreman, continue to train equipment operators to be discreet in moving shifting sand deposits. This will maintain the status quo, but will not abate any of the problems or increase our understanding of the park resources as discussed in 1.2 above.

2. No action will result in continued pollution of the ground water from outside sources with a resulting impact on monument flora and fauna. The effects of an altered ground water table are unknown.

3.4 Recommended Course of Action

Initiate research to analyze, quantify, qualify and monitor the parks resources and geohydrological system.

A water resources study should analyze at least these basic factors:

1. A study and mapping of the general water system and flow (surface and subsurface) throughout the park, including the major sources and potability of fresh water.
2. The functions of fresh water in the ecosystem such as runoff amount, use by and importance to basic faunal and floral system, etc.
3. The threats from potential water deficiencies, pollution of water including the identification of materials released into the environment from various types of debris, the effects of the material on plant and animal life, potential dangers from residual build-ups.

4. Determine the extent of the impaction by vehicles on the environment along the maintained roadway, i.e. is the hydrological system blocked by the compaction, etc.

5. Quantification of Federal Water Rights. Currently, approved 10-238's exist for Water Rights studies (packages 137 and 144) and Geohydrological investigations (packages 136 and 145).

4.1 WHSA - N12 - Backcountry Impaction

Addressed in the 1974 WSNM RMP.

4.2 Statement of Issue or Problem

Visitor access to the backcountry of White Sands National Monument is readily available from a wide variety of uncontrolled points. There are numerous roadways, particularly along the southwestern section of the monument, some of which were made by early ranchers and some resulting from early missile recovery activities. These roads are a scar on the land and encourage inappropriate backcountry travel. On-duty and off-duty military personnel are particularly apt to enter the monument. This unauthorized trespass is causing damage to the natural resources; e.g., considerable damage occurs from the removal of selenite crystals. The area's terrain is especially attractive to cross country travel, and many roads along the monument boundary offer easy access to the primitive portions of the area. Occasional use by horseback groups pose no serious problems. Use by the groups is monitored closely by the park staff with specific areas designated in the dunes area for horse trailer parking. Annual horse use in the backcountry does not exceed an estimated 200 per year and is day use only due to lack of forage and water.

4.3 Alternative Actions and Their Probable Impact

1. Close all roads but Scenic Dunes Drive. This would eliminate only the types of travel we are aware of and would not stop off-road entry. It would also be impractical due to the sporadic use of portions of the monument for the retrieval of missiles.

2. Attempt more patrols. This would require increased personnel and travel funding, both are scarce commodities in today's budgets.

3. No action. This will only allow the impact to continue and the resources to be diminished.

4.4 Recommended Course of Action

Continue to enforce present regulations that restrict off-road vehicular use. Continue to issue citations to offenders. Continue to explain impaction problems to area visitors and neighbors in adjacent communities through interpretive programs and public relations. Continue to identify roads that are not used and which do not serve a necessary purpose. Work out an agreement with the White Sands Missile Range to refrain from using certain roads, and close those roads that have no purposes. Bar visitors from the roadways through the use of barriers and signing. Obliterate scars where possible. On the north boundary, post and sign at appropriate entry points.

Continue to negotiate a Memorandum of Understanding with White Sands Missile Range and Holloman Air Force Base to include their assistance in patrol of our mutual boundaries.

Construction of the fence mentioned in Project WHSA - N16 would go a long way to solving much of this problem as well.

5.1 WWSA - N10 - Protection of Cacti and Habitat

This project was listed in the 1974 WWSA RMP.

5.2 Statement of Issue and Problem

Several varieties of threatened cacti and several species exhibiting extensions of their previous range have recently been reported for the monument. In addition, many of the more abundant Claret Cup Cacti are near the roadways. Their showy flowers frequently attract visitors and often times removal of plants result.

5.3 Alternate Actions and Their Probable Impacts

1. Close the Dunes Drive During Periods of Cactus Flowering. This would be certain to cause an uproar from park visitors since this road is the only access to the White Sands.

2. No Action. This would surely mean a continued loss of plants.

5.4 Recommended Course of Action

Currently, 170 plants, the known population of Claret Cups along the dune margins, have been tagged by UTEP. These plants will be monitored to detect any removal problems. Monitoring these plants will also yield indications of reproductive rates. The areas of critical habitat along the dune fronts near headquarters, toward the Big Dune Trail and towards Walter Ranch will be treated with increased concern. All areas of cactus habitat will be left in an undisturbed state, when it is determined that disturbance would adversely affect the species in its monument range. Posted regulations and interpretive programs will point out restrictions on collection of natural objects. Increased law enforcement attention will be given to the delicate area along the roadway.

Much research has been completed. A map of existing cacti areas and tag numbers will be supplied by UTEP. A study to determine the reason for cactus concentration is also needed. Plans are for this study to be conducted by UTEP in the spring of 1982.

6.1 WHSA - N15 - Noise Pollution

Addressed in 1974 WHSA RMP.

6.2 Statement of Issue or Problem

The silence to be found in the White Sands dunes is one of the important resources of the monument. The special quality of this silence is peculiar to the monument; a result of the sound absorbing quality of the gypsum dunes. Noise from military aircraft and missile activity shatters this quietude which is so rarely found in today's world. Also, recent studies show that noise pollution can have harmful physical effects on animals as well as people.

6.3 Alternate Actions and Probable Impacts

1. Interpret the situation to visitors and wait for quiet to return.
2. No Action. This would result in a continued situation which would limit visitor use and enjoyment of the resource and could have a harmful effect on the health and well being of monument personnel and wildlife.

6.4 Recommended Course of Action

Seek cooperation from the nearby, very active Holloman Air Force Base and the White Sands Missile Range. Seek to minimize sounds from aircraft and missile flight testing through further agreements, especially as it relates to take off and flight patterns which bring flighters directly over the monument headquarters area at low altitude.

7.1 WHSA - N8 - Control of Exotic Plants

7.2 Statement of Issue and Problem

Salt Cedar (Tamarix sp.) is an exotic plant introduced into the Southwest between 1899 and 1915. The plant has since spread throughout the region and now occupies wet areas at White Sands National Monument. Small islands of Salt Cedars (200 acres in total) occur at several locations. Intentional plantings at Garton Lake, prior to Park Service administration of that area, have developed into dense thickets that inhibit native vegetation. Salt Cedars have also appeared along dune fringes, along the Lost River Drainage and on disturbed soils near buildings, and along roadways. Arando donax, a large introduced grass is also located in a small area of the dunes and tumbleweeds grow in several areas of disturbed soil, especially around the monument headquarters.

7.3 Alternate Actions and Their Probable Impact

1. Physically remove all such plants. This would disturb large areas of soil and vegetation throughout the park since many of the Salt Cedars are quite large and located in areas deep within the park and far from any roadway.
2. Chemically "poison" all such plants. This would cause introduction of harmful chemicals into the park ecosystem and, at present, there are no approved herbicides for park use.
3. No action. This will result in a still thicker spread of these plants until at some point in time we will have what one researcher has called "Salt Cedar National Monument".

7.4 Recommended Course of Action

Continued effort is necessary to control the fast spreading Tamarix. Individual plants should be physically removed whenever possible and small stands should be controlled whenever possible. If an effective control method can be determined it should be utilized on the larger stands if it can be proven to be environmentally sound. The Arando donax should be monitored to prevent its spread. The area of disturbed soil around the headquarters should be limited as much as possible to prevent the spread of tumbleweed and other weedy species.

8.1 WHSA - N18 Bat Control

8.2 Statement of Issue and Problem

The Mexican Freetail Bat is abundant during warm months around the visitor center, maintenance and residence areas, where they hang from buildings and porches and ceilings. This creature may present a health hazard as a carrier of rabies or bubonic plague, which is indigenous to the area. It also causes a maintenance problem resulting in clean-up of droppings from visitor center patio and other buildings.

8.3 Alternative Actions and Their Probable Impact

1. Destroy the bats. This would be contrary to National Park Service policy since they are native to the area. It could also result in an increase in the number of insects in the immediate area.

2. Research a means by which the bats can be induced to leave the area with sound devices.

3. No action. This will result in a continuation of bat problems for the park staff, and will continue to provide an unnatural roosting place for the bats, to their great delight I'm sure.

8.4 Recommended Course of Action

Initiate research to determine the best method of inducing the bats to find another home. Meanwhile, continue to tempt them into use of the "Bat House" and away from the park buildings. Continue to screen areas that are especially desired to be free of roosting bats.

B. Cultural Resources Management Program

1. Overview and Needs Section

As proclaimed in its Statement for Management, White Sands National Monument is primarily a Natural Area. It is a unique set of geological features which is the primary significance of the area. The flora and fauna are also of significance in this highly developed ecological situation where living communities of plants and animals form a complex interdependent life system.

Still, although relatively meager, the cultural history and prehistory of the area are also of interest. These include evidence of prehistoric Indian hearth sites and Mogollon Culture Pueblo ruins as well as historic Apache campsites at scattered fringe locations.

Preliminary surface surveys were conducted in 1973 and 1977 (see Appendix B - Completed Research). Additional archaeological research has been programmed for the period 1981 through 1985. However, priority changes have resulted in delays to this program. Much work needs to be done to complete the Cultural Resources Inventory required by E011593.

Other Cultural Resources problems, such as protection of the Fairchild site eligible for the National Register and preservation of the Oliver Lee Ranch home, have not been addressed in this plan since they are located on a detached 440 acre portion of the monument that is scheduled to be transferred to another agency.

2. Cultural Resources Project Statements

<u>Item</u>	<u>Park Code & Project Number</u>	<u>Project Title</u>
1.	WHSA - C1	Archaeological Survey

1.1 WHSA - C1 - Archaeological Survey of White Sands National Monument
Addressed in 1974 WSNM RMP.

1.2 Statement of Issue or Problem

The vast majority of prehistoric limited activity locations and small campsites throughout the Southwest are small, almost entirely surficial and seldom contain preserved organic remains suitable for direct dating methods like Carbon-14. Although this type of site is by far the most numerous in archaeological record, and is represented during all periods of human occupation, their general lack of diagnostic artifacts as well as their poorly preserved nature, seldom allows for adequate interpretation. In short, although these sites are the most numerous, they are the least understood. The hearth sites within White Sands represent a unique set of cultural resources. They often contain diagnostic artifacts, organic preservation is almost complete, and the hearth casts undoubtedly contain uncontaminated pollen, carbon and macrofossil materials of great value both to archaeological interpretation and to environmental reconstruction. Although related methods of environmental analysis, like the study of fossil packrat middens, have proved quite successful in this regard, they are often limited to mountainous rocky terrain where naturally protected situations are common. Open desert basin floors seldom afford any degree of natural protection whatsoever, and similar remains are extremely uncommon. Thus, while Holocene environments have been successfully reconstructed through time in the southwestern mountains, comparable data are presently unavailable for desert basins. In the absence of such environmental data, the prehistoric relationship between humans and their environment remains poorly understood.

A comprehensive site survey as required by E011593, has never been completed for the entire monument.

The cultural resource inventory of a tract of land as large as WSNM is a vast undertaking. Most inventory surveys undertake areas in the range of ten square miles. Even the largest inventories which have been done thus far in New Mexico, scarcely exceed 60 square miles. Likewise, no hearth site sampling has been undertaken.

More than 76 sites are known from earlier preliminary surveys (1973 and 1977), but the true extent and identification of all the archaeological resources within the boundary are not known. An archaeological base map for the entire monument does not exist. This information is necessary for management purposes, both in planning and in the protection of archaeological resources.

Modern activities threaten sites, both in the dunes and in the bajada community of the western area of the monument. Illegal entry from the military boundary surrounding the monument frequently results in "pot-hunting" and intentional or accidental damage by vehicles. Likewise, the impact and recovery operations of the missile range creates a threat. Military alterations of natural drainage patterns have affected the erosional pattern across downslope lands containing the Lake Lucero site. Protection of these sites must be improved and an inventory and sampling program completed to avoid the loss of the unique opportunity to reconstruct the environmental and chronological prehistory of the area.

1.3 Alternative Actions and Probable Impacts

1. Foot Survey. Typically, professional and federal agency standards require an interval between survey crew members of not more than 60 meters. Linear speed of an archaeological survey crew (including necessary recording) averages 3-4 miles per day. If we assume a crew of four per vehicle, each square mile of inventory grade coverage would require one full day and one vehicular round trip. Areas totally inaccessible to vehicles would require proportionately more time and an increase in trips to the survey area proximity. Typical archaeological survey logistics could pose a distinct and massive threat to the fragile ecology. Even if access during survey were restricted to present unimproved vehicle trails, the necessity for repeated trips could seriously degrade areas which are managed as essentially roadless.

2. Horseback Survey. Two previous reconnaissance surveys used horses with good success, and this alternative would serve well for inventory, if feasible. However, many areas within the Monument lie either within the Cooperative Use Area, or are accessible only through WSMR. Survey efficiency would be directly proportional to uninterrupted access, and thus the Christmas break would be an ideal survey period for these more remote areas. At other times, military operations would greatly hamper the survey and would mean that the survey would take years to complete.

3. No Action. Failure to complete the survey will result in a continuing loss of the potential for greater understanding of the past environment and human occupations of the White Sands area as a result of loss of data for interpretive and management purposes.

Hearth and other sites, although relatively stable, deteriorate rapidly through weathering processes when disturbed by human activity. This would mean loss of site integrity and the stratigraphic record. With each passing year, the weather and human activity take away a record that can not be reconstructed.

1.4 Recommended Course of Action

A comprehensive archaeological survey, including testing, should be accomplished through contract to a qualified institution. In view of the large acreage involved, the survey will probably take several years. During the past few years, the interpretive use of aerial photography in archaeology has become a major cost effective tool in large inventory surveys in the Southwest. Detailed orthophotographic maps based on stereo photographic imagery have proven particularly useful in the low relief terrain typical of desert basins and in regions where mapping control points and/or mapped man-made features are scarce. Both conditions generally pertain within White Sands National Monument.

Stereo aerial photography can be of great utility in locating and interpreting the distributions of particular site types which have a high surface visibility. In the White Sands, numerous hearth sites have been recorded, and their visibility is known to be generally high, due to sharp contrast between pure gypsum sands and those stained by carbonized organic materials. A detailed analysis of these types of features prior to the initiation of fieldwork will assist in the development of a more effective survey design, as well as allowing the most expedient sampling of these sites for environmental and chronological reconstruction.

From a strictly ideal archaeological perspective, the inventory of cultural resources, and related studies would be most effective in the following order of priorities:

1. new aerial photography at a scale of approximately 1:10,000;
2. preparation of orthophotographic base maps;
3. remote sensing interpretation;
4. chronological and paleoenvironmental studies;
5. inventory survey of high priority areas: those areas with a high site density and/or high adverse impacts;
6. sample survey of low priority areas: those areas expected to have few sites and/or remote from modern activity;
7. completion of inventory.

In the meantime, an increased effort will be needed to protect the sites from adverse impact.

Since the "off limits" signs along the southern and western boundaries are ineffective, Antiquities signs should be placed along the boundary in appropriate places and every effort should be made to take punitive actions against violators. Increased patrols will be needed within energy restraints. Continue to initiate cooperative relations with White Sands Missile Range and Holloman Air Force Base to point out the problem and gain their support. Map and document all cultural resources and continue to accompany all recovery operations and discourage impacts in cultural resource areas.

The fencing project proposed in WHSA - N16 (Exotic Oryx Control) will greatly reduce the potential for damage due to illegal entry along the Monument's south and west boundaries.

III. PROGRAMMING SHEETS AND RESEARCH PRIORITIES

RESOURCES PROGRAMMING SHEET

White Sands NM		Southwest	New Mexico	X	Natural	Cultural	December 1, 1981				Page	1 of		
Park		Region		State		Date								
Area Pri- ority	RMP Ref. No.	Pack. No.	PROJECT TITLE	Action Type*	FY 82	FY 83	FY 84	FY 85	FY 86	NPS Cost/ M.Y. \$1000	NPS Cost/ M.Y. \$1000	NPS Cost/ M.Y. \$1000	NPS Cost/ M.Y. \$1000	
					NPS Cost/ M.Y. \$1000	NPS Cost/ M.Y. \$1000	NPS Cost/ M.Y. \$1000	NPS Cost/ M.Y. \$1000	NPS Cost/ M.Y. \$1000					NPS Cost/ M.Y. \$1000
1.	WHSA-N16		Control of Exotic Fauna	RM	12	12	12	12	12					
2.	WHSA-N17	137, 144	Air Quality Monitoring Project	M	.25	5.2	.25	5.2	.25	5.2	.25	5.2	5.2	
3.	WHSA-N3	136, 145	Water Resources Analysis Project	R				71						
4.	WHSA-N12		Backcountry Impaction	M	.4	.4	.4	.4	.4	.4	.4	.4	.4	
5.	WHSA-N10		Protection of Cacti Habitat	M	.02	.3	.02	.3	.02	.3	.02	.3	.3	
6.	WHSA-N15		Noise Pollution	M	.01	.15	.01	.15	.01	.15	.01	.15	.15	
7.	WHSA-N8		Control of Exotic Plants	RM	1	15	1	15	1	15	1	15	15	
8.	WHSA-N18		Bat Control	RM				2.5						

* RM = Resource Management

M = Monitoring

R = Research

RESOURCES PROGRAMMING SHEET

Page 1 of 1

December 1, 1981

X Cultural

Natural

New Mexico
State

Southwest
Region

White Sands
ark

FY 86
YEAR 5
NPS Cost/
M.Y. \$1000

FY 85
YEAR 4
NPS Cost/
M.Y. \$1000

FY 84
YEAR 3
NPS Cost/
M.Y. \$1000

FY 83
YEAR 2
NPS Cost/
M.Y. \$1000

FY 82
YEAR 1
NPS Cost/
M.Y. \$1000

Pack.
No.

RMP
Ref. No.

PROJECT TITLE

35

30

25

R

1. WHISA-C1 117,139 Archaeological Survey

* R = Research

IV. ENVIRONMENTAL ASSESSMENT MATRIX

The following is a summary of the environmental impact narrative evaluations which are found in the individual Project Statements. With the exception of Projects N16, N17 and N18, which are new or significantly redefined projects, only the recommended action components have been evaluated. In the cases of N16, N17 and N18 all alternatives are evaluated.

No impact category (soils, wildlife, etc.) appears to be significantly affected by the cumulative impact of all proposed actions.

Agencies and persons consulted in the preparation of this plan include:

Lt. Robert Andreoli, Environmental Health, Holloman AFB

Mr. Peter Eidenbach, Human Systems Research

Mr. Narciso Garcia, FE, White Sands Missile Range

Dr. William Reid, University of Texas at El Paso

PROJECT STATEMENT TITLE: Control of Exotic Fauna (WMSA - N16)

IMPED FOR THE PROPOSAL: Exotic African Gemsbok, Oryx gazella, transplanted onto the White Sands Missile Range by the New Mexico Fish and Game Department have moved into the Monument and established home range. Their number is increasing and they are consuming resources to the detriment of other native species such as Mule Deer and Pronghorns.

ALTERNATIVE ACTIONS IMPACT CATEGORIES	PROPOSED ACTION	NO ACTION	ALTERNATIVE 1	ALTERNATIVE 2	ALTERNATIVE 3	ALTERNATIVE 4
	Fence Western and Southern boundary. Herd Oryx out by helicopter		Document sightings only	Allow public hunting	Have NPS destroy Exotics	Have State remove and relocate Oryx
Soils	Temporary disturbance where vehicles travel to install fence and maintain it later	Continued formation of "trails" marking Oryx routes	Same as No Action			
Wildlife	Fence must be of a type to allow natives to pass through. More resources will then be available for them.	Less resource available as they are used by Exotic.		Other animals would undoubtedly be disturbed.		
Plant Communities	Temporary disturbance of individuals along fence line.	Disturbed and eaten as Exotics continue to expand their range				
Noise Levels	Helicopter work will cause noise that may frighten other wildlife during herding					
Air Quality	Temporary disturbance of surface dust and sand during helicopter herding					
Social - Economic				Violation of NPS Policies	Negative public reaction	Large expense and probable PR problems

FOR RESOURCES MANAGEMENT PLANS

ENVIRONMENTAL ACTION CATEGORY MATRIX

PROJECT STATEMENT TITLE:

Air Quality Monitoring Project (WHA - N17)

USED FOR THE PROPOSAL:

To protect area air quality in accordance with Clean Air Act, amended 1979.

<div>ALTERNATIVE ACTIONS</div> <div>IMPACT CATEGORIES</div>	PROPOSED ACTION	NO ACTION	ALTERNATIVE	ALTERNATIVE	ALTERNATIVE
	Establish baseline data through monitoring				
Air Quality	Prevent future degradation and loss of visual resources	Would leave NPS with no means of establishing loss in air quality related values - violate Clean Air Act.			

PROJECT STATEMENT TITLE: Water Resources Analysis (WHA - N3)

ISSUED FOR THE PROPOSAL: Military operations on neighboring White Sands Missile Range and Holloman AFB threaten to pollute monument water resources. Also, pumping of ground water for experimental waste and energy developments in local communities is being proposed.

ALTERNATIVE ACTIONS IMPACT CATEGORIES	PROPOSED ACTION	NO ACTION	ALTERNATIVE	ALTERNATIVE	ALTERNATIVE	ALTERNATIVE
	Research to Analyze and monitor water resources					
Water Quality	No affect other than a few drill holes to monitor flow levels					
Soils	Possible disturbance if drilling rig must be moved to areas not accessible by roadways					

FOR RESOURCES MANAGEMENT PLANNING

ENVIRONMENTAL ACTION PLAN

PROJECT STATEMENT TITLE

Backcountry Impaction (WHSA - N12)

NEED FOR THE PROPOSAL

Illegal entry and backcountry travel cause damage to environment.

ALTERNATIVE ACTIONS IMPACT CATEGORIES	PROPOSED ACTION	NO ACTION	ALTERNATIVE	ALTERNATIVE	ALTERNATIVE
Visitor Use	Continue current action to inform public and work with Military neighbors				
	No appropriate use will be affected since the "roads" at issue are closed anyway.				
	Missile Recovery will be almost exclusively by helicopter which causes temporary noise and blowing dust. The fence if constructed, will have the effects mentioned in Project WHSA - N16.				

PROJECT STATEMENT TITLE

Protection of Cacti & Habitat (WHSA - N10)

NEED FOR THE PROPOSAL

Cacti are frequently removed illegally. Some varieties of threatened cacti and several species exhibiting range extensions are included in those taken.

ALTERNATIVE ACTIONS IMPACT CATEGORIES	PROPOSED ACTION	NO ACTION	ALTERNATIVE	ALTERNATIVE	ALTERNATIVE	ALTERNATIVE
Visitor Use	Monitor Plants and protecting Habitat					
	During flowering periods some visitors may be contacted when observed in habitat areas. Some curtailment of use in study area may occur.					

FOR RESOURCES MANAGEMENT PLANS

ENVIRONMENTAL ACTION REPORT MATRIX

PROJECT STATEMENT TITLE

Noise Pollution (WISA - N15)

NEED FOR THE PROPOSAL

Nearby Air Base results in continued low altitude fly overs of Monument.

ALTERNATIVE ACTIONS IMPACT CATEGORIES	PROPOSED ACTION	NO ACTION	ALTERNATIVE	ALTERNATIVE	ALTERNATIVE
	Seek cooperative with Holloman AFB & WSMR to minimize				
	No adverse affects.				

PROJECT STATEMENT TITLE:

Control of Exotic Plants (MHSA - N8)

NEED FOR THE PROPOSAL:

Salt Cedar (Tamarix sp.) is establishing itself within the Monument. It is spreading into even the most remote sections of the park.

ALTERNATIVE ACTIONS IMPACT CATEGORIES	PROPOSED ACTION	NO ACTION	ALTERNATIVE	ALTERNATIVE	ALTERNATIVE	ALTERNATIVE
Plant Communities	Physical Removal of small stands and monitor.					
	More water will be available for native vegetation					
Soils	Some temporary disturbance of soil around area of removal.					
	"Artificial" habitat will be lost to minor degree.					
Wildlife habitat	The number of plants that can be removed physically is so small that very little affect is likely to occur.					
	This amounts more to a "wait and see" policy.					

FOR RESOURCES MANAGEMENT PLANS

INTRODUCTORY AND SUBJECT MATTER

PROJECT STATEMENT TITLE

Bat Control (WMSA - N18)

USED FOR THE PROPOSAL

Bats are a nuisance around buildings where they hang during the evenings creating a health hazard and creating maintenance problems.

ALTERNATIVE ACTIONS IMPACT CATEGORIES	PROPOSED ACTION	NO ACTION	ALTERNATIVE 1	ALTERNATIVE 2	ALTERNATIVE	ALTERNATIVE
Wildlife	Initiate research and continue to temp them to roost in other areas.		Destroy the bats	Research to determine how to get them to leave with sound.		
			Obviously will affect the bats but may also cause increase in insects around Visitor Center and residences	If bats leave, insects may increase		
Employee Health		Continued exposure to possible rabies and Bubonic Plague	More insect related problems	More insect related problems		
Maintenance	Cost of construction of new home for bats	Continued clean up of bat guano-lost time and funds				

PROJECT STATEMENT TITLE: Archaeological Survey (WHA - C1)

NEED FOR THE PROPOSAL:

A survey of Cultural Resources as required By E011593 has not been completed.

ALTERNATIVE ACTIONS IMPACT CATEGORIES	PROPOSED ACTION	NO ACTION	ALTERNATIVE	ALTERNATIVE	ALTERNATIVE
	Complete the survey using remote sensing and sampling.				
	This project has already been approved and determined to have no significant impact in the 1974 RMP for White Sands National Monument.				

A. OVERVIEW

The following is a review of all actions proposed within the White Sands National Monument Resources Management Plan and outlined in the four categories described in the plan.

I. THOSE ACTIONS WHOSE IMPLEMENTATION WILL HAVE A SIGNIFICANT AND MEASURABLE EFFECT ON THE ENVIRONMENT OR ARE HIGHLY CONTROVERSIAL.

None. All ^{NR} natural and cultural resource projects were considered on their own merits and those actions planned do not have a significant or measurable effect on the environment. All actions fall into Categories II, III and IV. Some actions fall into a combination of categories.

II. THOSE ACTIONS WHICH WILL CONTINUE EXISTING MAINTENANCE OR MANAGEMENT ACTIONS (CONTINUE MAINTENANCE)

Projects N-3, N-8, N-10, N-12 and N-18 fall into this category. All but N-3 are already or partially on-going and include continued activities by the Park Staff and are of management or actual maintenance in character.

III. THOSE ACTIONS WHICH WILL INITIATE NEW MAINTENANCE OR MANAGEMENT ACTIONS (NEW MAINTENANCE)

Project N-16, control of exotic fauna by building a fence is the only project in this category.

IV. THOSE ACTIONS WHICH WILL ENTAIL RESEARCH

Projects N-3, N-8, N-10, N-12, N-16, N-17, N-18 and C-1 fall into this category. These projects all include investigations into various phases of the area's systems and may, when completed, result in further and different management determinations. These could then require an action plan different than those now proposed and may require an environmental assessment in the future when the Resources Management Plan is revised and updated.

DETERMINATION: All projects and actions proposed in the White Sands National Monument Resources Management Plan and outlined above are research or maintenance in character and do not significantly affect the environment or cause controversy. Therefore, in accordance with the following paragraph from "Environmental Assessment and Statements Guidelines", (NPS-12, December 22, 1976, Chapter 3, Pages 3 and 4).

"Routine maintenance and operation of Parks, small changes in programs for managing resources and providing for visitor use, and similar continuously occurring minor actions --- must be taken in ways to insure protection and enhancement of environmental quality, but a written documentation of their environmental impacts is not required."

NO ENVIRONMENTAL ASSESSMENT WILL BE PREPARED.

41

4/26/77

Recommended by: Wiford Fletcher
Chief, Natural Resources, Southwest Region

Recommended by: Richard W. Selman
Chief, Southwest Cultural Resources Center

Concurred by: Jack Hechler
Associate Regional Director, Park Operations

Approved by: Robert J. [Signature]
Regional Director, Southwest Region

B. REVIEW, DATES AND CHANGES

The Resources Management Plan will be reviewed annually by the Superintendent and the Regional Resources Management Plan Coordinator. Necessary changes will be incorporated with the plan upon approval of the Superintendent and the Regional Director.

The Resources Management Plan will be revised and fully updated at intervals of not less than five years.

 20 May '82
Resources Management Plan Coordinator Date

V. APPENDICES

4/26/82

APPENDIX A - CONSTRAINT DOCUMENTS

TITLE 43—PUBLIC LANDS: INTERIOR

Chapter I—Bureau of Land Management, Department of the Interior

Appendix—Public Land Orders

[Public Land Order 703]

New Mexico

WITHDRAWING PUBLIC LANDS FROM PROSPECTING, LOCATION, ENTRY, AND PURCHASE UNDER THE MINING LAWS AND RESERVING THEM FOR THE USE OF THE DEPARTMENT OF THE ARMY FOR MILITARY PURPOSES

By virtue of the authority vested in the President and pursuant to Executive Order No. 9337 of April 24, 1943, it is ordered as follows:

Subject to valid existing rights, the public lands within the following-described areas in New Mexico are hereby withdrawn from prospecting, location, entry, and purchase under the mining laws of the United States and reserved for the use of the Department of the Army for military purposes:

NEW MEXICO PRINCIPAL MERIDIAN

- Tps. 6 to 15 S., R. 2 E.
Secs. 1 to 4, 9 to 16, 21 to 23, and 33 to 36 inclusive in each township.
- T. 17 S., R. 2 E.
Secs. 1 to 4, 9 to 16, 22 to 27, and 34 to 36 inclusive.
- T. 18 S., R. 2 E.
Secs. 1, 2, 11 to 14, 24, 25, and 36.
- Tps. 11 to 18 S., inclusive R. 3 E.
- T. 19 S., R. 3 E.
Secs. 1 to 18, 20 to 29, and 32 to 36 inclusive.
- T. 20 S., R. 3 E.
Secs. 1 to 4, 9 to 16, 22 to 27 inclusive, 35 and 36.
- T. 21 S., R. 3 E.
Secs. 1, 2, 11, 12, 13, 24, and 25.
- Tps. 17 to 23 S., inclusive R. 4 E.
- Tps. 17 to 23 S., inclusive R. 5 and 6 E.
- Tps. 17 to 23 S., R. 7 E.
- Tps. 24 and 25 S., R. 7 E., those portions west of the Southern Pacific Railroad right-of-way.

AUG 3 1976

REVISION #1
MEMORANDUM OF UNDERSTANDING BY AND BETWEEN
WHITE SANDS MISSILE RANGE AND WHITE SANDS NATIONAL MONUMENT

Supt.	
Admin.	
Off.	
Prot.	
Tech.	
Training	
Public Aff.	
Records	
Legal	
Medical	
Food Service	
Transportation	
Utilities	
Construction	
Other	

Whereas, the White Sands Missile Range (WSMR) and White Sands National Monument (WSNM) have a mutual desire and interest to continue the present cooperative efforts on a local level for the preservation and protection of the White Sands National Monument concurrently with the vital necessity for conducting the test and evaluation of national space and missile programs on and adjacent to land areas of the White Sands National Monument, and,

Whereas, pursuant to paragraph 18 of the Special Use Permit granted the Secretary of the Army by the Secretary of the Interior, a Memorandum of Understanding shall be entered into between the Commanding General, WSMR, and the Superintendent, WSNM, to outline in detail the cooperative responsibilities to be assumed by each party in carrying out the terms of the Special Use Permit.

Now, Therefore, in consideration of the mutual covenants and understanding herein, it is agreed by and between WSMR and WSNM as follows:

AGREEMENT AND RESPONSIBILITIES OF WHITE SANDS MISSILE RANGE

WSMR does hereby, agree:

1. To review Special Use Permit Annex A, Map PE-GM-31 June 1976 to include changes in location of approved facilities within the boundaries of WSNM.
2. To maintain the definition of WSMR Range Route 7 within the boundaries of WSNM by installing appropriate markers at one-quarter ($\frac{1}{4}$) mile intervals, one hundred feet each side from Range Route 7 center line. Maintenance operations of WSMR Range Route 7 to be confined within this right-of-way.
3. To maintain identification of the location of power and telephone lines within WSNM that require mobile vehicle and/or equipment access for patrol or maintenance purposes. Identification of these lines will be indicated on Annex A map.
4. To coordinate with WSNM all travel (other than WSMR Routes 7, 271 and 288) and subsequent work required on land within the boundaries of WSNM by WSMR personnel and/or contractors.
5. To maintain the signs for identification of the north-south permit line delineating the Zone of Cooperative Use.

6. To prepare and submit documents to the appropriate office of the National Park Service to obtain authorization for new facilities within WSNM not covered under the current Special Use Permit.

7. Identify, annually, installations and facilities within the boundaries of the monument no longer needed for the WSMR mission. Removal of installations and facilities will be undertaken from the monument lands, Annex A description and Annex A map of the Special Use Permit.

8. To submit written requests for the approval of the Superintendent, WSNM, when there is a planned impact of a test item in the zone of cooperative use or evacuation is required of all or part of the picnic loop, access road or other areas of WSNM. Each written request will give the date, time and duration and be submitted at least one workday prior to the desired test date. The Superintendent, WSNM, shall be consulted when extension of duration is required. Tests will be scheduled during early morning hours or outside regular operating hours of WSNM when possible.

9. Provide MP assistance to WSNM during testing as needed and available. Duties for such assistance will be delineated in a subsequent agreement between WSNM and WSMR MP's.

10. To provide advance notification to the concessionaire of the WSNM whenever evacuation of the monument headquarters area is required.

11. To initiate, as soon as practical, recovery operations of missile or other debris impacting intentionally or unintentionally in any portion of the WSNM. Such recovery operations will be subject to prior coordination with the WSNM and be completed to the satisfaction of the Superintendent, WSNM. Recovery operations will not be initiated unless a representative of the WSNM is present at the monument boundary. In the event classified material impacts within the monument and immediate recovery is required, WSNM personnel will determine the routes of travel and the method of recovery, even though WSNM may not accompany the WSMR recovery personnel. These recovery operations, and recovery of future impacted material, will require that WSMR restore the land to as close to its original condition as practical, with final approval for completeness of the restoration to be given by the Superintendent or his designated representative. (Commitment to restoration of the land after missile impact will include utilizing hand tools when deemed necessary). Helicopters will be the primary recovery vehicle, where established roads do not exist. When ground transportation is authorized, only the minimum number of vehicles necessary to effect recovery will enter the Monument. The recovery method, i.e., use of hand tools, helicopter recovery and number of vehicles, is subject to approval of the Superintendent or his representative. Where removal or destruction

of explosive ordinance is required, Explosive Ordinance Disposal (EOD) personnel will determine whether safe removal can be accomplished or on-site destruction is required. Safety considerations required for recovery by helicopter and if loads are too heavy for helicopter recovery will be determined by the pilot. Where recovery of missiles or test vehicles reaches an impasse between field representatives of WSMR and WSNM, no further recovery action will take place until the Director, National Range Operations, WSMR, and the Superintendent, WSNM, or their representatives, resolve the impasse in a timely and equitable manner.

12. To coordinate with WSNM personnel for the operations of mobile instrumentation sites within the Monument, except in areas authorized under the Special Use Permit (NE-30, Hotel Site and access road to See Horn).

13. To remove missile debris within the Monument and to complete the removal of all materials that have impacted since the establishment of the testing program. Air search and removal of debris will be accomplished as work load permits and as clearance into the area is available. A concentrated effort to cleanup debris will be accomplished during slowdown in mission schedules, 1 October through 31 December.

14. To have WSMR organizations, including contractors, cleanup after completion of any projects that take place within the boundaries of WSNM to prevent accumulation of construction waste materials. To cooperate in the indoctrination/orientation of involved WSMR personnel in the rules, regulations and procedures dealing with the mutual cooperation agreement between WSMR and WSNM. The need for such indoctrination/orientation is to be evaluated at least annually and conducted if needed at such intervals as necessary.

15. To assist the WSNM by providing Military Police on scheduled patrols along Range Route 7 (especially in the vicinity of Lake Lucero) and Range Route 10 for the purpose of detecting trespasses and other illegal activities in violation of existing laws, rules and regulations. Those persons apprehended in violation of these laws, rules and regulations will be subject to disciplinary action. Law enforcement personnel of both WSMR and WSNM have the right of "hot pursuit" when violators may attempt to evade apprehension through flight into either the WSNM or WSMR.

16. To assist in recovery of objects, including weather balloons, metal spheres, etc., resulting from unplanned impacts which occur within the monument from unknown sources and are unreported.

17. To have representatives of WSNM and WSMR meet annually to prepare maintenance work programs that will provide for:

a. Restoration of lands where roads were established as a result of military operations but are no longer required for the military mission and are no longer identified as established roads on Map PE-GM-31 June 1976

b. Surveying and marking of the mutual boundary in order to properly define its location, specifically in the southwest corner of WSNM and along the northern boundary. The total cost of this work, as accomplished, will be equally divided between WSNM and WSMR.

AGREEMENT AND RESPONSIBILITIES OF WHITE SANDS NATIONAL MONUMENT

WSNM does hereby, agree:

1. Depending on the nature of military materiel debris found while performing their regular duties, WSNM personnel will:

a. Recover non-hazardous debris that can be easily removed and transport it to a designated area for pickup by WSMR.

b. Locate and flag the sites where there is debris which is potentially hazardous or is difficult to remove.

c. Notify WSMR Range Control telephone 678-1156, of military debris located.

d. Provide personnel to guide and assist in the debris cleanup operations.

2. To coordinate with WSMR, Facilities Engineering Directorate, Master Planning Branch, in matters pertaining to obtaining new or renewing WSMR security badges for WSNM personnel or WSNM research investigators who require access outside the WSNM boundary and inside WSMR.

GENERAL UNDERSTANDING AND AGREEMENT

1. WSNM shall submit a statement and justification to WSMR for reimbursement of any and all expenses that may be incurred in patrolling and cleanup operations and by reasons of the permit. Upon approval, WSMR will reimburse WSNM for the expenses incurred. This work shall not exceed \$10,000 annually.

2. Any matter not covered herein and any conflicts arising during the period of this agreement shall be resolved by conference between the representatives of WSMR and WSNM.

3. Nothing contained in the memorandum obligates a participating agency or Bureau to expend funds or to obligate manpower in excess of appropriations authorized by law and administratively made available for the purpose of this memorandum.

This Memorandum of Understanding becomes effective upon the date of the last signature of the parties and shall expire December 31, 1986. This memorandum may be extended by the mutual agreement and approval of the signature parties to this agreement, hereto, and shall be subject to review and amendment, by mutual agreement of the parties thereto, at the end of each calendar year after execution.

APPROVED:

Alan C. Ford

Commanding General
U. S. Army, White Sands Missile Range

DATE 27 July 1981

APPROVED:

Donald R. Hansen

Superintendent
White Sands National Monument

DATE 7-21-81

APPENDIX B - COMPLETED RESEARCH

Completed Research (annotated list of past projects/bibliography)

<u>Date</u>	<u>Item</u>	<u>Result</u>
1935	.....<u>An Ecological Reconnaissance in White Sands, New Mexico</u>	F. W. Emerson, published in Ecology 16:226-233.
1942	.....<u>Notes on Animal Occurrence and Activity in the White Sands National Monument, New Mexico</u>	R. E. Bugbee, published in Trans. Kansas Acad. Sci. 45:315-321.
1943	.....<u>The White Sands Earless Lizard</u>	H. M. Smith, published in Zool. Ser. Field Mus. Nat. Hist. 23 (30):339-344.
1948	.....<u>Flora of White Sands National Monument</u>	E. R. Schaffner, M.S. Thesis, New Mexico State University. Copy in WHSA library.
1950	.....<u>A Survey of the Insects of White Sands National Monument, Tularosa Basin, New Mexico</u>	C. P. Stroud, published in Amer. Midl. Natur. 44 (3):659-677
1950-1957	.....<u>Physiology of Plants Growing in a Gypsum Sand Deposit</u>	Lora M. Shields, numerous published papers in various journals; eleven (11) papers in WHSA library.
1962	.....<u>Confirmation of Source Locale of Gypsum Sands at White Sands</u>	Paul V. Wykert, Regional Chief Boundary Studies Branch; report in file N22 WHSA.
1962-1966	.....<u>Dune Movement and Structures of Dunes</u>	Edwin D. McKee, USGS, geologic paper entitled <u>Structures of Dunes at WHSA, NM.</u> Copy in WHSA Library.
1965	.....<u>Analysis of Mineral Content of Ground Water Samples Taken on the Loop Drive and at Lake Lucero</u>	Roger Anderson, UNM, Dept. of Geology; report in file N22 WHSA.
1965	.....<u>Core Samples (149' Core) Taken at Lake Lucero</u>	Roger Anderson, UNM, Dept. of Geology; report in file N22 WHSA.
1966	.....<u>Core Samples Taken at Lake Lucero and Near WSMR Route No. 6</u>	Department of Army contract w/Woodward, Clyde, Sherard & Associates, Oakland, CA; copy of boring logs in file N22 WHSA
1967	.....<u>Aspects of the Biology of Lizards of the White Sands, New Mexico</u>	J. R. Dixon, published in Contr. Sci., Los Angeles Co. Mus. No. 129:1-22

- 1969Habitat Partitioning Among Three Species of Lizards from White Sands National MonumentC. MacFarland, M.S. Thesis, University of Wisconsin, Madison, Wisconsin.
- 1971Hydrologic Control Over the Origin of Gypsum at Lake LuceroRoger Allmendinger, M.S. Thesis, New Mexico Institute of Mining and Technology, Socorro, NM. Copy in WHSA library.
- 1971Growth and Movement of Dunes at White Sands National MonumentEdwin D. McKee, USGS Denver, Geological manuscript.
- 1971Deformation of Lee-Side Laminae in Eolian DunesEdwin D. McKee, USGS Denver, Geological manuscript.
- 1972Measured Physiological Limitations of Microorganisms Isolated from Lake Lucero and Gypsum CrystalD.T. Chun, M.S. Thesis, New Mexico State University
- 1973Regional Hydrology and Evaporative Discharge as a Source of Gypsum at White Sands National MonumentR.J. Allmendinger and F.B. Titus, report for NM Bureau of Mines and Mineral Resources, Socorro, NM.
- 1973Archaeology of White Sands Including the Dog Canyon Detached PortionHuman Systems Research, Inc., two (2) archaeological manuscripts under NPS Contract C plus Technical Manual, 1973 Survey of the Tularosa Basin, the Research Design.
- 1973The Herpetofauna of the Tularosa BasinRobert McKeever, NPS, summary of observations over a three year period. Copy on file in WHSA library.
- 1976Geometry and Growth of the White Sands Dune FieldE.D. McKee and R. Moiola, USGS, published report J. Res. USGS 3:59-66
- 1976-1981.....Natural Resources Inventory and Ecosystem Analysis at White Sands National Monument
- The University of Texas at El Paso, UTEP, Department of Biological Sciences, Laboratory for Environmental Biology (L.E.B.) under direction of Project Coordinator Dr. William H. Reid conducted an enormous amount of research on the ecology of the White Sands under NPS Contracts CX 702980023, CX 702960173, CX 702900001 and PX 702900311. The research has resulted, thus far, in seven (7) Masters Thesis', twelve (12) L.E.B. Research Reports, and numerous published and unpublished reports. Listed below is research completed by the UTEP study team.
- 1977Plant Community Structure in White Sands National MonumentR.D. Echlin, M.S. Thesis, UTEP.

- 1978 Epidemiology, Distribution and Isolation of Pathogenic Fungi from White Sands National Monument K.M. Ero, M.S. Thesis, UTEP.
- 1978 Reproductive Ecology of Three Lizard Species at White Sands National Monument S.C. Helfert, M.S. Thesis, UTEP.
- 1978 Plant Associations Within White Sands National Monument W.H. Reid and R.D. Echlin, published abstract in Bull. N.M. Acad. Sci. 18:10
- 1979 Plant Phenology in Interdunal Communities at White Sands National Monument D.L. Hogg, M.S. Thesis, UTEP.
- 1979 The Distribution and Ecology of Two Echinocereus Triglochidiatus Populations in White Sands National Monument R. Lozano, M.S. Thesis, UTEP.
- 1979 Aspects of the Ecology of Cacti at White Sands National Monument R. Lozano and W.H. Reid, abstract, published in J. Colo.-Wyo. Acad. Sci. 11:34.
- 1979 Dune Crest Vegetation at White Sands National Monument G.R. Patrick and W.H. Reid, abstract, published in J. Colo.-Wyo. Acad. Sci. 11:34.
- 1979 Catalog of White Sands National Monument Plant Specimens W.H. Reid, unpublished report submitted to NPS, Santa Fe, NM.
- 1979 White Sands National Monument, Natural Resources Inventory and Analysis, Final Report W.H. Reid, this report represents a summary and compilation of research completed by UTEP, submitted to NPS, Santa Fe, NM. Copy in WHSA library.
- 1979 Structure of Plant Associations at White Sands National Monument W.H. Reid, D.L. Hogg and G.R. Patrick, abstract, published in J. Colo.-Wyo. Acad. Sci. 11:33.
- 1980 Plant Succession in the Gypsum Dune Field of White Sands National Monument G.R. Patrick, M.S. Thesis, UTEP.
- 1980 Oryx Activity in White Sands National Monument W.H. Reid, Final report CX 702900311, Copy in WHSA library.
- 1980 Vegetation, Physical Environment and Distribution in White Sands National Monument W.H. Reid, published in Proceedings of 2nd Conference on Research in the National Parks
- 1981 Claret Cup Cactus in White Sands National Monument R. Lozano and W.H. Reid, in review for The Cactus and Succulent Journal, U.S.

- 1981Additions to the Cactus Flora...W.H. Reid, G.R. Patrick and
at White Sands National R. Lozano, published in the
Monument Southwest Naturalist 26 (2):
205-207.
- 1980Archaeological Surface Survey...J.E. Boll, NMSU, report
of Sec. 8, Township 19S, Range submitted to NPS, Santa Fe, NM.
6 E. of White Sands National
Monument
- 1980Archaeological Reconnaissance...P.L Eidenbach and M.L. Wimberly,
in White Sands National Human Systems Research, Copy in
Monument WHSA library.
- 1980Hydrologic Evaluation of Garton..F.R. Sprester, Copy in WHSA
Lake, White Sands National library.
Monument

LIST OF ALL PROJECTS FROM OLD PLANS AT WHITE SANDS

Natural Science Resource Study Plan (RSP), 1969

<u>Number</u>	<u>Project Title</u>	<u>Status</u>
N-1	Origin and Development of Gypsum Dunes	Completed
N-2	White Sands Ecosystem	Completed
N-3	Plant Nutrition in a Gypsum Desert	Completed
N-4	Ecology of Vertebrates	Limited Action

Natural Resources Management Plan (RMP), 1974

<u>Number</u>	<u>Project Title</u>	<u>Status</u>
N-1	Natural Resources Basic Inventory	Completed
N-2	Vegetative Cover & Effects of Grazing	Completed
N-3	Water Analysis	Now - WHSA - N3
N-4	Basic Climatological Data	Completed
N-5	Faunal Factors	Incorporated in WHSA-N16
N-6	Kit Fox Ecology	Dropped
N-7	Hazardous Animals	Dropped
N-8	Control of Exotic Plants	Now - WHSA - N8
N-9	Buckmoth Management	Dropped
N-10	Protection of Cacti	Now - WHSA - N10
N-11	Dune Impaction by Road Maintenance	Incorporated in WHSA - N
N-12	Backcountry Impaction	Now - WHSA - N12
N-13	Visitor Carrying Capacity	Completed
N-14	Aquatic Pollution	Incorporated in WHSA-N3
N-15	Noise Pollution	Now - WHSA - N15
C-1	Archaeological Survey	Now - WHSA - C1

APPENDIX C

SELECTED BIBLIOGRAPHY OF PUBLICATIONS
RELATING TO WHITE SANDS NATIONAL MONUMENT
AND THE TULAROSA BASIN, NEW MEXICO

(Revised 1981)

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APPENDIX D - COLLECTIONS AND LOCATIONS

<u>QUANTITY</u>	<u>COLLECTIONS</u>	<u>LOCATION</u>
1-71	Bird Skins	Monument Library, WHSA
2-29	Mammal Skins	Monument Library, WHSA
3-12	Tail Feathers	Monument Library, WHSA
3-29	Projectile Points	Transferred to WAC
4-10	Miscellaneous Artifacts	Transferred to WAC
5-1	Watercolor Painting	Administrative Office, Rm. 2, WHSA
6-3	Transportation Accessories	Patio, VC, WHSA
7-5	Misc. Apache Weapons	Monument Library, WHSA
8-13	Miscellaneous Artifacts	On Display in Various VC Exhibits
9-1	Miscellaneous Artifacts	Monument Library, WHSA
10-20	Gypsum Specimens	Monument Library, WHSA
11-3	Lava Specimens	Monument Library, WHSA
12-8	Trinitite Specimens	Monument Library, WHSA
13-1	Historical Military Equipment	Monument Library, WHSA
14-1	Oil Painting	VC, Room #2, WHSA
15-11	Matted, Bird Paintings	Display, Monument Library, WHSA
16-1	Polymer Painting	Administrative Office, Rm. 1, WHSA
17-2	Photographs	Administrative Office, Rm. 2, WHSA
18-1	Lead Brick	Monument Library, WHSA
19-14	Potsherds	Monument Library, WHSA
20-1	Oil Painting	Superintendent's Office, WHSA
21-5	Misc. Projectile Points	Monument Library, WHSA
22-2	Oil Painting	Staircase, VC, WHSA
23-1	Misc. Vegetal Material	Monument Library, WHSA
24-4	Mammal Skins	VC, Room #3 , WHSA
25-2	Mammal Skins and Skeleton	Univ. of Texas at El Paso, TX.

APPENDIX D - COLLECTIONS AND LOCATIONS

<u>QUANTITY</u>	<u>COLLECTIONS</u>	<u>LOCATION</u>
26-1	Mammal Skull	Monument Library, WHSA
27-3000	B & W Negatives	Monument Library, WHSA

APPENDIX E

SPECIFIC MANAGEMENT PLANS - ACTION PLANS

BASIC THEMATIC MAP FILE

Regional Features
Population Centers
Political Subdivisions
Land Use
Outdoor Recreation Facilities
Transportation, Communication, Utilities
Overnight Accommodations
Land Ownership

PARK SPECIFIC MAP FILE

Topography. Topographic features of White Sands National Monument and the surrounding area are mapped on U.S.G.S. map No. N3230 - W10600/30, N. Mex. Point of Sands, scale 1/125000, dated 1946. In addition, the topography may be discerned from the map entitled "White Sands Missile Range, New Mexico, Master Plan Basic Information Maps, White Sands National Monument", scale 1"-4000 ft., Jan. 1964. These maps are available at Park Headquarters. Topographic maps of the actual dune area are unavailable because of the nature of the actively shifting dunes.

Geology. The geologic significance of White Sands National Monument lies in the ever-shifting gypsum sand dunes and in Lake Lucero as a source of gypsum. Maps and diagrams dealing with the geology of the White Sands may be found in the U.S.G.S. Water-Supply Paper, 343, "Geology and Water Resources of Tularosa Basin, New Mexico", by O.E. Meinzer and R.F. Hare, 1915, and "Hydrologic Control over the Origin of Gypsum at Lake Lucero", by R.J. Allmendinger, M.S. Thesis, New Mexico Institute of Mining and Technology, 1971. Copies of these reports are available in the park library.

Land Use and Ownership. Land Status and Boundary Maps, which denote status of lands within the boundaries of the park, are on file at Park Headquarters. Updated recent land status and boundary changes are available at the Division of Land Acquisition, National Park Service, Santa Fe, NM. The most recent Land Status Map is dated March 1979.

Soils. A general soil map of White Sands National Monument is included in "Soil Survey of White Sands Missile Range, New Mexico". This map provides soil information to the association level and was compiled by the U.S. Soil Department of Army and the New Mexico Agricultural Experiment Station, 1976. This report is available in the park library.

Hydrology. Hydrological features within White Sands National Monument and adjacent areas may be discerned from White Sands Quadrangle - 102 in "Quadrangle Maps of the State of New Mexico", prepared by the New Mexico State Highway Department Planning Division in cooperation with U.S. Department of Commerce, Bureau of Public Roads, 1960. These features are also found in "White Sands Missile Range, New Mexico, Master Plan Basic Information Maps, White Sands National Monument", scale 1"-4000 ft., Jan. 1964. Both of the maps are available at Park Headquarters.

APPENDIX F

Vegetation. Vegetation maps illustrating plant disturbance, associations, and succession are found in the VEGETATIVE COVER portion of "White Sands National Monument, Natural Resources Inventory and Analysis, Final Report" compiled by the University of Texas at El Paso (UTEP), Biological Sciences, Laboratory for Environmental Biology, 1979. In Appendix 6.2 of the UTEP report are plant species distribution maps.

Wildlife. There are no overall wildlife maps of White Sands National Monument. Distribution and range maps for individual species have been prepared by various investigators. Appendix 6.3 of "White Sands National Monument, Natural Resources Inventory and Analysis", Contract CX 702980023, 1979, includes Mammal Species Distribution Maps. This report and other pertinent ones are available in the park library.

Cultural. Maps showing archaeological site locations are included in the following reports: "Evaluation of the Archaeological and Related Resources of the Dog Canyon Detached Portion of White Sands National Monument", Contract No. CX 700030220, Sept. 1973; "Evaluation of the Archaeological Potential of White Sands National Monument", Contract No. CX 700030220, Dec. 1973; "Archaeological Reconnaissance in White Sands National Monument", Contract No. CX 702970060, 1980. All of the above were prepared by Human Systems Research, Inc. and are available in the park library and at the Southwest Regional Office, National Park Service, Santa Fe, NM.

Recreation, Development and Support Facilities. Maps of these facilities are included in the Master Plan for White Sands National Monument. The Master Plan, though, is outdated and in need of revision.

NARRATIVE FILE

Climate. Daily temperatures, maximum and minimum, as well as daily precipitation are recorded at White Sands National Monument. This information is compiled monthly in "Climatological Data", prepared by the National Oceanic and Atmospheric Administration and the National Climate Center, Asheville, NC. These monthly reports are on file in the park library. Climate summary sheets are available at Park Headquarters, and are given and mailed to interested persons on request.

Geology. Narrative treatment of the geology of the White Sands is presented in the booklet "Lake Lucero" by Pete Hendrickson, 1976. This booklet is sold at Park Headquarters. The works of Dr. Edwin McKee best present the processes involved in dune movement, notable among his papers is "Structures of Dunes at White Sands National Monument", 1966. Several other reports on the geology of the area are available in the park library.

Land Use and Ownership. The use and ownership of land within White Sands National Monument is documented in the monument's Master Plan. The Master Plan, though, is in need of revision.

APPENDIX F

Soils. The best treatment on the soils of White Sands National Monument is provided in "White Sands National Monument, Natural Resources Inventory and Analysis", prepared by the Laboratory for Environmental Biology at UTEP, 1979. This exhaustive report is available in the park library and at the Southwest Regional Office, National Park Service, Santa Fe, NM.

Hydrology. The hydrological factors within White Sands National Monument are presented in "Hydrologic Control over the Origin of Gypsum at Lake Lucero" R.J. Allmendinger, 1971 and in "Hydrologic Evaluation of Garton Lake" F. Sprester, 1980. These reports are available in the park library.

Vegetation. Numerous thesis', papers, reports discussing the vegetation of the White Sands area are available in the park library. Notable among them are: "Flora of White Sands National Monument" E.R. Schaffner, 1948; the many works on plant physiology by Lora M. Shields; and the above mentioned report by the UTEP Laboratory for Environmental Biology.

Wildlife. As with the vegetation of the White Sands, there are numerous scientific papers discussing the wildlife. While the majority of papers relate to individual species, some are general. All are available in the park library. Among the "general" category are: "Annotated List of Mammals of the Tularosa Basin, New Mexico", W.F. Blair, 1941; "Notes on Animal Occurrence and Activity in the White Sands" R.E. Bugbee, 1942; and the above mentioned UTEP natural resources inventory report. In addition, a wildlife observation card file is maintained by the monument staff.

Cultural Values. The archaeological and historical resources of White Sands National Monument are detailed in the Human Systems Research, Inc. reports listed in the Cultural section of the Park Specific Map File. In addition, the disturbance history, relevant historical factors and historic sites are documented in "White Sands National Monument, Natural Resources Inventory and Analysis", UTEP Laboratory for Environmental Biology.

1. CHECKLIST FOR PLANTS

DIVISION - CYANOCHLORONTA (Blue-Green Algae)

Oscillatoria sp.

DIVISION - CHLOROPHYTA (Green Algae)

Chlamydomonas sp.

Microcoleus paludosus

Microcoleus vaginatus

Nostoc spp.

Palmogloea protuberans

Plectonema nostocorum

Schizothrix californica

Schizothrix lamyi

Scytonema hofmannii

DIVISION - CHAROPHYTA (Stone Worts)

Nitella sp.

DIVISION - EUGLENOPHYCOPHYTA (Euglenoids)

Euglena sp.

DIVISION - THALLOPHYTA (Lichens)

Dermatocarpon lachneum

Fulgensia sp.

Physia aipolia

Psora sp.

Psora decipiens

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DIVISION - SPERMATOPHYTA

GYMNOSPERMAE (Non-flowering Plants)

EPHEDRACEAE (Ephedra Family)

Ephedra torreyana

Mormon Tea

Ephedra trifurca

Canatilla

ANGIOSPERMAE (Flowering Plants) MONOCOTYLEDONAE

CYPERACEAE (Sedge Family)

Scirpus maritimus

Salt-Marsh Bulrush

JUNCACEAE (Rush Family)

Juncus mexicanus

Rush

LILIACEAE (Lily Family)

Yucca elata

Soaptree Yucca

Yucca baccata

Datil Yucca

POACEAE (Grass Family)

TRIBE (4) ABUNDINEAE

Arundo donax

Giant Reed

TRIBE (8) STIPEAE

Oryzopsis hymenoides

Indian Ricegrass

TRIBE (13) ERAGROSTEAE

<u>Erioneuron belchellum</u>	Fluff Grass
<u>Muhlenbergia arenacea</u>	Ear Muhly
<u>Muhlenbergia pungens</u>	Sandhill Muhly
<u>Scleropogon brevifolius</u>	Burrograss
<u>Sporobolus airoides</u>	Alkali Sacaton
<u>Sporobolus contractus</u>	Spike Dropseed
<u>Sporobolus cryptandrus</u>	Sand Dropseed
<u>Sporobolus flexuosus</u>	Mesa Dropseed
<u>Sporobolus giganteus</u>	Giant Dropseed
<u>Sporobolus nealleyi</u>	Gypgrass

TRIBE (14) CHLORIDEAE

<u>Bouteloua barbata</u>	Six-weeks Grama
<u>Bouteloua breviseta</u>	Gyp Grama
<u>Bouteloua gracilis</u>	Blue Grama
<u>Chloris virgata</u>	Feather Fingergrass
<u>Hilaria mutica</u>	Tobosa Grass

TRIBE (16) AELUROPODEAE

<u>Distichlis spicata</u>	Inland Saltgrass
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TRIBE (19) ARISTIDEAE

<u>Aristida adscensionis</u>	Six-weeks Threeawn
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TRIBE (20) PANICEAE

<u>Setaria leucopila</u>	Plains Bristlegrass
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TRIBE (21) ANDROPOGONEAE

<u>Schizachyrium scoparium</u>	Little Bluestem
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RUPPIACEAE (Ditch-grass Family)

Ruppia maritima

Widgeon Grass

TYPHACEAE (Cattail Family)

Typha angustifolia

Narrow-leaved Cattail

Typha latifolia

Common Cattail

ANGIOSPERMAE (Flowering Plants) DICOTYLEDONAE

AIZOACEAE (Carpet-weed Family)

Trianthema portulacastrum

Horse Purslane

AMARANTHACEAE (Amaranth Family)

Amaranthus retroflexus

Pigweed

Tidestromia lanuginosa

Wooly Tidestromia

ANACARDIACEAE (Cashew Family)

Rhus aromatica

Squaw-bush, Sumac

APOCYNACEAE (Dogbane Family)

Amsonia arenaria

Blue-Star

ASCLEPIADACEAE (Milkweed Family)

Asclepias arenaria

Broadleaf Milkweed

Asclepias subverticillata

Poison Milkweed

ASTERACEAE (Composite Family)

TRIBE (3) ASTEREAE

<u>Baccharis bigelovii</u>	Bigelow Baccharis
<u>Baccharis glutinosa</u>	Seepwillow Baccharis
<u>Baccharis salicina</u>	Willow Baccharis
<u>Chrysothamnus nauseosus</u>	Rubber Rabbitbrush
<u>Chrysothamnus pulchellus</u>	Southwest Rabbitbrush
<u>Erigeron arenarius</u>	Fleabane
<u>Isocoma heterophyllus</u>	Jimmy-weed
<u>Isocoma wrightii</u>	Goldenweed
<u>Machaeranthera linearis</u>	Sand Goldenweed
<u>Machaeranthera parviflora</u>	Wild Aster
<u>Machaeranthera scabrella</u>	
<u>Machaeranthera tanacetifolia</u>	Tohoka Daisy
<u>Xanthocephalum microcephalum</u>	Three Leaf Snakeweed
<u>Xanthocephalum sarothrae</u>	Broom Snakeweed

TRIBE (5) HELIANTHEAE

<u>Dicranocarpus parviflorus</u>	Pitchfork
<u>Flourensia cernua</u>	American Tarbush
<u>Helianthus annuus</u>	Common Sunflower
<u>Helianthus petiolaris</u>	Prairie Sunflower
<u>Hymenoclea monogyra</u>	Singlewhorl Burro-brush
<u>Thelesperman megapotamicum</u>	Greenthread
<u>Verbesina encelioides</u>	Golden Crownbeard
<u>Zinnia grandiflora</u>	Rocky Mountain Zinnia

TRIBE (6) HELENIEAE

<u>Clappia suadaefolia</u>	Clappia
<u>Hymenopappus arenosus</u>	Hymenopappus
<u>Hymenopappus filifolius var. cinereus</u>	Yellow Cutleaf

(continued)

TRIBE (6) HELENIEAE (continued)

<u>Pectus angustifolia</u>	Lemonweed
<u>Psilostrophe tagetina</u>	Woolly Papenflower
<u>Sartwellia flaveriae</u>	Threadleaf Sartwell

TRIBE (8) SENECEONEAE

<u>Senecio longilobus</u>	Threadleaf Groundsel
<u>Senecio ridellii</u>	Ridell Groundsel
<u>Senecio spartiodes</u>	Broom Groundsel,

TRIBE (9) CYAREAE

<u>Centaurea repens</u>	Russina Knapweed
<u>Cirsium wheeleri</u>	Wheeler Thistle

TRIBE (10) MUTISIEAE

<u>Perezia nana</u>	Desert Holly
<u>Bahia absinthifolia</u>	Bahia

BIGNONIACEAE (Bignonia Family)

<u>Chilopsis linearis</u>	Desert Willow
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BORAGINACEAE (Borage Family)

<u>Tiquilia hispidissima</u>	Purple Borage
<u>Cryptantha fuluocanescens</u>	Yellow Cryptantha
<u>Heliotropium greggii</u>	Heliotrope

BRASSICACEAE (Mustard Family)

<u>Descurainia pinnata</u>	Tansy-mustard
<u>Dimorphocarpa wislizenii</u>	Spectacle-Pod

BRASSICACEAE (Mustard Family) continued

<u>Diploaxus tenuifolia</u>	Slimleaf Wallrocket
<u>Lepidium montanum var. alyssoides</u>	Pepperweed
<u>Lesquerella fendleri</u>	Bladderpod
<u>Nerisyrenia camporum</u>	Velvety Nerisyrenia
<u>Nerisyrenia linearifolia</u>	Narrowleaf Greggia
<u>Sisymbrium irio</u>	London Rocket
<u>Streptanthus arizonicus</u>	Arizona Jewel Flower

CACTACEAE (Cactus Family)

<u>Coryphantha fragrans</u>	
<u>Coryphantha macromeris</u>	Nipple Beehive Cactus
<u>Coryphantha vivipara</u>	Biscuit Cactus
<u>Echinocereus triglochidiatus var. gonacathus</u>	Claret Cup Hedgehog
<u>Opuntia imbricata</u>	Tree Cholla
<u>Opuntia leptocaulis</u>	Desert Christmas Cactus
<u>Opuntia macrorhiza var. pottsii</u>	Plains Prickly Pear
<u>Opuntia macrorhiza</u>	Tuberous Prickly Pear
<u>Opuntia phaeacantha var. discata</u>	Desert Prickly Pear
<u>Opuntia polyacantha</u>	Starvation Prickly Pear
<u>Opuntia violacea var. macrocentra</u>	Purple Prickly Pear
<u>Pediocactus papyracanthus</u>	Grass Grass Cactus

CHENOPODIACEAE (Goosefoot Family)

<u>Allenrolfea occidentalis</u>	Pickle-weed
<u>Atriplex canescens</u>	Four-wing Saltbush
<u>Salsola kali var. tenuifolia</u>	Russian Thistle
<u>Suaeda depressa</u>	Seepweed
<u>Suaeda suffrutescens</u>	Desert Seepweed
<u>Suaeda torreyana</u>	Torrey Seepweed

CONVOLVULACEAE (Morning Glory Family)

Cressa depressa

Silky Cressa

CUCURBITACEAE (Gourd Family)

Cucurbita foetidissima

Buffalo Gourd

EUPHORBIACEAE (Spurge Family)

Croton dioicus

Croton

Euphorbia albomarginata

Whitemargin Spurge

Euphorbia lata

Hoary Euphorbia

Euphorbia serrula

Sawtooth Spurge

FABACEAE (Pea Family)

Astragalus allorchrous

Halfmoon Loco

Cassia lincheimeriana

Senna

Dalea scoparia

Broom Pea

Hoffmanseggia glauca

Hog-Potato

Melilotus officinalis

Yellow Sweet Clover

Prosopis glandulosa

Honey Mesquite

FOUQUIERIACEAE (Ocotillo Family)

Fourquieria splendens

Ocotillo

FRANKENIACEAE (Frankenia Family)

Frankenia jamesii

Frankenia

GENTIANACEAE (Gentian Family)

Centaurium texense

Centaury

Eustoma exaltatum

Catch-Fly Gentian

Eustoma grandiflorum

Bluebell

HYDROPHYLLACEAE (Waterleaf Family)

<u>Nama carnosum</u>	Gype Nama
<u>Nama hispidum</u>	Hispid Nama
<u>Phacelia corrugata</u>	Blue-Curls
<u>Phacelia crenulata</u>	Scorpionweed
<u>Phacelia integrifolia</u>	Scalloped Phacelia
<u>Phacelia robusta</u>	Phacelia

KOEBERLINIACEAE (Junco Family)

<u>Koeberlinia spinosa</u>	Spiny All-thorn
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LAMIACEAE (Mint Family)

<u>Poliomintha incana</u>	Hoary Rosemarymint
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LOASACEAE (Stick-leaf Family)

<u>Cevallia sinuata</u>	Cevallia
<u>Mentzelia integra</u>	Blazingstar
<u>Mentzelia multiflora</u>	Desert Mentzelia
<u>Mentzelia pumila</u>	Stick-leaf

MALVACEAE (Mallow Family)

<u>Sida leprosa var. depauperata</u>	Scrufty Sida
<u>Sphaeralcea angustifolia</u>	Narrow-leaf Globemallow
<u>Sphaeralcea arenaria</u>	Globemallow
<u>Sphaeralcea incana</u>	Soft Globemallow
<u>Sphaeralcea subhastata</u>	Globemallow

NYCTAGINACEAE (Four O'clock Family)

<u>Abronia angustifolia</u>	Sand Verbena
<u>Allionia choisyi</u>	Smooth Trailing Four O'clock
<u>Allionia incanata</u>	Trailing Four O'clock
<u>Ammocodon chenopodoides</u>	Goosefoot Moonpod
<u>Mirabilis mutliflora</u>	Colorado Four O'clock
<u>Selinocarpus diffusus</u>	Spreading Moonpod
<u>Selinocarpus lanceolatus</u>	Gyp Moonpod

ONAGRACEAE (Evening Primrose Family)

<u>Calylophus hartwegii</u>	Yellow Evening Primrose
<u>Gaura coccinea</u>	Scarlet Gaura
<u>Gaura parviflora</u>	Lizard Tail
<u>Oenothera albricaulis</u>	Prairie Evening Primrose
<u>Oenothera pallida runcinata</u>	White Evening Primrose

PAPAVERACEAE (Poppy Family)

<u>Argemone polyanthemus</u>	Prickly Poppy
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PLUMBAGINACEAE (Leadwort Family)

<u>Limonium limbatum</u>	Sea-lavender
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POLEMONIACEAE (Phlox Family)

<u>Ipomopsis pumila</u>	Low Gilia
<u>Ipomopsis longiflora</u>	Pale Trumpets

POLYGONACEAE (Buckwheat Family)

<u>Eriogonum rotundifolium</u>	Round Leaf Wild Buckwheat
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RHAMNACEAE (Buck-thorn Family)

<u>Condalia spathulata</u>	Knifeleaf Condalia
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SALICACEAE (Willow Family)

<u>Populus angustifolia</u>	Narrowleaf Cottonwood
<u>Populus wislizenii</u>	Rio Grande Cottonwood
<u>Salix gooddingii</u>	Goodding Willow

SANTALACEAE (Sandlewood Family)

<u>Comandra pallida</u>	Bastard-toadflax
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SOLANACEAE (Potato Family)

<u>Datura wrightii</u>	Jimson Weed
<u>Lycium berlandieri</u> var. <u>parviflorum</u>	Ternac Wolfberry
<u>Lycium pallidum</u>	Pale Wolfberry
<u>Lycium torreyi</u>	Torrey Wolfberry
<u>Solanum elaeagnifolium</u>	Silverleaf Nightshade

TAMARICACEAE (Tamarix Family)

<u>Tamarix gallica</u>	Salt Cedar
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VERBENACEAE (Verbena Family)

<u>Phyla incisa</u>	Texas Frog-fruit
<u>Verbena bracteata</u>	Prostrate Vervain

ZYGOPHYLLACEAE (Caltrop Family)

<u>Kallstroemia hirsutissima</u>	Carpetweed
<u>Larrea tridentata</u>	Creosote Bush

Revised 1980

SYNONYMY

FOR

Andropogon scoparius
Andropus carnosus
Aplopappus spinulosus
Aster dichoriaceus
Aster linearis
Aster parvulus
Aster Tenacetifolius
Centaurea picris
Chrysothamnus latisquameus
Cladanthrix lanigulosa
Comandra umbellata
Crassina grandiflora
Cressa truxillensis
Dicranocarpus dicranocarpus
Distichlis stricta
Dithyrea wislizenii
Dondia moquini
Dondia suffrutescens
Erythraea texense
Gilia pumila
Greggia camporum
Greggia linearifolia
Gutierrezia sarothra
Haplopappus heterophyllus
Haplopappus spinulosus
Heterospermum dicranocarpum
Hoffmanseggia densiflora
Lepidium alyssoides
Lippia incisa
Nuttallia procera
Opuntia engelmannii
Oenothera hartwegii
Oenothera lavandulifolia
Oenothera runcinata
Phacelia corrugata
Rhus trilobata
Schmalitzia emoryi
Scripus brittonianus
Scirpus paludosus
Selinocarpus chenopodioides
Sida lepidota
Sideranthus australis
Sphaeralcea lobata
Sporobolus asperifolia
Sporobolus strictus
Thelesperma gracile
Wootonia parviflora

SEE

Schizachyrium scoparium
Nama carnosum
Haplopappus spinulosus
Machaeranthera chichoriaceus
Machaeranthera linearis
Machaeranthera parviflora
Machaeranthera tenacetifolia
Centaurea repens
Chrysothamnus naseosus
Tidestroma lanigulosa
Comandra pallida
Zinnia grandiflora
Cressa depressa
Dicranocarpus parviflora
Distichlis spicata
Dimorphocarpa wislizenii
Suada torreyana
Suada suffrutescens
Centarium texense
Ipomopsis pumila
Nerisyrenia camporum
Nerisyrenia linearifolia
Xanthocephalum sarothrae
Isocoma wrightii
Machaeranthera pinnatifida
Dicranocarpus parviflora
Hoffmanseggia glauca
Lepidium montanum
Phyla incisa
Mentzelia pumila
Opuntia phaeacantha discata
Calylophus hartwegii
Calylophus hartwegii
Oenothera pallida runcinata
Phacelia crenulata
Rhus aromatica
Rhus aromatica
Scripus maritimus
Scirpus maritimus
Ammocodon chenopodioides
Sida leprosa
Machaeranthera australis
Sphaeralcea angustifolia
Muhlenbergia asperifolia
Sporobolus contractus
Thelesperma megapotamicum
Dicranocarpus parviflora

2. CHECKLIST OF MAMMALS

<u>Myotis californicus</u>	California Myotis (C)
<u>Tadarida brasiliensis</u>	Brazilian freetail bat (C)
<u>Antrozous pallidus</u>	Pallid bat (C)
<u>Taxidea taxus</u>	Badger (C)
<u>Vulpes macrotis</u>	*Kit fox (C)
<u>Urocyon cinereoargenteus</u>	*Grey fox (C)
<u>Canis latrans</u>	*Coyote (C)
<u>Felis concolor</u>	Mountain lion (R)
<u>Lynx rufus</u>	Bobcat (R)
<u>Bassariscus astutus</u>	Ringtail cat (R)
<u>Spermophilus spilosoma</u>	Spotted ground squirrel (C)
<u>Mustela frenata</u>	Longtailed weasel
<u>Cynomys ludovicianus</u>	Blacktail prairie dog (R)
<u>Geomys arenarius</u>	Desert pocket gopher (A)
<u>Pappogeomys castanops</u>	Yellow-faced pocket gopher (R)
<u>Perognathus flavus</u>	Silky pocket mouse (R)
<u>Perognathus flavescens gypsi</u>	*Plains pocket mouse (C)
<u>Perognathus penicillatus</u>	Desert pocket mouse (C)
<u>Dipodomys spectabilis</u>	*Bannertail kangaroo rat (C)
<u>Dipodomys merriami</u>	Merriman kangaroo rat (R)
<u>Dipodomys ordii</u>	Ord kangaroo rat (C)
<u>Onychomys torridus</u>	Southern grasshopper mouse (R)
<u>Onychomys leucogaster</u>	Northern grasshopper mouse (R)
<u>Reithrodontomys megalotis</u>	Western harvest mouse (R)
<u>Peromyscus maniculatus</u>	Deer mouse (C)
<u>Peromyscus leucopus</u>	White-footed mouse (C)
<u>Peromyscus eremicus</u>	Cactus mouse (C)

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MAMMALS (continued)

<u>Sigmodon hispidus</u>	Hispid cotton rat (R)
<u>Neotoma micropus</u>	Southern plains woodrat (C)
<u>Neotoma albigula</u>	White-throated woodrat (C)
<u>Neotoma mexicana</u>	Mexican woodrat (C)
<u>Erethizon dorsatum</u>	*Porcupine (C)
<u>Lepus californicus</u>	Blacktail jackrabbit (C)
<u>Sylvilagus auduboni</u>	Desert cottontail (C)
<u>Antilocapra americana</u>	Pronghorn antelope (R)
<u>Mephitis mephitis</u>	*Striped skunk (R)
<u>Conepatus mesoleucus</u>	*Hog-nosed skunk (R)
<u>Oryx gazella</u>	Oryx (C)
<u>Odocoileus hemionus</u>	Mule deer (R)

(A) Abundant; (C) Common; (R) Rare

*These frequent both marginal and interior dunes. Others are found mostly on marginal dunes.

Revised 1930

3. CHECKLIST OF REPTILES AND AMPHIBIANS OF THE WHITE SANDS NATIONAL MONUMENT

Non-Poisonous Snakes

Heterodon nasicus

Masticophis flagellum testaceus

Pituophis melanoleucus affinis

Arizona elegans philipi

Rhinocheilus lecontei tessellatus

Tantilla n. nigriceps

Hypsiglena torquata texana

Sonora episcopa

Gylapion canum

Western hognose snake (R)

Western coachwhip (C)

Sonora gopher snake (A)

Painted desert glossy snake (R)

Texas long-nosed snake (R)

Plains blackheaded snake (C)

Texas night snake (C)

Ground snake (R)

Western hook-nose snake (R)

Poisonous Snakes

Sistrurus catenatus edwardsi

Crotalus viridis viridis

Crotalus atrox

Desert massasauga (R)

Prairie rattlesnake (A)

Western diamondback rattlesnake

Lizards

Holbrookia maculata ruthveni

Holbrookia texana scitula

Crotaphytus wislizenii wislizenii

Crotaphytus collaris

Sceloporus undulatus consobrinus

Sceloporus undulatus cowlesi

Sceloporus magister bimaculosus

Uta stansburiana stejnegeri

Phrynosoma cornutum

Phrynosoma modestum

Cnemidophorus inornatus

Cnemidophorus neomexicanus

Cnemidophorus tigris marmoratus

*Lesser earless lizard (bleached)

+Greater earless lizard (A)

Long-nosed leopard lizard (C)

Collared lizard (C)

Southern prairie lizard (C)

*Cowles prairie lizard (A)

Desert spiny lizard (C)

Desert side-blotched lizard (A)

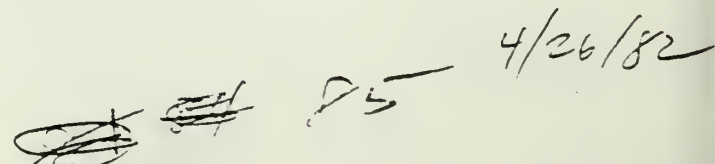
Texas horned lizard (C)

Round-tailed horned lizard (C)

Little striped whiptail (C)

New Mexican whiptail (C)

+Marbled whiptail (A)

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Turtles

Terrapene ornata luteola

Yellow box turtle (R)

Salamanders

Ambystoma tigrinum mauertium

Barred tiger salamander (R)

Toads

Bufo cognatus

Great plains toad (C)

Bufo punctatus

Red-spotted toad (R)

Spadefoot toads

Scaphiopus bombifrons

Plains spadefoot (C)

Scaphiopus hammondi

Western spadefoot (C)

Scaphiopus couchi

Couchs spadefoot (C)

(A) Abundant (C) Common (R) Rare

Frequency of occurrence refers only to the frequency these animals are encountered and does not indicate the actual abundance of the animal. Special thanks is given to Robert McKeever for his assistance in the preparation of this list.

+ (Animals found primarily on the bajada west of Lake Lucero)

* (Animals found only within the dune field)

Revised 1976

4. INSECTS OF WHITE SANDS

ORDER - THYSANURA (Bristletails)

F. Lepismatidae

Silverfish

F. Machilidae

Jumping Bristletails

ORDER - COLLEMBOLA (Springtails)

F. Entomobryidae

Common Springtails

ORDER - ODONATA (Dragonflies and Damselflies)

F. Aeshnidae

Darners

F. Libellulidae

Common Skimmers

F. Coenagrionidae

Narrow-Winged Damselflies

ORDER - ORTHOPTERA

F. Acrididae

Short-Horned Grasshoppers

F. Tettigoniidae

Long-Horned Grasshoppers

F. Gryllacrididae

Camel Crickets

F. Gryllidae

Crickets

F. Mantidae

Mantids

F. Phasmatidae

Walking Sticks

F. Blattidae

Cockroaches

ORDER - DERMAPTERA (Earwigs)

F. Labiidae

Little Earwigs

ORDER - HEMIPTERA (Bugs)

F. Corixidae

Water Boatmen

F. Notonectidae

Backswimmers

F. Belostomatidae

Giant Water Bugs


F. Gerridae

Water Striders

F. Miridae

Leaf or Plant Bugs

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ORDER - HEMIPTERA (Bugs) continued

F. Nabidae	Damsel Bugs
F. Lygaeidae	Seed Bugs
F. Pyrrhocoridae	Red Bugs
F. Coreidae	Leaf-footed Bugs
F. Corizidae	Scentless Plant Bugs
F. Scutelleridae	Shield-Backed Bugs
F. Pentatomidae	Stink Bugs

ORDER - HOMOPTERA

F. Cicadidae	Cicadas
F. Cercopidae	Spittlebugs or Froghoppers
F. Cicadellidae	Leafhoppers
F. Flatidae	Planthoppers
F. Dictyopharidae	Planthoppers
F. Aphididae	Aphids

ORDER - NEUROPTERA

F. Chrysopidae	Green Lacewings
F. Myrmeleontidae	Antlions

ORDER - COLEOPTERA (Beetles)

F. Cicindelidae	Tiger Beetles
F. Carabidae	Ground Beetles
F. Dytiscidae	Predaceous Diving Beetles
F. Histeridae	Hister Beetles
F. Hydrophilidae	Water Scavenger Beetles
F. Silphidae	Carrion Beetles
F. Dermestidae	Dermestid Beetles
F. Malachiidae	Soft-Winged Flower Beetles
F. Cleridae	Checkered Beetles
F. Elateridae	Click Beetles
F. Buprestidae	Metallic Wood-Boring Beetles
F. Coccinellidae	Ladybird Beetles

ORDER - COLEOPTERA (Beetles) continued

F. Anthicidae	Antlike Flower Beetles
F. Oedemeridae	False Blister Beetles
F. Meloidae	Blister Beetles
F. Tenebrionidae	Darkling Beetles
F. Bostrichidae	Branch and Twig Borers
F. Scarabaeidae	Scarab Beetles
F. Cerambycidae	Long-Horned Beetles
F. Chrysomelidae	Leaf Beetles
F. Curculionidae	Snout Beetles

ORDER - Lepidoptera (Butterflies and Moths)

F. Papilionidae	Swallowtails
F. Pieridae	Whites, Sulfurs and Orange-tips
F. Danaidae	Milkweed Butterflies
F. Lycaenidae	Gossamer-Winged Butterflies
F. Nymphalidae	Brush-Footed Butterflies
F. Hesperiidae	Skippers
F. Sphingidae	Sphinx or Hawk Moths
F. Noctuidae	Noctuid Moths
F. Gelechiidae	Gelechiid Moths
F. Incurvaridae	Yucca Moths

ORDER - DIPTERA (Flies)

F. Tipulidae	Crane Flies
F. Culicidae	Mosquitoes
F. Tabanidae	Horse and Deer Flies
F. Asilidae	Robber Flies
F. Bombyliidae	Bee Flies
F. Dolichopodidae	Long-legged Flies
F. Syrphidae	Flower Flies
F. Otitidae	Picture-Winged Flies
F. Ephydriidae	Shore Flies
F. Sarcophagidae	Flesh Flies

ORDER - DIPTERA (Flies) continued

F. Tachinidae	Tachinid Flies
F. Calliphoridae	Blow Flies

ORDER - HYMENOPTERA (Ants, Bees, Wasps)

F. Ichneumonidae	Ichneumons
F. Cynipidae	Gall Wasps and others
F. Tiphidae	Tiphid Wasps and others
F. Scoliidae	Scollid Wasps
F. Mutillidae	Velvet Ants
F. Formicidae	Ants
F. Pompilidae	Spider Wasps
F. Vespidae	Vespid Wasps
F. Sphecidae	Sphecid Wasps
F. Colletidae	Yellow-faced and Plasterer Bees
F. Halictidae	Mining Bees
F. Megachilidae	Leafcutting Bees
F. Apidae	Digger, Carpenter, Honey and Bumble Bees

Arthropods Other Than Insects

CLASS: CHILOPIDA-CENTIPEDES

ORDER - SCHOLOPENDROMORPHA

F. Scolopendridae	Giant Desert Centipedes
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CLASS: ARACHNIDA

ORDER - PEDIPALPIDA	Whip-Scorpions (Vinegaroon)
ORDER - SCORPIONIDA	Scorpions
ORDER - SOLPUGIDA	Wind-Scorpions or Solpugids
ORDER - CHELONETHIDA	Pseudoscorpions

Arthropods Other Than Insects continued

ORDER - ACARINA

Mites and Ticks

ORDER - ARANEIDA

Spiders

F. Salticidae

Jumping Spiders

F. Thomisidae

Crab Spiders

F. Lycosidae

Wolf or Ground Spiders

F. Araneidae

Orb-Weavers

F. Theridiidae

Comb-Footed Spiders (Black Widows)

F. Theraphosidae

Tarantulas

CHECKLIST OF BIRDS

A separate bird checklist entitled Sand and Feathers - Birds of White Sands National Monument is available, at no charge, at the monument information desk.

Revised - 1980

5. BIRDS OF WHITE SANDS NATIONAL MONUMENT

LOONS

Common Loon

GREBES

Western Grebe

Horned Grebe

Eared Grebe

Pied-billed Grebe

PELICANS

White Pelican

HERONS

Black Crowned Night Heron

Great Blue Heron

Snowy Egret

White Faced Ibis

WATERFOWL

Canada Goose

Snow Goose

Mallard

Gadwall

Pintail

Green-winged Teal

Blue-winged Teal

Cinnamon Teal

American Widgeon

Redhead

Ring-necked Duck

Canvasback

Greater Scaup

Lesser Scaup

Ruddy Duck

Bufflehead

Common Merganser

Northern Shoveller

Mexican Duck

HAWKS, VULTURES AND FALCONS

Turkey Vulture

Sharp-shinned Hawk

Cooper's Hawk

Rufous Hawk

Black Hawk

Western Red-Tailed Hawk

Swainson's Hawk

Rough-legged Hawk

Golden Eagle

Marsh Hawk

Prairie Falcon

Peregrine Falcon

Merlin

American Kestrel

GALLINACEOUS BIRDS

Gambel's Quail

Scaled Quail

CRANES, PLOVERS AND SHOREBIRDS

Sandhill Crane

Black-bellied Plover

Common Gallinule

American Coot

Virginia Rail

Semipalmated Plover

Snowy Plover

Killdeer

Common Snipe

Long-billed Curlew

Spotted Sandpiper

Solitary Sandpiper

Willet

Greater Yellow-legs

Least Sandpiper

Long-billed Dowitcher

GULLS AND TERNS

Bonaparte's Gull
Ring-billed Gull
Franklin's Gull
Black Tern
Forster's Tern

DOVES

Mourning Dove
Ground Dove

CUCKOOS

Roadrunner

OWLS

Great Horned Owl
Short-eared Owl
Burrowing Owl

NIGHTHAWKS

Poor-will
Common Nighthawk
Lesser Nighthawk

SWIFTS

White-throated Swift

HUMMINGBIRDS

Black Chinned Hummingbird

KINGFISHERS

Belted Kingfisher

WOODPECKERS

Ladder-backed Woodpecker
Common Flicker
Yellow-bellied Sapsucker

FLYCATCHERS

Vermillion Flycatcher
Western Kingbird
Cassin's Kingbird

CRANES, PLOVERS AND SHOREBIRDS CONT.

Semipalmated Sandpiper
Western Sandpiper
Baird's Sandpiper
Lesser Yellow-legs
American Avocet
Black-necked Stilt
Wilson's Phalarope

LARKS

Horned Lark

SWALLOWS

Violet-green Swallow
Tree Swallow
Bank Swallow
Rough-winged Swallow
Barn Swallow
Cliff Swallow
Purple Martin

CROWS AND JAYS

Common Crow
White-necked Raven
Pinyon Jay
Scrub Jay

TITMICE

Plain Titmouse
Verdin

NUTHATCHES

Red-breasted Nuthatch

CREEPERS

Brown Creeper

WRENS

Bewick's Wren
Long-billed March Wren
Rock Wren

FLYCATCHERS CONT'D

Ash-throated Flycatcher
Empidonax sp.
Black Phoebe
Say's Phoebe
Western Wood Pewee
Olivaceous Flycatcher
Olive-sided Flycatcher

THRASHERS

Mockingbird
Crissal Thrasher
Curved-billed Thrasher
Brown Thrasher

THRUSHES

American Robin
Hermit Thrush
Mountain Bluebird
Western Bluebird

GNATCATCHERS AND KINGLETS

Blue-Grey Gnatcatcher
Ruby-crowned Kinglet

PIPIT

Water pipit

WAXWINGS

Cedar Waxwing

SHRIKES

Northern Shrike
Loggerhead Shrike

STARLINGS

Starling

VIREOS

Solitary Vireo
Gray Vireo

WRENS CONT'D

Cactus Wren
House Wren

WARBLERS

Painted Redstart
Orange-Crowned Warbler
Yellow Warbler
Wilson's Warbler
Black-and-White Warbler
Palm Warbler
Northern Waterthrush
McGillivray's Warbler
Common Yellowthroat
American Redstart
Yellow-rumped Warbler
Parula Warbler
Virginia's Warbler
Black-throated Green Warbler

WEAVER FINCHES

House Sparrow

BLACKBIRDS AND ORIOLES

Scott's Oriole
Western Meadowlark
Yellow-headed Blackbird

Red-winged Blackbird

Northern Oriole

Brewer's Blackbird

Great-tailed Grackle

Common Grackle

Brown-headed Cowbird

TANAGERS

Western Tanager

Summer Tanager

FINCHES

Pyrrhuloxia

FINCHES

Black-headed Grosbeak
Indigo Bunting
Cassin's Finch
House Finch
Lesser Goldfinch
Dickcissel
Green-tailed Towhee
Rufous sided Towhee
Brown Towhee
Savannah Sparrow
Baird's Sparrow
Lark Bunting
Vesper Sparrow
Black-throated Sparrow
Sage Sparrow
Dark-eyed Junco
Gray-headed Junco
Chipping Sparrow
Brewer's Sparrow
Black-chinned Sparrow
White Crowned Sparrow
Lincoln's Sparrow
Song Sparrow
Pine Siskin
White-throated Sparrow
Rose-breasted Grosbeak
Blue Grosbeak
Lark Sparrow