WHC Nomination Documentation

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SITE NAME ("TITLE") Carlsbad Caverns National Park

DATE OF INSCRIPTION ("SUBJECT") 9/12/95

STATE PARTY ("AUTHOR") UNITED STATES OF AMERICA

CRITERIA ("KEY WORDS") N (i)(iii)

DECISION OF THE WORLD HERITAGE COMMITTEE:
19th Session
The Committee inscribed the nominated property on the basis of criteria (i) and (iii), considering that the site is of outstanding universal value with exceptional geological features, unique reef and rock formations, and containing major cave formations, gypsum chandelier speleothems, aragonite 'christmas trees' and hydromagnesite balloons. The Committee also wished to encourage the authorities in their efforts to establish a cave protection zone to the north of the Park.

BRIEF DESCRIPTION:
In the state of New Mexico, this karstic network comprises 81 currently recognized caves. Among this high concentration of caves, outstanding because of their size and the profusion, diversity and beauty of mineral formations, the Lechuguilla cave stands out, forming an underground laboratory where geological processes can be studied in a virtually intact setting.

1.b. State, province or region: Eddy County, State of New Mexico

1.d Exact location: Long.104°22’51»W ; 32°10’13»N

CARLSBAD CAVERNS NATIONAL PARK

WORLD HERITAGE SITE NOMINATION

BY

THE UNITED STATES OF AMERICA

SEPTEMBER

1994

WORLD HERITAGE NOMINATION
CARLSBAD CAVERNS NATIONAL PARK
UNITED STATES OF AMERICA

1. SPECIFIC LOCATION

a. Country

United States of America

b. State, Province or Region

Carlsbad Caverns National Park is located in Eddy County in the Southeastern part of the State of New Mexico.

c. Name of Property

In 1923 private citizens, state officials, U. S. Congressional representatives, and officials from the U.S. Geological Survey and General Land Office (now the Bureau of Land Management) recommended including Carlsbad Cavern in the National Park System. On October 25, 1923, a Presidential proclamation established it as Carlsbad Cave National Monument. The Congress of the United States passed legislation to make it Carlsbad Caverns National Park which was accomplished on May 14, 1930.

d. Exact Location on Map and Indication of Geographical Coordinates

Carlsbad Caverns National Park contains 46,766 acres (18,926 Hectares), or approximately 73 square miles. Its boundary is irregular in shape. The park entrance is located at approximately 104° 22′ 51" west longitude and 32° 10′ 13" north latitude.

2. JURISDICTION DATA

a. Owner

The United States Department of the Interior, National Park Service is the sole owner of 46,427 acres. Only one small tract of 339 acres is privately owned, which the USDI-NPS plans to acquire. The Federal Government has full jurisdiction over all lands within the park boundary through the U.S. Department of the Interior and National Park Service.

b. Legal Status

Of the 46,766 acres in the park, over 40,000 acres was already federally owned public domain land. Approximately 3,000 acres was obtained by exchange with the State of New Mexico and 879 acres was acquired by purchase. Over its history, the park has grown from the original 719 acres, first set aside as a national monument, to its present size of nearly 47,000 acres. (See enclosed legislative history.) All lands except for the one private tract are publicly owned in fee title. A total of 33,125 acres out of the 46,766 has been officially designated as wilderness by the U.S. Congress (92 Stat. 3467) which precludes any adverse developments. The one remaining private tract is surrounded by wilderness on three sides and by extremely rugged mountainous terrain (defacto wilderness) on the other making adverse usage or development unlikely.

A Land Protection Plan approved in 1984 is in place covering the private tract. If adverse development or use of the private tract should be threatened which could endanger it or other park values, condemnation proceedings could be initiated to acquire the tract. Efforts are presently ongoing to acquire the tract through exchange.

Public Law 103-169, which was passed by Congress and signed into law in 1993 also provides legal protection to park caves through withdrawal of 6,280 acres of public land bordering the park on the north. This law, known as the "Lechuguilla Cave Protection Act of 1993" was passed specifically to protect and preserve park caves. (See enclosed Land Protection Plan and Lechuguilla Cave Protection Act Review.)

The Secretary of the Interior is empowered to make rules and regulations for proper management and protection of the park and its resources and these rules are already in place.

c. Accessibility to the General Public

The park is accessible from U.S. Highway 62/180, which was recently designated a major U.S. travel route. Interstate highways 10 and 20 are approximately a 1-1/2 hour drive south of the park via U.S. 285, and Interstate 40 is approximately a 4 hour drive north of the park, also via U.S. 285 from Carlsbad, New Mexico. Carlsbad, New Mexico, located 20 miles from the park entrance has air and bus transportation service and car rentals. Major population centers are within 3 to 5 hour drives in several directions and include El Paso,

Texas; Juarez, Mexico; Midland and Odessa, Texas; Lubbock, Texas; Albuquerque, New Mexico and Las Cruces, New Mexico. Park visitation in 1993 was 687,161 and exceeded 800,000 visitors in 5 separate years between 1972 and 1978.

d. Responsible Administration

The United States Department of the Interior, National Park Service, is responsible for the administration of Carlsbad Caverns National Park. The address is U.S. Department of the Interior, 18th and C Street N.W., P.O. Box 37127, Washington, D.C. 20013-7127.

A Superintendent is responsible for on-site administration. The Superintendent's staff includes managers and specialists with knowledge, skills and experience in administration, education, resource management, visitor protection, law enforcement and maintenance. The resource management activity has specialists in natural and cultural resource management, cave management, and fire management.

3. IDENTIFICATION

a. Description and Inventory

CULTURAL HERITAGE

Human occupation of the park area began with the arrival of Paleo Indian people around 12,000 B.C. Beginning about 6,000 B.C., Archaic hunters and gatherers moved into the area and remained until 800 A.D. or later. Pictographs left by these Archaic people are found in several park caves. The period between 800 A.D. and 1541 was an adaptation period. While agricultural and pottery influences were beginning to be felt from the Jornado Mogollon culture to the west, the Indians living in the Guadalupe Mountains region still relied mostly on wild plants, including the Agave plants which were roasted in large midden rings which are preserved throughout the park. Pottery sherds and metates have been found at several of the park's 125 archeological sites documenting the presence and mogollon influences on the people living in the area during this period.

The park has several particularly outstanding pictograph sites. These include the profusely decorated Painted Grotto site which is on the National Register of Historic Places, Upper Painted Grotto, and Slaughter Canyon Cave. The Painted Grotto and Upper Painted Grotto sites are impressive cave shelters situated in scenic Slaughter Canyon, while the Slaughter Canyon Cave

location is an example of deep cave rock art beyond the reach of entrance sunlight. Painted Grotto and Upper Painted Grotto have numerous Middle and Late Archaic paintings as well as later Apache-Jumano art and possibly Pueblo period art. Archaeologists estimate that both sites represent at least 2,500 years of painting over several cultural periods.

Slaughter Canyon Cave contains older and more complex paintings than other caves in the Region and is believed to be one of the oldest examples of deep cave art in North America. It is also the only such site in a national park. This site has over 500 Archaic or Hunter-Gatherer style pictographs and spans at least three cultural periods.

The Apaches began moving into the area just prior to the arrival of the Spaniards and survived well through hunting and gathering. Apaches living near Mescalero, New Mexico, about three hours by road northwest of the park, and Tigua Indians, living near El Paso, Texas, about 3 hours southwest of the park, are descendants of pre-historic people who lived in and around the present day park and left pictographs and other artifacts which the park preserves.

Penetration and exploration of areas beyond portions of the cave used by the pre-historic Indians began in the late 1880's when people from nearby ranches and homesteads looking for stray stock came across the entrance to Carlsbad Cavern. Some were attracted by the nightly summer evening flights of a large colony of bats which roost and raise young in a portion of the Cavern. Later, bat guano was taken from the Cavern for about a 20-year period for use as fertilizer, mostly in California citrus tree groves. The most noted early explorer was James Larken White, a cowboy and miner who spent more than 20 years exploring and showing the Cavern to others.

Photos published in the New York Times in 1923, along with investigations and surveys by Robert Holley of the U.S. General Land Office and Willis T. Lee of the U.S. Geological Survey (and National Geographic Society) led to Carlsbad Cavern becoming a national monument, and then later, a national park. Public visitation grew from 1,876 visitors in 1924 to a peak of 876,500 in 1976. Development of the Carlsbad Cavern for public use between 1926 and 1956 resulted in a number of structures and features which have historical/cultural interest in themselves. Two Historic Districts have been established and listed on the National Register of Historic Places covering older buildings and other structures both near the entrance to Carlsbad Cavern and at the park's Rattlesnake Springs unit. Both districts include some examples of work done by a Civilian Conservation Corp (CCC) camp which was stationed in the park from 1938 to 1942. Examples of

Public Works Administration (PWA) projects from the 1930's are also present.

NATURAL HERITAGE

Carlsbad Caverns National park contains the deepest limestone cave in the United States, and the largest cave room in North America. It also has some of the most highly decorated caves in the world. In all, it has 81 separate known caves. Its caves have formed differently than 90 percent of the world's other caves in that sulfuric acid had a major role in their creation rather than erosion or carbonic acid solution. Hydrogen sulfide gas from underlying oil and gas deposits seeped upward and mixed with the fresh water of the Capitan Reef to form the sulfuric acid which hollowed out the limestone cavities.

The limestone in which the caves formed is part of a 350 mile long fossil reef surrounding the Delaware Basin of western Texas and southeastern New Mexico. The Capitan Reef was formed during the Permian period and attracts geologists from throughout the world for research and study. Deep, scenic canyons in the park have eroded through the reef leaving exposed cross sections which provide windows to this geologic era.

The newest notable cave discovery in the park has gained international fame as possibly the "most beautiful cave in the world." This cave, Lechuguilla Cave, as of July 1994, is the fourth longest in the United States and the seventh longest in the world, and has been advancing steadily on these two lists. It is over 77 miles long (125 kilometers), nearly 1,606 feet (490 meters) deep and provides the only known transversable cross-section through the world's largest exhumed fossil reef, the Capitan barrier complex and its back reef equivalent beds comprised of the Seven Rivers and Lower Yates formations. This remarkable cross section provides unique views for geologists of rock structures never seen before except through limited core samples. In addition to containing more elemental sulfur than all limestone caves in the world combined, this cave also has an extensive variety of gypsum and calcite formations that make it unique. Some of the gypsum chandelier formations are over 20 feet long. Rare, sub-aqueous helictites which are still forming underwater have also been found in this cave, but have never been documented from any other cave in the world. Other finds in this cave are the discovery of unusual bacteria in delicate, ceiling bound rock corrosion residues. Without the aid of light, some of these microbes possibly derive their energy from reduced iron, manganese, and sulfur in the limestone walls, or from the chemically - unusual hydroaerosols in the cave air. A unique ecosystem has been formed by the association of these suspected autotrophs with known heterotrophic bacteria and fungi.

Exploration, mapping, and scientific studies are continuing and it is expected that the cave's known length will increase considerably along with its scientific importance.

The park's most famous cave, Carlsbad Cavern, is over 1,000 feet deep and currently has 30 miles of mapped passages. Recent discoveries have opened up new leads which will likely result in still more. An assessment by the U.S. Geological Survey and National Geographic Society geologist in 1924 described this cave as "King of its Kind." The combination of its huge volume and scenic decorations make this statement as true today as when first written 70 years ago. This cave's "Big Room" is a "T" shaped room over 1,800 feet (549 meters) long and 1100 feet (335 meters) wide at the top, and contains nearly 13 acres of floor space. The highest point in its ceiling is over 255 feet (78 meters) above the floor. Massive stalagmites, stalactites, columns, flowstone, travertine and cave "popcorn" or corralloid formations decorate the room.

Other notable caves in the park are Ogle Cave which has one of the world's tallest columns measuring over 106 feet (32 meters) high, and Slaughter Canyon Cave with its deep rock art left by Native Americans. Both of these caves also have historic guano mining remains.

In addition to its caves and karst, the park contains an impressive segment of the Chihuahuan Desert with its mountains and canyons. Some 800 plant species have been identified ranging from drought resistant shrubs like creosote bush to walnut, hackberry, oak, desert willow, buckeye and soapberry trees in the canyons, to juniper, ponderosa pine and douglas-fir at the higher elevations. Various agaves, yuccas, prickly pear, sotol and ocotillo on the surface provide stark contrast to the limestone world below. Colorful wildflowers often cover the canyons and hills in spring and fall.

Wildlife species recorded include 331 species of birds, 64 species of mammals, and 44 species of reptiles and amphibians. An additional 28 species of reptiles and amphibians tentatively identified may increase this number.

The park's largest wildlife attraction is a colony of bats numbering about one million. Eighteen species of bats have been identified in the park, but the most common is the Mexican Free-tailed Bat (Tadarida brasiliensis mexicana). The colony spends about 6 to 7 months in the park where their young are born each year. The colony winters in Mexico.

Habitat is also preserved for nesting Golden Eagles, Cave Swallows and other migratory birds which are declining in numbers elsewhere.

Endangered species which have been observed in the park includes the bald eagle, black footed ferret, Lloyds hedgehog cactus, and the southwestern willow flycatcher (on the potentially endangered list). Threatened species found in the park include gypsum wild buckwheat, Lee's pincushion cactus, and Mexican spotted owl. Eleven other category 2 (candidate species for listing) are also found in the park. Because of their vulnerability, listing of several of these as threatened or endangered may occur within the next few years.

Fossil remains of extinct animals which lived during the late Pleistocene period, (25,000 to 50,000 years ago) have been recovered from several park caves, including Musk-Ox Cave, Carlsbad Cavern and Lechuguilla Cave. Among the extinct fossil remains found are Bush Ox, Musk-Ox, Dire Wolf, Giant Ground Sloth, ring-tail cat, Pleistocene age camel and bear. Permian age fossils (200 - 225 million years old) are also found in limestone exposures in the caves and canyons. The slightly corrosive nature of the cave air preferentially dissolves the rock, leaving highly-etched base-reliefs of gastropods, sponges, calcareous algae, and other Permian-age fossils in some of the most beautiful exposures in the world.

Some of the Park's oldest inhabitants are vast populations of microscopic bacteria and fungi that have inhabited the stable, totally-dark cave environments for hundreds of thousands, if not millions, of years. Evidence for this is found today in Lechuguilla Cave where a bizarre variety of fossilized forms, or biothems, are preserved throughout the cave; this collection comprises some of the most unique speleothems in the world. In this newly-discovered cave, modern populations of microbes appear to flourish with no apparent sources of organic matter, a prerequisite for sustaining life in the desert underground. In 1990, K. I. Cunningham of the U.S. Geological Survey reported the presence of suspected primary producers (lithoautotrophs) on speleothems recovered from the cave's deepest point, and from ceiling deposits of corrosion residues. Using scanning electron microscopy, the USGS documented an assortment of bacteria and fungi living where they should not be able to: on sterile calcite speleothems and cave soils, on biothems, in nutrient-poor cave pools, and in corrosion residues. For a desert cave, Lechuguilla was a veritable "microbiological forest".

From 1990 to 1992, Diana Northup, of the University of New Mexico, collaborated with Cunningham and a number of associates to perform a biological inventory of Lechuguilla Cave. This report included invertebrates and microbiological sampling and identification. The microbiology was further divided into two broad categories: Fungi and Bacteria.

A total of 124 fungi samples were collected throughout the cave, resulting in the identification of 94 different species of fungi from over 30 different genera. Identification to the species level is not yet completed. Bacteria were sampled from 31 pools, from corrosion residues, and from sulfur deposits throughout the cave. Thirty-one types of bacteria have been recovered from the various pools so far. Most of these bacteria fall into the category of 'oligotrophic', or those organisms capable of living under extremely low nutrient conditions.

Bacterial and fungal samples from corrosion residues are particularly microbially-rich and diverse: the corrosion residues are a possible home for populations of chemolithoautotrophic bacteria which may be indigenous to Lechuguilla Cave. These bacteria appear to provide the requisite organic matter to higher organisms throughout the cave, such as heterotrophic bacteria and fungi. In laboratory cultures the suspected autotrophic bacteria appear to produce a sulfur dioxide odor which may indicate that they are capable of oxidizing sulfur. There is also the possibility that fungi and bacteria may form a unique ecosystem in the corrosion residues, aiding in the mechanical destruction of the wall rock. More studies are planned to define this relationship and to determine whether this relationship is actually enlarging the passages of the cave over time. Very little is still known about these bacteria because they are quite rare.

More microbiological studies are scheduled including a study by Dr. L. Mallory, a soil biochemist at the University of Massachusetts at Amherst, who is investigating the isolation of cancer chemotherapeutic natural products from cave microorganisms. Preliminary results from Lechuguilla Cave, as well as from work he has done in Mammoth Cave, are very positive. To date, over 600 strains of microbes have been isolated in Lechuguilla Cave. (See enclosed article from Cave Research Foundation Newsletter, May 1994.)

b. Maps or Plans

Maps and plans of Carlsbad Caverns National Park pertinent to its protection and operation are enclosed with this report. These include:

1. Statement For Management, Carlsbad Caverns National Park, January 1993.

2. Land Protection Plan, December 1984

3. Aerial photo/soil map, USDA, Soils Conservation Service, 1965.

5. Lechuguilla Cave Action Plan, Carlsbad Caverns National Park 1991

6. Backcountry/Wilderness Management Plan and Environmental Assessment, Carlsbad Caverns National Park, 1991.

Note: The park's General Management Plan (GMP) and Resources Management Plan (RMP) are currently undergoing revision. Copies will be available when completed. The RMP will be completed in 1994 and the new GMP in 1995.

c. Photographic Documentation

A 50 minute VHS video documenting the parks major features including caves, plants and wildlife is enclosed. Photographs showing the significance of Carlsbad Caverns National Park are contained in the enclosed publications, "Silent Chambers, Timeless Beauty", "Stories in Stone," and "Bats of Carlsbad Caverns National Park" as well as in other enclosures.

d. History

Information on the cultural and natural history of this property has been discussed elsewhere in this report. Supplemental information is also found in the enclosed publications referred to in "c" above.

e. Bibliography
A list of source material used in preparing or documenting this nomination is attached.

4. STATE OF PRESERVATION/CONSERVATION

a. Diagnosis

Visits to Carlsbad Cavern, the most internationally famous of the park's 81 known caves began in the 1880's. The earliest visitors arrived on foot or by horseback. A wagon road was opened around 1905 when a portion of the cave started being mined for guano. Some limited impacts occurred in connection with mining operations and from visitors in the early years. However, adverse effects were minimal since it was a small operation using mostly hand tools such as shovels to remove guano accumulations. The Cavern's scenic and scientific values survived the short mining span intact. Greater protection was afforded to Carlsbad Cavern and other nearby caves by their inclusion in the National Park System. While some damage has continued to occur under National park Service administration, human use impacts which would adversely affect cave resources visually have been

minimal. Effects on delicate microbial ecosystems are unknown. Most of these impacts have occurred along the three-mile long visitor trail in Carlsbad Cavern, which is only one of the parks 81 total caves. While this limited speleothem damage has occurred in the past within arms reach of the visitor trail, it is also minimal in the overall scenic and scientific importance of the park. Management actions have been taken in recent years to reduce and eliminate these adverse human impacts. The actions include such measures as using guided rather than self-guided tours in the most delicate and fragile areas, use of security alarms to detect movement off trails, and increased ranger presence during periods of heavy visitation. The park also embarked on preparation of a new General Management Plan in 1992 which will be completed in 1995. This plan is addressing problem areas and should insure long term protection and preservation of the area. Most of the park's undeveloped caves are in designated wilderness and are in relatively pristine condition. This is especially true of Lechuguilla Cave which contains the rarest, and in some cases, most unique speleothems in the world. Human use effects on the unique microbial ecosystem of this cave are unknown.

Much of the land surrounding the park is also federally owned and defacto wilderness offering greater protection of the park's wilderness values. Some potential threats have developed along the northern and southern borders of the park in the past three years, but these have been averted by cooperative efforts between National Park Service and other federal agencies, and by passage of the Lechuguilla Cave Protection Act of 1993 (Public Law 103-169).

b. Agent Responsible for Preservation/Conservation

The United States Government is responsible for Carlsbad Caverns National Park and it is administered through the U.S. Department of the Interior by the National Park Service.

c. History of Preservation/Conservation

Efforts to protect Carlsbad Cavern began soon after exploration started revealing its marvels. When stories and photographs began to appear in newspapers, the Cavern's fame spread quickly and resulted in several investigative trips, reports, and more publicity. A major photo article in the New York Times on November 18, 1923, followed by the first extensive National Geographic Magazine article in January 1924, along with an extensive letter writing campaign led by Richard F. Burges of El Paso, Texas, and W. F. McIlvain of Carlsbad played key roles in gaining national monument status and later national park status. The first official investigations of the area were by Robert A. Holley of the U.S. General Land

Office (now the Bureau of Land Management) in 1923, and by Willis T. Lee of the U.S. Geological Survey and the National Geographic Society in 1923 and again in 1924. Their reports led to proclamation of the area as a national monument by the President of the United States on October 25, 1923, and later, to the U.S. Congress passing legislation to make it a national park on May 14, 1930.

A series of boundary adjustments occurred between 1930 and 1963 (see summary of legislative history) to enhance protection of the area. On November 10, 1978, public law 95-625 was enacted, designating 33,125 acres (13,406 Hectares) as wilderness which precludes any adverse developments.

In 1993, Public Law 103-169, the "Lechuguilla Cave Protection Act of 1993" was passed by Congress withdrawing 6,280 acres of public land bordering the park's north boundary from mineral leasing, exploration, or development. The purpose of the Bill was to protect Lechuguilla Cave and other caves within the park from potential adverse effects caused by drilling for oil and/or gas on lands adjacent to the park. This protection was sought and obtained based on scientific studies performed by the U.S. Geological Survey and private contractors, which demonstrated that fractures in the limestone bedrock near proposed drilling sites on Bureau of Land Management (BLM) lands connected with Lechuguilla Cave inside the park boundary and potentially could have caused contamination from seeping oil and gas. This new law, together with actions being taken by the Bureau of Land Management, which administers the adjacent lands, provides strong and effective protection to park caves from this earlier potential threat.

d. Means for Preservation/Conservation

The National Park Service is charged by Congress (46 Stat. 279) (16 U.S. Code Sec. 407c) with the responsibility to administer, protect, and develop Carlsbad Caverns National Park for the benefit and enjoyment of the public.

e. Management Plans

A Statement for Management approved January 27, 1993, and a Master Plan approved February 18, 1975, guide the management and preservation of park resources, along with services provided to visitors. A new General Management Plan is being prepared which will be completed in 1995. The new plan will be more comprehensive in addressing protection of park resources and provision for visitor use.

5. JUSTIFICATION FOR INCLUSION ON THE WORLD HERITAGE LIST

Carlsbad Caverns National Park contains and preserves both physical and biological formations and groups which are of universal-world wide value and interest both aesthetically and scientifically. Both the general public, cavers, and cave scientists (speleologists) from throughout the world have been coming to the park for many years to view the massive and highly decorated cave rooms. Likewise, geologists from all over the world come to study the Permian-age reef in which the caves formed and to study the unique and newly learned explanations for speleogenisis. The large migratory bat colony and the maternity roost it occupies in Carlsbad Cavern as well as other plant and animal species and habitats add to the site's universal multi-nation value from a scientific and conservation standpoint.

The caves within Carlsbad Caverns National Park and the surrounding area are of such importance and significance that the Congress of the United States through Public Law 101-578 (passed November 15, 1990) has initiated a study for establishment of a National Cave Research Institute in the Carlsbad area. This study is the direct result of new discoveries found in the park's Lechuguilla Cave which have prompted world-wide attention. This world-wide attention has grown considerably since Speleo-Projects, Caving Publications International, of Basel Switzerland published a large and lavishly illustrated book on Lechuguilla Cave titled Lechuguilla Cave, Jewel of the Underground. This book, published in 1991 in three languages, will be undergoing its second printing soon.

If the National Cave Research Institute is established, it will be one of very few such facilities in the world.

In the "Atlas of Great Caves of the World" funded by the Cave Research Foundation of the United States and published by Cave Books of Saint Louis, Missouri in 1989, Carlsbad Caverns occupies a prominent spot. The original edition of this French book was authored by Paul Courbon and Claude Chabert. It was translated into English in the 1989 edition by Peter Bosted. All three authors have extensive first-hand knowledge of caves throughout the world. Photos of Lechuguilla Cave in Carlsbad Caverns National Park are on the cover and opposite the "Forward" in this atlas because of this site's international appeal.

Carlsbad Cavern is included in the Atlas's list of the largest underground chambers in the world, with 33,210 square meters in its "Big Room". Lechuguilla Cave and Carlsbad Cavern are also included in the book's list of deep caves, although new discoveries in Lechuguilla Cave have pushed its depth far below what is shown in the Atlas and have now placed it in first place in the list of deepest limestone caves in the United States. Then, in the description of Carlsbad Cavern, the most famous of the park's 81 caves is described as "world-renowned". The description goes on to say that it is known for "its abundant displays of large speleothems" and that "in addition, a wide variety of rare speleothems and speleogens have been identified." It further states, "The occurrence of extensive deposits of massive

gypsum in the cave, along with the incidence of related elemental sulfur, has led to the development of a theory that solution by sulfuric acid (from hydrothermal waters of pyrite oxidation) played a significant role in the formation of Carlsbad Cavern."

Carlsbad Caverns National Park also occupies a prominent spot in Time-Life's Planet Earth series book titled Underground Worlds, published in 1982. This book features caves from throughout the world. The book's extensive, well illustrated chapters on Carlsbad Caverns points out that early pictures of the Cavern showed scenes which were so fantastic that they were thought to be fakes. The text also goes on to say that "many geologists believe that the genesis of this cave, and of others in the Guadalupe Mountains, was radically different from that of most caves." "Carlsbad appears to have been created largely by sulfuric acid, formed when hydrogen-sulfide brine rose through the earth from nearby oil and gas fields." "The tremendous scale of Carlsbad's chambers, with their high vaulted ceilings, is apparently the result of the acid eating its way upward over a period of thousands of centuries."

Still another reference on the global significance of Carlsbad Caverns National Park's cave resources and speleothem formations is the book Cave Minerals of the World by Carol A. Hill of the United States and Paolo Forti of Italy, published by the National Speleological Society of the United States in 1988. This book, which has an historical introduction by Trevor R. Shaw of England, and which underwent peer review by noted cave scientists world-wide contains an inventory and description of cave minerals and formations found in caves world-wide. The variety, scenic beauty, and scientific importance of the formations found in the caves in Carlsbad Caverns National Park are well documented in this book.

a. Natural Heritage Property

i. Major Stages Of The Earth's Evolutionary History

The famous Capitan Reef complex, within which park caves formed, had its origins in the Permian period of geologic time at the end of the Paleozoic era which dates from 280 million to 225 million years ago. The sections of this reef exposed within the park and its environs are among the best preserved in the world accessible to humans for study. Here, geologists and others can study the reef both from its inside and outside through cave passages which penetrate in and through the reef as well as in canyon exposures which have uncovered cross sections through erosion. The reef complex limestone is 2000 feet (610 meters) thick and the park's major caves provide views at depths of 1,030 feet (314 meters) and 1,606 feet (490 meters) respectively. Fossils preserved in rock exposure include Bryozoans, Pelecypods, Gastropods, Echinoderms, Brachiopods, Fusulinds, Sponges,

Trilobites, and Algae.

The Capitan Barrier Reef preserved in the park and surrounding mountains is a classic natural laboratory which is studied extensively and continuously by scientists from around the world. In writing to former U.S. Secretary of the Interior Stewart Udall in 1965 about the reef complex preserved in the park and neighboring Guadalupe Mountains, Dr. Norman D. Newell of the American Museum of Natural History, and author of the book The Permian Reef Complex of the Guadalupe Mountains Region, Texas and New Mexico, stated, "This area is considered by geologists throughout the world as an outdoor laboratory of unique importance for research on basic scientific principles for tracing the history of the earth and for understanding the origins of certain valuable mineral resources such as petroleum, potash, dolomite, and limestone." He went on to state, "Even such celebrated areas as the Grand Canyon and Yellowstone Park will not compare with the Guadalupe Mountains for the diversity and clarity of exposition of geologic phenomena. In short, the science of geology has been immeasurably advanced by studies and research in the Guadalupe Mountains. Hundreds of professional geologists visit this region annually to make original observations and to collect specimens for laboratory studies....."

Traces of the Mesozoic Era which gave rise to extensive oil and gas deposits in the basins east of the park remain also, mostly in the form of Cretaceous period fossils.

During the early Miocene epoch of the Tertiary period, (about 26 million years ago) the stage was set for extensive cave development in the area as faulting and other forces caused the basins to sink and the mountains and plateaus to rise. This was followed by the gradual exhumation (erosion) of the Guadalupe Mountains with concurrent sulfuric acid speleogenesis that developed the caves. Subsequent speleothem development occurred within the caves after the regional water table began to fall throughout the Pleistocene period.

Remains in some of the park caves illustrate life and conditions in the region during the Pleistocene epoch of the Quaternary period.

The park is one of the few places in the world accessible to study the newly evolving theories of cave formation through sulfuric acid versus formation through erosion or carbonic acid dissolution.

ii. Significant on-going geological processes, biological evolution and man's

interaction within the natural environment.

The geological processes are continuing and are most apparent in the active portions of wild caves where rare speleothems continue to form. Perhaps the best examples are in Lechuguilla Cave where helictites are forming underwater which have never been described from any other cave in the world. In other locations, helictites form in air by capillary action through an internal conduit, while in Lechuguilla Cave, all known theories of how they form do not apply. In Lechuguilla, it is the rare combinations and placement of minerals which seem to account for how they form. Many other rare and unique speleothems such as the world's largest and most diverse collection of bacterially assisted "biothems" have been found in Lechuguilla Cave during the past seven years. These features have astounded speleologists from throughout the world and prompted calls for establishment of a National Cave Research Institute nearby, which would focus research studies in this remarkable cave.

Erosion in the deep backcountry canyons continues to expose Permian age fossils and occasionally cuts into a previously unknown cave beneath.

Human interaction with the caves, which is briefly touched on in the Cultural Heritage section, continues through an active program of exploration. In 1970, the park had 30 known caves. At the start of 1994, it had 81 known caves. Until 1986, Lechuguilla Cave's known length was only a few hundred feet. In August 1994, its known length had grown to 77.7 miles (125 kilometers). Lechuguilla's entrance exchanges air at higher velocities than any other known cave in the world, and violates accepted temperature- and barometric pressure-driven exchange theories. At Carlsbad Cavern, exploration and surveying have extended its known length from 8 miles (12.8 kilometers) in 1962 to more than 30 miles (48 kilometers) in 1994. These figures will continue to grow in coming years as research, exploration and surveying continue and as human skills and equipment improve. Only within the past five years has exploration pushed down to the top of the water table depth in the Capitan Reef formation. This water bearing formation supplies water to the city of Carlsbad, 20 miles to the northeast.

In the Spring of 1994, the U.S. Geological Survey coordinated a visit to Lechuguilla Cave for a team of National Aeronautics and Space Administration (NASA) scientists studying terrestrial sites as possible analogs for future Mars biology investigations. Because of the possible lithologic similarity between this site's cave bearing rocks and possible Martian lander locations, the scientists will be making additional research trips to the park in connection with future Mars exploration objectives. The intertwined geology, chemistry and biology of Lechuguilla Cave may hold

keys to understanding the geology of Mars, and the primitive bacterial and microbial life forms in Lechuguilla Cave may some day help scientists determine if there was or is life on Mars. If life does currently exist on Mars, the scientists believe it may be found in caves, joints, or fractures below the Martian surface and may share characteristics with some of the bacteria found in Lechuguilla Cave. Future trips by this team of scientists are planned. (See enclosed paper on "The Relevance of Lechuguilla Cave to the Search For Life on Mars")

Recent research has also discovered unusual microbes in pools and in hydroaerosols in the cave air, suspected lithotrophic bacteria which may derive metabolitic energy from sulfur, manganese, and iron, and novel ecosystems dependent upon these autotrophic bacteria. Ongoing research is not only seeking to fully understand these rare and fragile features and how they are formed, but also is looking into potential medical applications of knowledge gained by studying the microbes. Respected soil microbiologist L. Mallory has already isolated more than 600 strains of microbes from the pools, soils, speleothems, corrosion residues, and sulfur deposits of Lechuguilla Cave.

iii. Superlative Natural Phenomena, Formations, or Features

The tremendously large rooms in the park's Carlsbad Cavern make this cave unique among known and accessible caves throughout the world. The combination of the great room sizes and its spectacular beauty also set it aside from longer and more sparsely decorated caves, including Mammoth Cave, which are outstanding for different reasons. The largest room in Carlsbad Cavern contains a vertical span at one point which is greater than the height of the U.S. Capitol building and contains floor space equal to a dozen football fields.

Lechuguilla Cave contains the world's largest and most extensive accumulation of gypsum chandelier speleothems many of which measure over 20 feet long and arc down from the ceiling in large transparent selenite crystals. It also contains thin gypsum hair-like formations 20 feet long which can be caused to sway simply from the heat generated by a human hand held next to them. The cave contains the world's largest accumulation of hydromagnesite balloons, subaqueous helictites, aragonite "Christmas Trees", and a myriad of other calcite and gypsum formations. The cave stands alone in boasting the world's largest accumulations of in-cave elemental sulfur, estimated at over 1,000 metric tons in place, and massive secondary gypsum deposits related to the sulfur acid speleogenetic process.

An Environmental Impact Statement which led to the passage of the "Lechuguilla Cave Protection Act of 1993" states: "Lechuguilla Cave is a world-class cave system that has spectacular features and is also important from a scientific research viewpoint. Many of the formations in the cave are considered as the finest examples of their type in the world, with Lechuguilla's subaqueous helictites being the only known example." Continuing complementary studies of the microbiology of Lechuguilla Cave have led investigators to the conclusion that the cave harbors unique and unusual microbial ecosystems that are ultimately dependent on lithotrophic, primary producers.

Other excerpts from this 1993 document go on to state: "...a series of digs in 1986 led to the discovery of passage that opened into perhaps the most significant cave in the world, arguably the finest cave system discovered, to date, in the United States..."

"The potential size of Lechuguilla Cave is overwhelming. The volume of air flow from the cave, documented at the entrance, suggests that only a small percentage of (the cave) has been discovered. The length and depth of Lechuguilla Cave will undoubtedly increase through future exploratory expeditions."

"The cave abounds in rare and fantastic formations, decorations and displays. As stated by Cahill and Nichols, (National Geographic, March 1991, Vol. 179. No. 3), 'some (formations) have never been seen in the quantity anywhere else, and a few, like the subaqueous helictites, were never even imagined.'

'It's not just the immense size of the rooms that is so amazing, but also their lavish decorations - glittering white gypsum chandeliers 20 feet long, walls encrusted with aragonite "bushes," rippling strands of indescribably delicate "Angel Hair" crystals, some 30 feet long but so fragile that a puff of air can break them. The caves shimmering lakes, like liquid sapphires, have lain untainted for millennia.'

'Lechuguilla is (also) a microbiological forest...the air flowing deep in the cave transports tiny organisms that consume rock. There are bacteria...that are chemosynthetic, able to feed off sulfur, manganese, and iron in the limestone. In turn, there are fungi that live on the bacteria....'

'It is highly probable that more spectacular formations and scientific wonders will be discovered as exploration [of the cave] progresses. As stated by Frank Deckert, Superintendent, Carlsbad Caverns,'...Lechuguilla Cave is a world-class resource worthy of world-class protection.'

The Regional Director further stated in his letter that "...based on its world-class significance, Lechuguilla Cave has been featured on every major television network news program," and the "...cave was featured in a PBS documentary dealing solely with wilderness considerations for Lechuguilla Cave."

"The National Geographic television special "Mysteries Underground," features Lechuguilla as the center piece of a program about caves of the world! Stories of the cave have appeared in major newspapers nationwide, magazines such as *National Geographic, Audubon, Smithsonian, New Mexico Magazine, Ranger Rick, Walt Disney Adventure Magazine, National Speleological Society,...Descent* (a British caving magazine), *Buzzworm Magazine,* and it is the sole subject of the book published in three languages, *'Lechuguilla - Jewel of the Underground'."*

STATEMENT OF SIGNIFICANCE

A statement of significance tells why a national park is important to our natural and cultural heritage. During the ongoing General Management Plan (GMP) planning process for the park, the planning team developed the following significance statements for Carlsbad Caverns National Park. It is appropriate that they be listed in this nomination.

° Carlsbad Caverns National Park contains large caves of world-class importance that have beautiful and diverse speleothems; the Big Room in Carlsbad Cavern is the largest, most easily accessible chamber in North America.

° Lechuguilla Cave is the deepest and fourth longest known limestone cave in the United States; it contains speleothems found nowhere else in the world.

° Carlsbad Caverns National Park preserves a portion of the Capitan Reef - one of the best preserved, exposed Permian age fossil reefs in the world. The park's caves and canyons provide visitors with unique opportunities to view this reef from the inside.

° Capitan Reef has exceptional potential for additional cave discovery, exploration, and research.

° The park contains one of the few protected portions of the northern Chihuahuan Desert ecosystem.

° Carlsbad Cavern has a world-famous colony of migratory Mexican free-tailed bats.

° Lechuguilla contains more elemental sulfur and secondary gypsum than any other known limestone cave in the world (Cunningham and other, 1993).

° Lechuguilla contains the most diverse assortment of biothems, or biologically-assisted speleothems, than any other known cave in the world. (Davis and others, 1990; Cunningham and others, in press).

° Lechuguilla contains more mapped passage 1,000 feet below a single entrance than any other known cave in the world.

° Lechuguilla's entrance exchanges air at higher velocities than any other known cave in the world, and violates accepted temperature- and barometric pressure-driven exchange theories (Cunningham and LaRock, 1991).

°Many species of plants and animals in the park are at the limits of their geographic distribution, including the northernmost and largest colony of migratory cave swallows in the United States.

° Guadalupe Mountains caves, including those in the park, collectively contain one of the continent's most diverse and undisturbed assemblages of extinct Pleistocene fauna.

° The park's cultural resources represent a long and varied continuum of human use starting in prehistoric times and illustrating many adaptations to this desert environment.

° Capitan Reef provides extraordinary scenic vistas, both from the top of the escarpment and from the rugged canyons below; the quality of these vistas depends on excellent air quality.

CARLSBAD CAVERNS NATIONAL PARK
WORLD HERITAGE SITE NOMINATION
SIGNATURE PAGE

Signed: George T Frampton, Jr.

Full Name: GEORGE T. FRAMPTON, JR.

Title: ASSISTANT SECRETARY, FISH & WILDLIFE AND PARKS, DEPARTMENT OF THE INTERIOR, UNITED STATES OF AMERICA

Date: SEPTEMBER 26, 1994

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Summary of Legislative History

Carlsbad Caverns National Park

October 25, 1923 - Presidential Proclamation (No. 1679) established "Carlsbad Cave National Monument" with 719.22 acres (43 stat. 1929)

April 2, 1924 - Executive Order (No. 3984) signed under authority of 36 stat. 847 and 37 stat. 497 temporarily withdrawing 85,683.20 acres of public land pending determination of whether they should be reserved for national park purposes.

May 3, 1928 - A supplemental Executive Order (No. 4870) was signed withdrawing an additional 2,560 acres pending determination of reserving for national park purposes.

May 30, 1930 - Act establishing Carlsbad Caverns National Park (Public Law 216) (46 stat. 279) (16 U.S.C. Sec. 407 c) passed by Congress was signed into law. This act authorized expansion of the park from withdrawn public lands by Presidential Proclamation.

June 17, 1930 - Executive order (No. 5370) signed under authority of statutes cited above, withdrawing temporarily, pending classification, 34,560 acres. Up to this point 123,522.42 acres or 193.0 square miles were available for inclusion in the park.

February 21, 1933 - Presidential Proclamation (No. 2031) (47 stat. 2556) signed making 9,239.94 acres of withdrawn land part of the national park.

May 4, 1934 - Act passed by Congress (48 stat. 664) authorizing acquisition of guano mining claim (40 acres) within Carlsbad Cavern through exchange.

February 3, 1939 - Presidential Proclamation (No. 2321) (53 stat. 2523) signed officially adding 39,488.41 acres of land withdrawn earlier to the park. (Note: at this point the park contained approximately 49,000 acres)

June 14, 1950 - Act passed authorizing commemorative plaque or marker of Jim White (cavern explorer) (64 stat. 211)

August 8, 1953 - Act passed authorizing use of appropriated funds for transportation of employees to and from city of Carlsbad, NM to the park to facilitate administration (967 stat. 495, 16 U.S.C. 16) Public Law 230 (67 stat 495,496) of same date authorized rendering emergency cooperative assistance outside park boundaries, construction of utility services necessary to serve the park, furnishing utilities to park concessions, equipment rental, right-of-way acquisition, motor and fire equipment acquisition and repair to facilitate park management.

December 30, 1963 - Public Law 88-249 (77 stat. 819) passed, redefining park boundaries and authorizing a land exchange with the state of New Mexico to eliminate isolated state owned tracts within park boundaries by trading for previously withdrawn Federal lands on the perimeter of the park. This act also officially brought into the park the 79.87 acre Rattlesnake Springs tract acquired in January, 1934 to supply water for park facilities. Other provisions were authority for rights-of-way for roads and utility lines between the detached Rattlesnake Springs unit and park headquarters and authority for the Secretary of the Interior to convey a right-of-way to the State of new Mexico for a new entrance road (this later authority was never exercised).

November 10, 1978 - (Public Law 95-625) (92 stat 3467). The National Parks and Recreation Act of 1978 designed 33,125 acres of Carlsbad Caverns National Park as wilderness.

As of March, 1993 the park contains 46,755.45 acres; of this, 46,427.26 acres are federally owned and 339.19 are privately owned.

STATEMENT FOR MANAGEMENT

CARLSBAD CAVERNS NATIONAL PARK

New Mexico

January 1993

Prepared by

CARLSBAD CAVERNS NATIONAL PARK

With assistance from

SOUTHWEST REGIONAL OFFICE
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DEPARTMENT OF THE INTERIOR / NATIONAL PARK SERVICE

STATEMENT FOR MANAGEMENT

Carlsbad Caverns National Park

Recommended by: Frank J. Deckert 1/15/93

Superintendent — Date
Carlsbad Caverns National Park

Approved by: [signature] 1/27/93

Regional Director — Date
Southwest Region

Revised by: _____

Superintendent — Date
Carlsbad Caverns National Park

Approved by: _____

Regional Director — Date
Southwest Region

CONTENTS

I. INTRODUCTION

A. DOCUMENT PURPOSE

This Statement for Management For Carlsbad Caverns National Park provides a brief description of the condition of the park. It is updated every 2 years. Included are descriptions of park background; influences upon management; major issues concerning management; and objectives for optimal management. The statement reflects the current state of the park, and desired outcomes; it does not present prescriptive decisions for future management, development and use.

B. PARK PURPOSE / SIGNIFICANCE

The park was established to preserve and make available to the public one of the world's largest and most beautifully decorated limestone caverns, along with surrounding lands that contain numerous other caves and other "outstanding natural and cultural resources."

The National Park Service establishment act of 1916 delineates the park's purpose as "to conserve the scenery and the natural and historic objects and the wildlife therein and to provide for the enjoyment of the same in such manner and by such means as will leave them unimpaired for the enjoyment of future generations."

Carlsbad Cavern, the most famous of the park's 80 known caves, is one of the world's largest by volume, as well as one of the most profusely decorated with speleothems. Nearly 70 years after being labeled "King of its Kind" by U.S. Geological Survey geologist and National Geographic Society expedition leader Willis T. Lee, the cavern's overall size and beauty remain unmatched among caves open to the public: 27 miles are mapped, and its large rooms, massive stalagmites and stalactites, and history are world-famous.

Rivaling Carlsbad Cavern and now exceeding it in both length and depth is Lechuguilla Cave. New discoveries since 1986 have established Lechuguilla Cave as the nation's deepest cave, at 1,593 feet. Presently, it is the fourth longest cave in the U.S., with just under 60 miles of mapped passages compared to 27 miles in Carlsbad Cavern. It also is the eighth longest cave in the world.

Lechuguilla Cave is a major and highly significant cave resource for many reasons. Unlike any other cave in the region, it passes through five separate geological formations: the Yates, Seven-Rivers, Queen, Capitan (Massive) Reef, and Goat Seep formations. Studies to date show that Lechuguilla Cave was not formed like

caves in other karst areas, or in the way that other caves in the Guadalupe Mountains were previously believed to have been formed. In addition, it contains many rare, and some totally unique, speleothem formations. It contains helictite formations that have formed, and are still forming, underwater. Sub-aqueous helictites of this type have never been found, or recorded, in any other cave in the world. Unusual, or unique, natural placement, or geographical associations of various minerals, are believed to be the reason for their growth. Rare hydromagnesite balloons, 20-foot-long gypsum chandeliers, 20-foot-long gypsum hairs, 15-foot-long soda-straw formations, and unusual gypsum crystals, flowers, and crusts all contribute toward making Lechuguilla Cave special and one of a kind.

Recently found in the cave are rare chemosynthetic bacteria and obligate fungi, which derive energy from gypsum, sulphur, magnesium, and iron deposits, and which are believed to have a role in speleo-genesis. These and other rare scientific features, along with the fact that Lechuguilla Cave is located within a designated wilderness area and has no human developments such as road, constructed trails, buildings, or utilities above or within the cave, present the park and the nation with a very rare opportunity for research. The pristine nature of Lechuguilla Cave, which lay hidden from man until 1986, presents an unprecedented chance to study natural cave processes and cave climate conditions, both for a better understanding of how caves are formed and for comparison with caves such as Carlsbad Cavern, Mammoth Cave, and others that have been developed and have received intensive public use. Studies of the cave's past climatic conditions could also be valuable in understanding global climate changes. Such studies will enable managers of both public and private lands to do a better job of managing the nation's cave and paleontological resources, and give mankind a better understanding of ancient and present geological, climatic, and scientific processes.

Another of the park's large caves, the Ogle/Rainbow complex, contains one of the tallest column formations known--measured at 106 feet high--along with unusually well-preserved guano-mining equipment dating from the early 1900's, and a partially completed mine tunnel.

Remains of several extinct Pleistocene-era animals have been found in park caves. Certain grottos and karst shelters contain extensive and complex polychrome pictographs and other archeological remains. Recently, nearly 50 Guadalupe Mountains-Archaic style color pictographs were identified deep within "New Cave." These dark zone pictographs are extremely rare, and New Cave is one of very few caves in North America where they have been found.

A large colony of migratory Mexican freetail bats reside at the park for about 7 months out of the year, using a portion of Carlsbad Cavern as a maternity roost.

The Permian-age limestone reef in which the cavern has formed is of interest to geologists all over the world.

The park's surface ecosystem, which includes 740 species of plants, 273 species of birds, 59 species of mammals, and 44 species of reptiles and amphibians, is of interest to plant and animal ecologists and other students of the Chihuahuan Desert.

Other non-cave-related cultural resources in the park include over 125 recorded archeological sites, most of which are associated with the Mescalero Apaches who camped, gathered, and cooked century plants in large roasting pits found throughout the area; and two historic districts. One of the historic districts is within the 80-acre detached Rattlesnake Springs unit; and the other consists of 13 buildings and associated stone work in the park's housing and maintenance area near the cavern entrance.

All of these resources increase in significance over time--that is, become more precious--as impacts and encroachments threatening and affecting them increase.

II. MAJOR ISSUES

A. CAVE DETERIORATION

Climate changes have rendered the caves essentially dormant with formation growth slow to nonexistent. Delicate speleothems are a nonrenewable resource and any damage is permanent. Continuing research since 1983 has shown that many speleothems are broken by human contact each year. Other formations are becoming dulled and discolored from repeated touching and from lint, skin oils, dirt and other human debris. Other human impacts include graffiti, off-trail travel, organic litter (which causes bacterial growth) and pollution of cave pools by coins and trash. As damage to cave resources is irreversible, the attitude and value system of the public are key to resource preservation. Park activities that instill a sense of appreciation for the cave and its preservation are an integral part of park management. Staffing is insufficient to mitigate these human impacts once they occur.

An experimental security system sounds an alarm when visitors step off the trail in sensitive areas. However, experience has shown that it is only effective when uniformed rangers are perceived to be in the area to react to the alarm. Technical difficulties with the system in the cave atmosphere have also reduced its effectiveness.

Management activities also have the potential of adversely impacting sensitive or irreplaceable cave resources. Exploration, mapping and surveying, photography, and research projects all contribute to the permanent degradation of the cave. The introduction of cave lighting, which is necessary for visitor safety and viewing of cave features, has resulted in the growth of algae, moss, fungi, and vascular plants in some locations of the cavern. Critical cave moisture is being reduced by the elevator shaft and lights, although the installation of revolving doors and low-energy lighting has somewhat mitigated this. There may be some changes in water infiltration due to surface activity, although water often travels laterally some distance along the top of formations like the Yates sandstone before entering the cave. Cave formations in remote areas of the park are occasionally illegally mined. Staffing levels preclude adequate patrols in these areas.

B. BAT DECLINE

The park's large colony of nearly a million migratory Mexican freetail bats, whose evening flights from the mouth of Carlsbad Cavern comprise a principal visitor attraction, remain in jeopardy. Threats include DDT, found in residual quantities in the area as a result of mid-20th century agricultural use, and in

higher concentrations in Mexico, the bats' winter home, where it is still used. The colony may also be impacted in Mexico by efforts to eradicate bats that are seen as a threat to other animals and humans. A fundamental problem in dealing with the colony is a lack of good, base-line data, especially on their winter habitat. A monitoring program is in place at the park during summer, and the population of the colony appears to have remained fairly stable during the past several years. Improved counting techniques using video and computers and monitoring of pesticide residue in young bats contribute to the park's research efforts. The two shafts of an old guano mine, formerly used as a primary nursery area, have been plugged to block air currents that caused the bats to abandon it. The bats have started using the area again.

C. TRAPPING/KILLING OF MOUNTAIN LIONS

The park is mandated to protect native wildlife on park lands. Mountain lions, whose range includes land inside as well as outside of the park, are being intensively trapped and killed on those adjacent lands. The issue is a major, emotion-laden controversy between environmental groups who want to protect the lions, and ranchers and livestock interests who are working toward even more intensive predator control. A 3-year research project addressing the lion population--its movement and home ranges, feeding habits and related issues--was completed in March 1986. A Mountain Lion Management Plan, approved in April 1986, proposed continuing protection of the lions within the national park. Such protection requires the establishment and maintenance of suitable range, habitat, and prey species. Toward that end, the Mountain Lion Management Plan also proposed establishment of a deer and elk monitoring program in the park and the development of an interagency mountain lion task force. The latter proposal was dropped from the plan due to opposition from surrounding land management agencies.

D. IMPACTS UPON ARCHEOLOGICAL/GEOLOGICAL/PALEONTOLOGICAL SITES

Human contacts and natural deterioration are having adverse effects upon cultural resources, including unique, high-quality polychrome rock-art pictographs; historic Apache and prehistoric Basketmaker-era archaeological remains; and Permian-age limestone reef and Pleistocene-era animal remains in caves. The difficulty of managing these cultural resources in exacerbated by the lack of a comprehensive inventory of sites. Increased backcountry use will increase the impacts to these resources.

E. OIL/GAS IMPACTS

The park's north, south, and east boundaries, as well as the park's domestic water supply in the detached Rattlesnake Springs

unit, are potentially threatened by oil and gas exploration and associated transmission and storage facilities. Oil companies have requested permission to cross park lands in order to obtain access to lease sites outside the park. With one exception in the early 1980's, when a special use permit was approved for one company to cross through a corner of one section in the park on a 1/2 mile stretch of road, crossing of park lands by oil companies has been denied. In most cases, other routes or means of access to proposed drilling sites are available outside the park. In addition to drilling, there was increased interest in seismic exploration on lands adjoining the park boundary in the early 1980's. Due to the size and weight of vehicles used to transport drilling rigs, heavy equipment, and water, such operations cannot be viewed as normal road use, and must be critically assessed in terms of their potential impact upon park resources. A recent upsurge of interest in oil and gas exploration is resulting in increased activity and associated threats to park resources along park boundaries. Such activities could adversely affect the quality of scenic vistas, air, wildlife, watersheds, visitor access to Slaughter Canyon, trailheads along the escarpment, and cave resources such as Lechuguilla Cave. Monitoring proposed activities and maintaining effective communications with the Bureau of Land Management and U.S. Forest Service, who issue leases, approve surface use plans, and prepare NEPA compliance documents for oil and gas operations, is critical to ensuring the park values are not impaired. Compliance with 36 CRF regulations on access when appropriate or when access through the park cannot be denied is critical.

F. BOUNDARY ADJUSTMENTS / WILDERNESS PROPOSALS

Several proposals to modify park boundaries have been made over the years, beginning in the 1920's. Most of them have recommended expansion of the park westward along Guadalupe Ridge to the New Mexico/Texas State line and the boundary of Guadalupe Mountains National Park, which would include several major caves and canyons, and essentially add all of the Guadalupe escarpment between the Carlsbad Caverns and Guadalupe Mountains National Parks. Such boundary adjustments would improve range and habitat conditions for mountain lions, deer, and elk, and would effectively remove the threat of damage or pollution of cave resources by oil and gas extraction activities, mining, and off-road vehicle use. Geologically, all of the escarpment is a continuum, and several caves outside the park are potentially connected to pristine park caves such as Lechuguilla or other, as yet unknown, spectacular caves. Subterranean water sources that exist in park caves, and are integral to their formation, have their source outside existing park boundaries.

Most recently, proposals have been made to add the Guadalupe Escarpment, Mudgetts Cave, and Lonesome Ridge Wilderness Study Areas to the Nation's Wilderness Preservation System. The Guadalupe Escarpment proposal incudes 21,000 acres between the

two national parks that are part of the Lincoln National Forest. The 2,941-acre Mudgetts Cave and 2,443-acre Lonesome Ridge proposals cover areas administered by the Bureau of Land Management.

Assessments by the National Park Service have deemed the Lonesome Ridge and Guadalupe Escarpment Wilderness Study Areas suitable for wilderness designation. Final determination of whether or not the Wilderness Study Areas will be designated as wilderness awaits congressional action. Proposals have also been made by a private conservation group--the National Parks and Conservation Association--to add the Mudgetts Cave and Lonesome Ridge Wilderness Study Areas to the national park. Potential threats to the park's Lechuguilla Cave exist within and near the Mudgetts Cave Wilderness Study Area.

Management concerns also center around the lack of visitor access to the trailhead at Rattlesnake Canyon on the park's southern boundary. This access is needed by visiting geology groups--both professional and academic--who visit regularly and hike through the canyon to study rock exposures, and who need vehicular access to the canyon mouth to be either dropped off or picked up for the one-way trip. A boundary study is recommended to determine if access to this and other potential trailhead points along both the north and south could best be achieved by boundary adjustments or by obtaining of rights-of-way.

As described in the park's Land Protection Plan (1984; revised 1987), and in the "Legislative/Administrative Constraints" sections of this Statement for Management, the problem of providing suitable permanent protection for the privately owned Double Canyon tract--along with protection against adverse uses within it--is long standing. Present authority allows for acquisition of the tract only by donation or exchange.

G. ADMINISTRATIVE ACCESS

Administrative access to critical areas along the park's northern and southern boundaries is severely restricted because of wilderness designated lands in the park or private lands outside the park. Four areas require serious consideration for deeded easements, ensuring administrative access over existing ranch roads. This access is required to permit reasonable access for research, hunting patrols, resource management, protection, and other administrative needs. This type of administrative easement would have little impact on local ranchers.

H. TRESPASS LIVESTOCK

Lack of fencing along approximately 10 miles of the park boundary results in trespass grazing by livestock from adjoining lands. Such grazing is causing alterations in species composition,

erosion, habitat degradation, and unnatural competition with native wildlife for available natural forage.

I. MUSEUM COLLECTION INADEQUACIES

The museum collection is composed of over 15,000 objects that we know of. Eleven thousand are stored at the park, with the remaining 4,000 at TARL, the Western Archeological Conservation Center, and universities throughout North America and the world. Of these 15,000, only 5,000 are catalogued--which is only approximately 1/3 of the collection. The university collections are not inventoried or accounted for. At present it is not even clear which institutions have collections from Carlsbad Caverns National Park.

J. STAFFING DEFICIENCIES

Staffing is insufficient to provide an adequate resource data base, fundamental research capability, and essential levels of management and protection for cave and surface resources. Funding and/or personnel cuts will result in corresponding curtailment of park activities including closure of park or cave areas to the public, reductions in hours of operation, and the elimination of special services.

K. MANAGEMENT OF LECHUGUILLA CAVE

Lechuguilla Cave is the deepest and fourth longest cave in the United States, and contains, arguably, the most spectacular formations in the world. Entry into Lechuguilla is permitted only for exploration and mapping, limited photography, and research. It is not open to recreation caving. The logistical and technical challenges of work in Lechuguilla preclude all but the most physically fit and technically expert cavers from entering. Exploration and mapping have been undertaken by cooperating cavers. Exercising the proper level of management control and protection of Lechuguilla, while maintaining a close liaison with volunteer cavers, and trying not to dampen their enthusiasm, is a continuing management challenge.

A high priority for the park is to maintain Lechuguilla in its essentially pristine condition. Cavers go to extraordinary lengths to keep it that way. However, a paradox of caving is that, once a cave passage is entered, it is inexorably changed. A continuing management challenge is to determine how much exploration is enough, and when the cave needs a rest, even from lofty and laudable research projects.

With the cave's current mapped length of 60 miles, and with many unexplored leads remaining, there is a potential that some passages may extend beyond park boundaries and/or connect with

other caves outside the park. Such events will necessitate agreements with park neighbors to ensure the protection of Lechuguilla. Oil and gas extraction activities near the park boundary pose a potential threat to Lechuguilla from a variety of pollutants associated with the exploration and extraction process, whether or not explorable passages go beyond the boundary. Research has already shown that cracks and fissures connected to Lechuguilla Cave extend beyond the boundary.

The complexity of Lechuguilla and its exploration, and the unique, world-class stature of its resources require a sophisticated resource management effort by the park. Presently, there is inadequate staffing and funding for the park to provide the needed oversight, research coordination, and direction for the proper management of Lechuguilla. The park has no geologist, hydrologist, or physical scientist on staff.

The April 1991 rescue of Emily Mobley from Lechuguilla revealed that the technical difficulties of such a rescue, the expertise required, and the cost of the effort can quickly push the park's inadequate resources to the limit. As the outer limits of Lechuguilla are probed, the difficulties and demands of another such rescue will only increase.

L. AIR QUALITY

The park is a designated Class I area for air quality under the Clean Air Act. Air quality in the park can easily be affected by oil and gas, industrial, mining, refining, or similar developments in the vicinity, or from many miles away when wind currents carry pollutants over the park or into vistas viewed from the park. Expanding energy-related development could potentially affect park air quality and in turn affect vegetation and cave resources.

M. WATER QUALITY

The park's water supply, which originates from an aquifer 6 miles blow the escarpment south of Carlsbad Caverns, is susceptible to contamination from leaks in wells in and near an underground natural gas storage plant located less than 3 miles west of the park well at Rattlesnake Springs. Leaks in the past in nearby aquifers have contaminated other private water wells 2 miles west of the spring. Hydrologists state that Rattlesnake Springs is downstream from two aquifers that merge in a "y" shape, and that mixing of these sources can vary under different conditions.

N. WILDERNESS

Because of the park's long, narrow configuration (varying from 3 to 6 miles in width, and 21 miles long), developments and

activities near park boundaries can potentially have an adverse affect on wilderness quality and character within the park. Such effects can result from both sound or sight.

O. VEGETATION CHANGES

Vegetation changes have occurred from trespass grazing and from fire management activities in previous years. Prescribed management fires and other resource management programs to restore natural conditions in certain areas and zones may become a controversial issue with some individuals or groups, as actions outlined in the Fire Management Plan and Resource Management Plans are carried out.

P. INTERPRETIVE SPACE NEEDS

Office space for the park's interpretive rangers is grossly inadequate for supervisory activities, curatorial activities, the preparation of interpretive programs, a research library, slide files, administrative work, and storage for equipment and supplies. The Carlsbad Caverns-Guadalupe Mountains Association sells interpretive materials in a 225-square-foot corner of the visitor center lobby. That space is insufficient for the number of titles carried, the numbers of visitors served, and the volume of business conducted each year. Approximately 4,400 square feet of the visitor center complex, presently occupied by the park concessioner and used for the nursery, kennel, and storage, may revert to park use if the concessioner undertakes a planned addition of similar size for his use. Consideration should then be given to moving the administrative offices to the park to better utilize the work hours available.

Q. VISITOR USE

Potential issues relating to visitor use range from local tourism and travel industry concerns that would be present if future use limits or carrying capacities were established severely restricting or reducing present visitation limits, to concerns by others that peak season or holiday limits are overdue. Although parking areas and elevator capacities seem to be a logical and effective way of establishing the visitor capacity of Carlsbad Cavern, it is generally recognized that during the park visitation period of June through August visitation is normally at a point where the quality of a visitor's trip through the main cavern is affected by crowding. On the other hand, vandalism incidents in the cavern tend to increase when visitation is low during the off-season, when other visitors are not present along the trail being traveled by would-be vandals.

Other concerns related to visitor use that could become issues are access to other backcountry caves not open to cavers under

the park's Cave Management Plan; and access to trailheads at Double Canyon, Rattlesnake Canyon, and other points along the south boundary, which must be reached by traveling across non-park land. The Ogle/Rainbow Cave complex across the canyon from New Cave was left out of the designated wilderness to allow the option for another developed cave in the park. Some would like to see this cave complex developed for general visitor use because of its historic guano-mining equipment; large size; and spectacular formations, which include one of the world's tallest known columns. Others would like to see access remain limited to qualified cavers.

Expanded caving opportunities into other backcountry caves, and the impacts of these upon cave resources is another issue to be evaluated.

R. ENTRANCE ROAD FLOODING

Portions of the park's 7-mile, two-lane paved entrance road lie within the mapped floodplain, and have been severely damaged or washed out several times during the park's history. Funding constraints preclude road improvements to correct the flooding problem. A new access road from near White's City to the Carlsbad Cavern area has been proposed but is not under serious consideration at this time. Additional culverts at each of the road/stream crossings would reduce the number of road closures due to flooding, and improve safety.

S. STAFFING INADEQUACIES

Unlike most national parks, where visitors can enjoy the resource on their own, the very nature of Carlsbad Caverns requires a large staff to ensure visitor safety, protection for the cave and quality interpretative activities that instill a sense of appreciation for the cave and its preservation. Cave resource protection, visitor orientation and information, fee collection and interpretive programs are all provided by rangers. The Carlsbad Caverns Visitor Center is one of the most heavily used in the National Park System with annual visitation, sometimes exceeding 800,000. Historically, staffing levels have never been adequate to provide the essential resource protection and visitor services required. Funding and staffing cuts further erode the park's ability to provide those services.

T. PARK WATER SUPPLY

The park water supply comes from a detached Rattlesnake Springs unit, 15 miles from park headquarters and 6 miles south, below the escarpment. Although park water rights on this source have priority, junior water rights on a portion of the spring flow are owned by neighboring Washington Ranch, now operated as a unit of

the Carlsbad Area Retarded Citizens Farm. A potential exists for conflict concerning the distribution of allotted amounts to Washington Ranch, which must be delivered through ditches on park land and controlled by NPS personnel. A potential also exists for controversy with The Nature Conservancy, which receives and depends upon water received as overflow down the natural drainage from the spring to a wetland bird habitat adjacent to the unit.

Water from the Rattlesnake Springs aquifer is pumped 6 miles horizontally and over 500 feet vertically to storage tanks west of park headquarters. Pump failure or breaks in the main line can have a major impact on operations if an adequate supply of stored water is not maintained, along with a dependable distribution system between the storage tanks and headquarters. Hydrologists have suggested that drilling of a new well at (or near) storage tanks or park headquarters could result in long-term savings if successful. This proposal, if approved and successfully completed, would eliminate the need for maintaining 6 miles of 6-inch pipeline from Rattlesnake Springs; remove the visual distraction of the above-ground water line (visible from the Walnut Canyon Desert Drive); result in energy savings from pumping water up hill for 6 miles; and eliminate the cost of maintaining expensive pumping equipment. Flow from the tank area is by gravity.

U. CONCESSIONS

Concession services have been offered by the same concession company since first authorized and established in 1927. Services provided include both above-ground and in-cave operations and facilities. The in-cave facilities and services, although rooted in history and deemed necessary and appropriate, have become more controversial in recent years. An environmental assessment dealing with both the above- and below-ground operations was prepared and approved in 1989 in connection with the start of negotiations for a new concessions contract. The assessment looked extensively at all aspects of the operations, as well as at biotic, abiotic, sociological, and economic impacts, and included a visitor survey and public involvement. Based on the results of the assessment, a new proposed contract was negotiated and agreed to by the concessioner in 1990. However, due to policy changes, the contract was not approved by the NPS, and was returned with changes that the concessioner has not agreed to. Operations are currently continuing under an interim authorization. Although the restaurant and gift shop are in concessioner-owned facilities, the nursery, kennel, office, and most storage space used by the concessioner are in a Government-owned building containing about 4,500 square feet that the NPS proposed to reclaim to meet other critical NPS needs. Under the new contract, the concessioner would build a replacement facility to house operations currently in the Government-owned building.

V. PARK HOUSING

Present dormitory space is in two converted, 1930's-vintage, historic two-bedroom residences. The number of available beds is inadequate to meet park needs, and a very tight housing market outside the park compounds the problem of recruiting seasonal employees and Student Conservation Association aides and volunteers. Also, the present dorms do not meet codes, and cannot be brought up to code. A proposal has been submitted under the Housing Initiative for a new dorm to replace the temporary, inadequate facilities now being used.

W. CAVE RESEARCH INSTITUTE

A congressionally mandated study on the feasibility of establishing a National Cave Research Institute, possibly located in the vicinity of the park, was started in 1992. The city of Carlsbad and Carlsbad Chamber of Commerce, and other land management agencies in the area support the idea of such an institute. The effects and impacts of the proposed institute on park resources and park operations, both good and bad, need careful evaluation. If properly planned and funded, and if operated in a manner compatible with park management goals and objectives, the proposed institute could potentially be a very valuable asset to the park and area--one of the prime caves and karst areas in the nation.

III. MANAGEMENT OBJECTIVES

A. RESOURCE MANAGEMENT

To ensure the protection and long-term perpetuation of the natural and historical conditions and associations of all cave and surface resources, the park will:

1. Manage the park to ensure the perpetual preservation and visitor enjoyment of park resources.

2. Manage public use in caves in a manner that will minimize deterioration due to human and natural impacts.

3. Rehabilitate and restore cave areas that have been adversely altered by disruptive management and development practices of the past; by vandalism and other human impacts; and by natural impacts.

4. To acquire, through research, monitoring, exploration, and other means, necessary information concerning the extent and nature of cave resources; the effects of visitor use on the caves; the suitability of cave resources for existing and potential uses; the correlation between surface development and use and cave impacts; and the sources and significance of pollution of the cave environment, and the effects of pollution on cave process and cave life.

5. To secure, through research, monitoring, exploration, and other means, information to enable proper management of surface resources, including, but not limited to, the bat colony, archeological/geological/paleontological sites, the mountain-lion population, backcountry/wilderness, and the natural role of fire.

6. Ensure, through boundary expansion or other appropriate means, the protection from external threats of major caves, canyons, flora, fauna, and other park resources.

7. Research, monitor, and when possible mitigate, the deterioration of surface resources due to impacts such as oil and gas developments, and trespass livestock from adjoining lands.

8. Maintain adequate, well-catalogued, and up-to-date records of park collections; provide adequate space to store collections; provide a controlled, stable, and secure storage environment; and provide adequate staff to perform curatorial functions.

9. Provide adequate staffing to protect cave and surface resources.

10. Cooperate with neighboring government agencies, private landowners, public organizations, and individuals in order to ensure that:

a. land use and development near the park are compatible with, and pose no threat to, the conservation of cave features, surface features, and other park resources;

b. cave resources discovered on lands near the park and important to the park story will receive adequate protection; and

c. recreational development and visitor services in the local area will complement, to the greatest extent possible, those developments and services available in the park.

B. VISITOR USE

To create within the public a sense of the value of park resources and the importance of their conservation, the park will:

1. Provide a broad range of high-quality interpretive activities and media that enlighten, educate, and infuse the value systems of visitors with a sense of the importance of parks and cave resources.

2. Reach into nearby communities to provide educational interpretive activities that instill the importance of parks and cave resources in the value systems of park neighbors, community groups, and future park users.

3. Provide sufficient staffing and employee development to ensure cave resource conservation and a high-quality interpretive and visitor service program.

4. Support the interpretive and visitor service program through the sale of high-quality, relevant interpretive publications, and an active publishing program by the park's cooperating association.

5. Provide an adequate, well-equipped and safe workspace in the visitor center for visitor services; cooperating association activities; program and media preparation; supervisory and administrative activities; curatorial activities; library activities; and storage of equipment, supplies, files,and historical records.

6. To protect visitors and the resource through successful law and safety regulation enforcement, including a continuous public information program.

7. To provide the maximum possible accessibility to and utilization of physical park facilities by handicapped citizens.

C. FACILITY MANAGEMENT

To ensure an adequate level of safe, functional, and appropriate public use and management facilities, the park will:

1. Provide and maintain public use and support facilities for the optimum efficiency of management activities and visitor use.

2. Ensure that park roads remain safe and dependable.

D. CONCESSIONS

To manage an appropriate concession program based on visitor needs and commercial services available in the surrounding area.

E. DEVELOPMENT

To ensure that park development is the minimum necessary for park administration and the provision of essential services to park visitors.

IV. BACKGROUND

A. LOCATION

Carlsbad Caverns National Park is in the southwestern part of Eddy County, New Mexico, within the State's Second Congressional District. The park entrance is 20 miles southwest of Carlsbad, New Mexico, near U.S. Route 62/180, at the western edge of White's City. The park contains 46,766 acres, and extends southwestward along the northeastern Guadalupe Ridge/Escarpment for a distance of about 21 miles. The park is about 6 miles wide at its widest point.

B. LEGISLATIVE/ADMINISTRATIVE CONSTRAINTS

1. "Carlsbad Cave National Monument" was established by Presidential proclamation on October 25, 1923. The monument boundaries were enlarged and the area was designated as Carlsbad Caverns National Park by a legislative act dated May 14, 1930. The park was further expanded by a Presidential proclamation of February 21, 1933; and by another Presidential proclamation of February 3, 1939. An act of December 30, 1963, made other boundary adjustments, and authorized the addition of the Rattlesnake Springs area, which had been acquired in 1934 for water-rights (supply) purposes when Oak Springs proved inadequate to meet the park's water supply needs.

2. In all, three Presidential proclamations, three Presidential Executive orders, and three congressional acts have authorized and shaped the park's present size and configuration. The Presidential proclamations and legislative act that created the park, and the current National Park Service Management Policies (approved in 1988) require that the park be managed so as to preserve all natural features, including caves, rock formations, plants, animals, and archeological/historical resources, while simultaneously providing, through appropriate facilities and services, for the safe, enjoyable use of the park by visitors.

3. Land acquisition is complete except for a single, private, 340-acre tract, which is surrounded by wilderness in a critical scenic zone along the park's western boundary. Existing authority restricts the methods of acquisition of this tract to donation or exchange. A Land Protection Plan (1984; revised 1987) addresses this situation, provides alternatives, and makes management recommendations. A total of 33,125 acres of the park's 46,766 acres are officially designated as wilderness, and must be managed in keeping with provisions of the Wilderness Act (78 Stat.890).

4. The National Park Service and the State of New Mexico have concurrent law-enforcement jurisdiction over the park. Commissioned National Park Service officers can enforce both Federal and State regulations therein. State and local authorities may also exercise jurisdiction within the park. Current operating procedures are explained in a memorandum of understanding with Eddy County.

5. Emergency ambulance service is provided and governed by a memorandum of understanding with the Carlsbad-South Eddy County Ambulance Service; and sponsorship of the park's Emergency Medical Services Program is provided and governed by a memorandum of understanding with Guadalupe Medical Center in Carlsbad, New Mexico.

6. Fire-management and fire-suppression activities are governed by provisions of cooperative and interagency agreements with the U.S. Forest Service; the Bureau of Land Management; and the White's City Volunteer Fire Department. Wildlife management is subject to provisions of a State-wide agreement with the New Mexico Department of Game and Fish. Cave-research and cave-management activities are similarly guided by agreements with the U.S. Forest Service, Bureau of Land Management, and Cave Research Foundation, as well as by the Federal Cave Resources Protection Act of 1988 (16 3 USC 4300-4309, 102 Stat, 4546). The National Park Service utilizes volunteer personnel from the Cave Research Foundation and National Speleological Society to do most cave exploration, surveying, and mapping. Memorandums of Understanding and local "Operating Procedures" govern the activities of the Cave Research Foundation.

7. Two special authorities have been legislatively granted to the park: One (67 Stat. 495) allows for the National Park Service to transport park employees between the park and the city of Carlsbad, for a charge, in the absence of adequate commercial transportation. This has been, and is being, done. Another authority allows for conveyance of a road right-of-way to the State for a new access road (extending from the west edge of SE 1/4 sec. 35, T. 24 S., R.25 E., to the area of Carlsbad Cavern). In effect, this would provide a second access-road from White's City to the caverns visitor center--one that would not be subject to the flooding that periodically closes the present road.

8. A memorandum of understanding with The Nature Conservancy provides for a portion of the Rattlesnake Springs unit and an adjoining tract owned by the conservancy to be managed as a natural zone.

9. An agreement with the Carlsbad Caverns-Guadalupe Mountains Association (the cooperating association formerly known as the "Carlsbad Caverns Natural History Association") provides for the publication and sale of interpretive and informational material. As requested by the park, the association produces interpretive publication and video-tapes to be sold or provided

free to the public, and purchases interpretive materials for resale. A supplement to this agreement provides for the association to distribute interpretive radio-receivers to park visitors for a fee, and retrieve them. The association's income is made available to Carlsbad Caverns and Guadalupe Mountains National Parks to aid their interpretive programs. A portion of the income from the rental of radio receivers is earmarked and placed into a special amortization account for replacement of the interpretive radio system.

10. An interim contract extension with the Cavern Supply Company stipulates terms and arrangements for concession services. The concessioner provides a restaurant, gift shop, nursery, and pet kennel, and child-care at the visitor center. Limited food, drinks, photography-related items, postcards, and certain clothing items are provided in the cave at the Underground Lunchroom.

11. White's City, Incorporated, provides commercial passenger-van service between White's City and the park visitor center on a daily schedule, although commercial licensing of this and other commercial buses has been deemed unnecessary.

12. In addition to these laws, regulations, and agreements, the following must also be considered in the management and development of Carlsbad Caverns National Park:

-Antiquities Act, 1906
-Historic Sites Act, 1935
-Endangered Species Act, 1973
-National Historic Preservation Act, 1973;
and amendments
-Executive Order 11988, Floodplain Management, 1977
-Architectural Barriers Act, 1968;
and implementing regulations regarding access
for disabled persons
-Executive Order 12372
-Public Law 91-383, as amended, requiring General
Management Plans for all parks,
and identification of carrying capacities
-Federal Energy guidelines regarding energy
conservation, Code of Federal Regulations
436, 1979
-Archeological Resources Protection Act, 1979
-National Park Service Management Policies
-National Park Service Guidelines
-Clean Air Act Amendments, 1977
-Federal compliance with Pollution Control
Standards, Executive Order 12088
-Federal Cave Resources Protection Act of 1988
(102 Stat. 4546)
-Public Law 101-578, November 15, 1990 (104 Stat. 2859)
on Cave Research Institute

C. RESOURCES

The park's natural and cultural resources are discussed in detail in the park's Resources Management Plan (revised in 1987), with appended bibliography and base-maps.

Justifying the park's inclusion in the National Park System are its 80 known diverse, spectacular, and fragile caves--including Carlsbad Cavern and Lechuguilla Cave, which are two of the world's largest and most beautifully decorated caves; and formations and biota associated with these caves.

The park contains 59 species of mammals, including a large colony of migratory Mexican freetail bats, and a small mountain-lion population. Also present are 273 species of birds; 44 species of reptiles and amphibians; 740 species of mountain and desert plants, some of them unusual; more than 125 archeological sites, including spectacular polychrome pictographs, and remains from the prehistoric Basketmaker era and historic Mescalero Apache Indian era; two designated historic districts; a Permian-age limestone reef, of interest to geologists all over the world; paleontological remains of extinct Pleistocene-era animals; and spectacular, scenic rugged mountain, desert, and canyon topography.

These resources and impacts upon them are discussed in detail in the Resources Management Plan. Those particularly relevant to park management and planning are targeted and described in detail in the "Major Management Issues" and "Management Objectives" sections of this Statement for Management.

D. LAND USE

Outside park boundaries, lands surrounding the park on all four sides (north, south, east, and west) are primarily used for ranching. On the park's north, south, and east sides are wells and transmission lines associated with oil and gas exploration. On the south side, near Rattlesnake Springs, is an underground gas-storage facility. These activities have increased in recent years, with some activity very near park boundaries and the park's domestic water supply at the detached Rattlesnake Springs unit, and Lechuguilla Cave.

The only non-Federal land remaining in the park is a privately owned, 340-acre inholding surrounded by the designated wilderness in the scenic Double Canyon area bordering the west boundary in the southwestern part of the park. The tract comprises steep, rugged terrain surrounded on the south, east, and north sides by National Park Service wilderness, and on the west by U.S. Forest Service Wilderness Study Area lands. The tract has no road access, no fences around it, and no other improvements upon it. The most feasible cross-country route to the tract is through the mouth of Double Canyon's south fork, which necessitates crossing

designated wilderness lands in the park. Double Canyon offers spectacular views, Douglas-fir and ponderosa pine forests, and typical Chihuahuan Desert plantlife. The tract may contain several scientifically significant caves with paleontological and cultural remains and bird-nesting sites, and it has been proposed for wilderness upon acquisition. (It is already in the park, although it is not federally owned.) It is currently not receiving any use, and is essentially managed as de facto wilderness. Mineral rights are owned by the State of New Mexico. The long-standing problem of providing suitable permanent protection for this tract is addressed in the park's Land Protection Plan (1984; revised 1987).

Approximately 40,000 acres of the park are primitive, undeveloped backcountry, 33,125 acres of which are designated wilderness. Historically, visitor use of this area has been limited by a scarcity of trails, the ruggedness of the terrain, high summer-time temperatures, and limited water. However, more people are beginning to visit the park's backcountry, and the park's Backcountry Management Plan, originally prepared in 1982, was revised and approved in 1991.

E. VISITOR USE

Annual visitation to Carlsbad Caverns National Park reached approximately 850,000 in 1972-73; slumped with the 1974-75 energy crisis; and peaked at 876,000 in the 1976 Bicentennial year. Visitation exceeded 860,000 in 1977-78; and has averaged from 750,000 to 790,000 visitor per year the past 5 years.

Approximately 50 percent of visitors come during the 3-month summer period of June, July, and August. Travel on weekends usually exceeds that of weekdays, and peak hours are usually between 10 a.m. and 11:30 a.m., and between 1 p.m. and 3:30 p.m. Visitation is heavy during major holiday periods, including Thanksgiving, Christmas, and New Year's Day. During the 10 years from 1966 to 1976, annual visitation grew on an average of 4.27 percent per year. A 1978 Transportation Study projected 1.5 million visitors per year by 1990, with visitation on peak-season weekdays reaching 9,800; and on weekend days reaching 13,000. Visitation has not increased at the above rate, but the projected number of visitors on peak weekend days is sometimes greater than can be properly accommodated. Although the carrying capacities of the park's natural resources have not been determined, the capacities of parking lots, cave trails, and elevators are known to be reached or exceeded at about 10,000 persons per day.

Park use will probably continue to be mostly day use in nature, and be centered around Carlsbad Cavern, unless facilities at Slaughter Canyon are expanded. The average length of stay is currently about 1/2 day in the park, and about 1 to 1-1/2 days in the area. This is not expected to change in the near future, although the percentage of visitors staying overnight in the

backcountry is expected to increase somewhat. Carlsbad community leaders are developing plans to make the city a destination for more extended vacation stays. If they succeed, the lengths of time that visitors stay in the park could increase.

Visitation is widespread and national in origin, rather than merely local or regional, and thus generally reflects national economic conditions. Periodic studies over the past 20 years have consistently shown that most visitors come from Texas, New Mexico, and California, but all states are represented. A significant number of visitors also come from foreign countries. Because of the park's close proximity to Mexico, many Mexican citizens visit the park, and basic publications and all interpretive exhibits are provided in both Spanish and English. A significant number of visitors also come from Canada, Germany, Japan, Great Britain, and France, and basic publications are provided in several other foreign languages to serve these foreign visitors.

Most visitors arrive in private vehicles by means of east-west highway routes. Commercial bus service is available from White's City, 7 miles from the cavern's visitor center. The city of Carlsbad, which lies 27 miles from the visitor center, offers regular scheduled air service, as well as car rentals. Rail passenger service (Amtrak) brings people to El Paso, Texas, 150 miles west of the park.

Visitor use is heavily concentrated in the developed area in and around Carlsbad Caverns; at Rattlesnake Springs; and at New Cave, near the mouth of Slaughter Canyon. Backcountry use is light, amounting to less than 1 percent of total park travel, but it would probably increase with improvements in the trail system and trailhead access.

There are two systems of public cave-tours at Carlsbad Cavern:

1. The system in use most of the year is self-guided. The self-guided system is necessary to accommodate large numbers of visitors; to permit visitors to walk at a pace suited to their individual physical capabilities and personal preferences; and to provide the best protection for the cave during periods of heavy visitation. The large tours (500 to 1,000 visitors) that were common prior to 1972 were unmanageable, and resulted in little more than herding crowds of people through the cave. The average pace of the tours was too slow for some, and too fast for others. With such large groups, considerable tour time was used for stopping and seating groups for talks and starting them up again. Most visitors could hear very little of what the ranger leading the tour was saying as they walked. Visitor enjoyment has greatly increased with the self-guided system, because visitors can travel at their own pace, and can receive as much interpretive information as they wish from the illuminated wayside exhibits, from the interpretive radio system, and from rangers circulating through the cave. Peak visitor loads, which were

previously concentrated during hours when tours were scheduled, have also leveled out, reducing crowding. With four elevators entering the cavern near the midpoint of the 3-mile "complete" (or" Blue) tour-route, visitors can choose walks of 1-3/4 miles, 3 miles, or 1-1/4 miles.

2. In addition to self-guided tours, when winter weekday visitation is low enough to enable tours to be limited to 75 persons guided tours, are conducted through a portion of the cave with the remainder being self-guided. The entire cave is self-guided on weekends. This system has proven to provide a reasonable level of protection for the cavern when staffing is adequate, and also provides a satisfactory interpretive experience for visitors.

The only other cave in the park open to regular guided public tours is New Cave. This large cave was mined for bat guano until around 1958, but remains undeveloped. New Cave tours provide a much different and more primitive cave experiences from those of Carlsbad Cavern tours. The cave is situated in an isolated area of the park, and is accessible only on foot, over a 1/2-mile trail from the end of the road at the mouth of Slaughter Canyon. Guided flashlight tours are conducted over a primitive path through the mined areas and beyond. Two guided tours lasting about 2 hours each are offered daily during the summer, and on weekends during the rest of the year. Tours are by reservation only, and are limited to 25 people. Two rangers are required to conduct each tour. Four daily trips were offered for several seasons when additional staffing was available.

Ten of the park's backcountry caves are open to cavers via permit under limitations and conditions spelled out in the park's Cave Management Plan.

To help ensure adequate protection of delicate cave resources, minimum staffing levels have been developed for the Carlsbad Cavern self-guided tours, and the maximum number of visitors per tour has been determined for guided tours at both the cavern and New Cave. Periodically, minimum staffing standards believed necessary for protection of the cave cannot be met because of budget constraints and/or training requirements.

E. FACILITIES/EQUIPMENT

The complexity of providing a high-quality interpretive experience, and the large size and tremendous depth of the cavern require a substantial investment in facilities and equipment. Keeping them in safe, effective operating condition through maintenance, rehabilitation, and eventual component replacement also involves relatively large costs.

Major facilities and equipment include: Entrance road, secondary roads, and parking; paved and primitive trails; amphitheater;

seating areas; visitor center and other buildings; cave and surface water, sewage, electrical and telephone systems, elevators, and solar-heating systems; picnic areas; concessioner-operated lunchroom, restaurant, gift shop, nursery, and kennel; patrol cabins; vehicles; horses and trailers; a long-distance two-way radio system with two repeaters; an interpretive radio system; picnic tables; specimen cabinets; furnishings for quarters; and miscellaneous tools and equipment.

1. Roads
There are 7 miles of paved, two-lane primary entrance road. (Portions lie within the mapped floodplain, and sometimes wash out or become damaged due to flooding.) There are also four additional miles of paved parking to accommodate 800 vehicles; 12 miles of graveled secondary road used regularly by visitors for scenic viewing and trail access; and 20 miles of primitive, unsurfaced secondary road used mostly for administration, protection, and resource management purposes, and only occasionally utilized by visitors.

2. Trails
There are 4 miles of paved, non-slip-surface trails in and around Carlsbad Cavern; and 57 miles of primitive backcountry routes.

3. Amphitheaters
The park has a 1,000-seat amphitheater at the cavern entrance, used for the evening bat flight program and other special events; a 450- to 500-person seating area in the cavern's Big Room; a 300- to 350-person seating area in the cavern's main corridor near Bat Cave; and a 300- to 350-person seating area near Iceberg Rock, used for interpretive talks.

4. Buildings
A 17,922-square-foot visitor center houses exhibits, elevators to the cavern, restrooms, fee-collection facilities, and interpretive office/work space. An interpretive staff of 30 to 60 employees works out of the visitor center, and is responsible for operating the visitor center; collecting fees; directing visitors through the cave; and providing all interpretive, safety, and resource-protection information to visitors.

The Carlsbad Cavern visitor center is one of the most heavily used in the National Park System: 700,000 to 800,000 visitors enter the facility each year, on an average of twice during each of their visits. The interior of the building was completely remodeled and new exhibits were installed in 1985. With the remodeling, new exhibits have been placed in the large lobby area, and a 100-seat theater has been provided in the old exhibit area. A bookstore, managed by Carlsbad Caverns-Guadalupe Mountains Association, occupies a corner of the former lobby area. The building is handicapped-accessible for visitors, but non-public work areas are not fully accessible.

Five other buildings, totaling 12,000 square feet, house maintenance shops and offices; warehouse storage-areas; and a fire-cache. A poorly designed historic building, originally used as a guide bunk house, totaling 5,000 square feet, houses an on-site operational office for the superintendent and staff; curatorial storage; and protection division workspace. (The administrative division, which also serves Guadalupe Mountains National Park, has offices in the city of Carlsbad.) There are also single-family quarters for 22 permanent or long-term employees, and two small two-bedroom historic residences converted to dormitories to house seasonal employees.

5. Utilities

The park has a water system with a storage capacity of 1.5 million gallons in two steel reservoirs; and 911 feet of vertical lift, plus 7.75 miles of mains.

The sewage system has 3.5 miles of main line, and four large lagoon cells with a surface area of 1.1 acres and a capacity of 1.5 million gallons.

The park has a 2,300-volt primary electrical system, and a cave lighting system consisting of 16.5 miles of primary and secondary wiring and over 800 lighting fixtures. Commercial electrical power is supplied by Southwestern Public Service Company to a substation, and distributed by means of underground lines belonging to the park. A 394-kilovoltampere (315-kilowatt), diesel-powered, backup generator in the visitor center building can provide electrical service for most of the headquarters area buildings and facilities during commercial power outages.

Commercial telephone service is provided by General Telephone Company by means of 4.75 miles of overhead and underground transmission wires.

Four high-speed elevators in two separate 750-foot shafts have a capacity of 1,200 passengers per hour.

The visitor center is equipped with a partial solar-heating system. Various combinations of solar, fuel-oil, and liquid-petroleum gas systems are used to heat buildings.

6. Picnic Facilities

Serving park visitors are a 22-site unit at Rattlesnake Springs; seven sites at the visitor center; three sites in Walnut Canyon; and three sites at the Slaughter Canyon/New Cave parking area. Picnic facilities are accessible to visitors with handicaps.

7. Concessions

A concessioner operates an underground lunchroom with a serving capacity of 1,200 people per hour, and seating for 550; a surface restaurant with seating for 235; a gift shop; a child-care nursery with a capacity of 30 children; and a kennel with room for 25 pets. The nursery and kennel are housed in an assigned

Government-owned building; the other concession facilities are owned by the Cavern Supply Company.

8. Patrol Cabins
There is one patrol cabin on the Guadalupe Ridge road near the west boundary and Putman Canyon; and another near the head of Yucca Canyon.

9. Major Equipment
Included are: 19 rented (GSA) and seven park-owned vehicles, road-grader, backhoe/loader, riding mower, road-sweeper, 200-gallon wildfire truck, 500-gallon structural-fire truck, water truck, park-owned dump truck, golf cart, all-terrain vehicle, fork lift, and diesel compressor; various shop power- and hand-tools; welding and plumbing equipment; vehicle repair equipment; structural and wildland fire suppression equipment; three horses, two pack mules, and two horse trailers; a two-way radio system; picnic tables; electronic cash registers; safes; weapons and other law enforcement equipment; weather station and cave climate monitoring equipment; darkroom equipment; specimen cabinets for curatorial storage; electronics shop; various office machines and equipment; several personal computers; and major appliances and furnishings for employee dormitories and other quarters.

The interpretive radio system has 43 listening zones, and consists of radio transmitters; 129 message repeaters, with messages in English (including a children's version) and Spanish; cable feeds; listening zones throughout the cave; 2,500 personal radio receivers; and mobile storage carts. The original system was installed in 1973. It was completely replaced and improved between 1986 and 1988. Renting of the interpretive radio receivers by the Carlsbad Caverns-Guadalupe Mountains Association should generate enough income to replace the system again in about 10 years.

G. MANAGEMENT ZONING

Except for the park's two historic districts, and the developed area around Carlsbad Cavern, the park is zoned and managed almost totally as a natural area. The 33,125 acres designated as wilderness, along with other park areas, are considered backcountry, with management practices detailed in a Backcountry Wilderness Management Plan (1991). In the natural zones, management emphasis is upon the conservation of natural resources and processes, and upon the accommodation of uses that do not adversely affect these resources.

Park development zones exist near Carlsbad Cavern, where the visitor center, maintenance shops, and employee housing are situated; and also at Rattlesnake Springs, where the park water supply originates and a large visitor picnic area is located. One other small, developed area exists at the mouth of Slaughter Canyon, where parking, picnicking, trailhead, and restroom

facilities are provided. The development zones indicate areas where park development and intensive use have altered the natural environment.

Although most of the park's backcountry cultural-resource sites lie within natural zones and are so small in size that separate historical zoning is impractical, a small historical zone has been designated for the Painted Grotto pictograph site in West Slaughter Canyon (a National Register of Historic Places property); and another has been designed for Ogle Cave, which contains the remains of an old guano-mining operation. Two other areas have been nominated for inclusion on the National Register: One, the Caverns Historic District, is located near the cavern entrance, and consists of 13 administrative, maintenance, and employee housing buildings; a limestone amphitheater; and a terraced area of parking-lots, roads, and trails. The other, the Rattlesnake Springs Historic District, is situated in the detached Rattlesnake Springs unit of the park, and includes an employee residence; a pumphouse; a rock-walled spring pond; the spring creek; irrigation ditches; an orchard; terraced pastures; and former building sites.

H. EXISTING PLANNING

Plan/Study	Preparer(s)	Approved	Adequacy
Master Plan	Park/DSC/SWRO	02-18-75	To be replaced with new GMP FY93/94
Statement for Management	Park/SWRO	09-88	To be replaced by this document
Interpretive Prospectus	Park/HFC	10-76	New plan needed--to be part of new GMP
Statement for Interpretation	Park	01-92	(Updated annually)
Exhibit Plan	Park/HFC	06-87	Satisfactory as ref for possible future need
Transportation Study	DSC	06-88	Rendered unnecessary by lower-than-expected travel
Resources Management Plan	Park	09-87	Current

Fire Management Plan	03-09-91	Current
Housing Management Park Plan	10-92	Current

I. PLANNING NEEDS

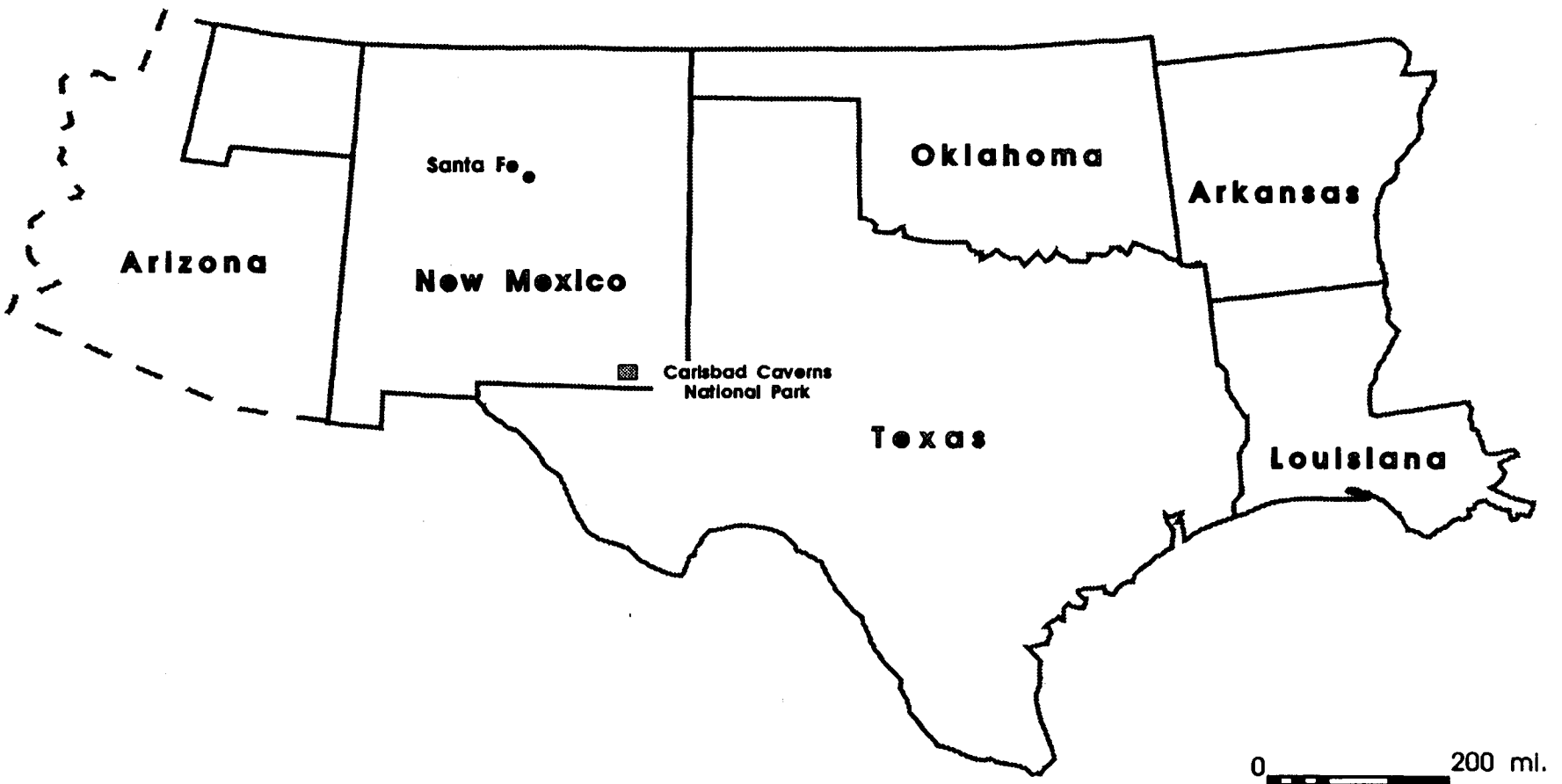
A master plan prepared by the park, Denver Service Center, and Southwest Regional Office was approved in February 1975, but it is out of date and too general in nature, and is tied to joint administration of the park with Guadalupe Mountains National Park, which is now administered separately. A new General Management Plan Study will begin in 1992.

An action plan on access and use of Lechuguilla Cave was approved in January 1991. An updated plan was started in 1992.

Study of the feasibility of a National Cave Research Institute, possibly near the park, began in 1992. The study will address the need for the facility, its costs, its purpose, what it should include, and where it should be located.

Depending on new General Management Plan proposals that may evolve in 1992, a new Development Concept Plan may also need to be considered for the park's Slaughter Canyon area.

Ogle/Rainbow Cave, which was left out of the wilderness area for future consideration as a second developed cave in the park, should also be evaluated to see if this is timely and appropriate, or whether its status should remain the same as it is now.



CARLSBAD CAVERNS NATIONAL PARK

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Southwest Region
National Park Service
Department of Interior

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Region Map

Carlsbad Caverns National Park

National Park Service

United States Department of the Interior

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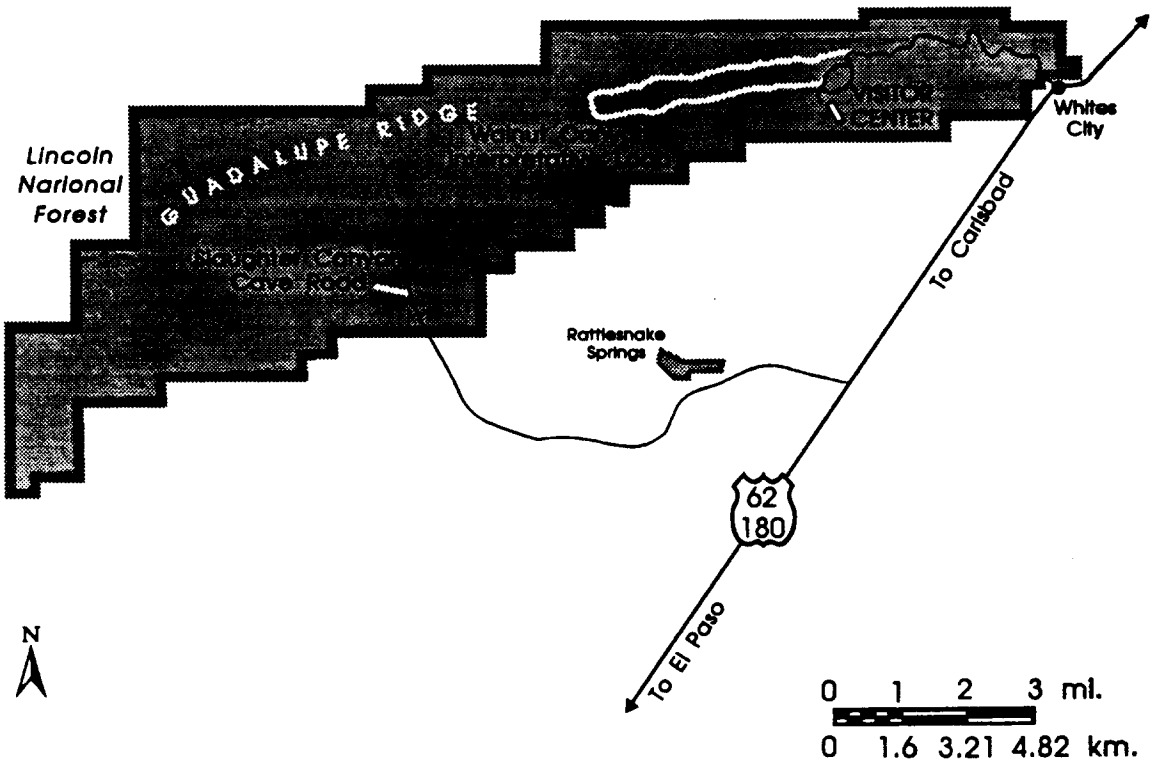

Vicinity and Boundary

Carlsbad Caverns National Park

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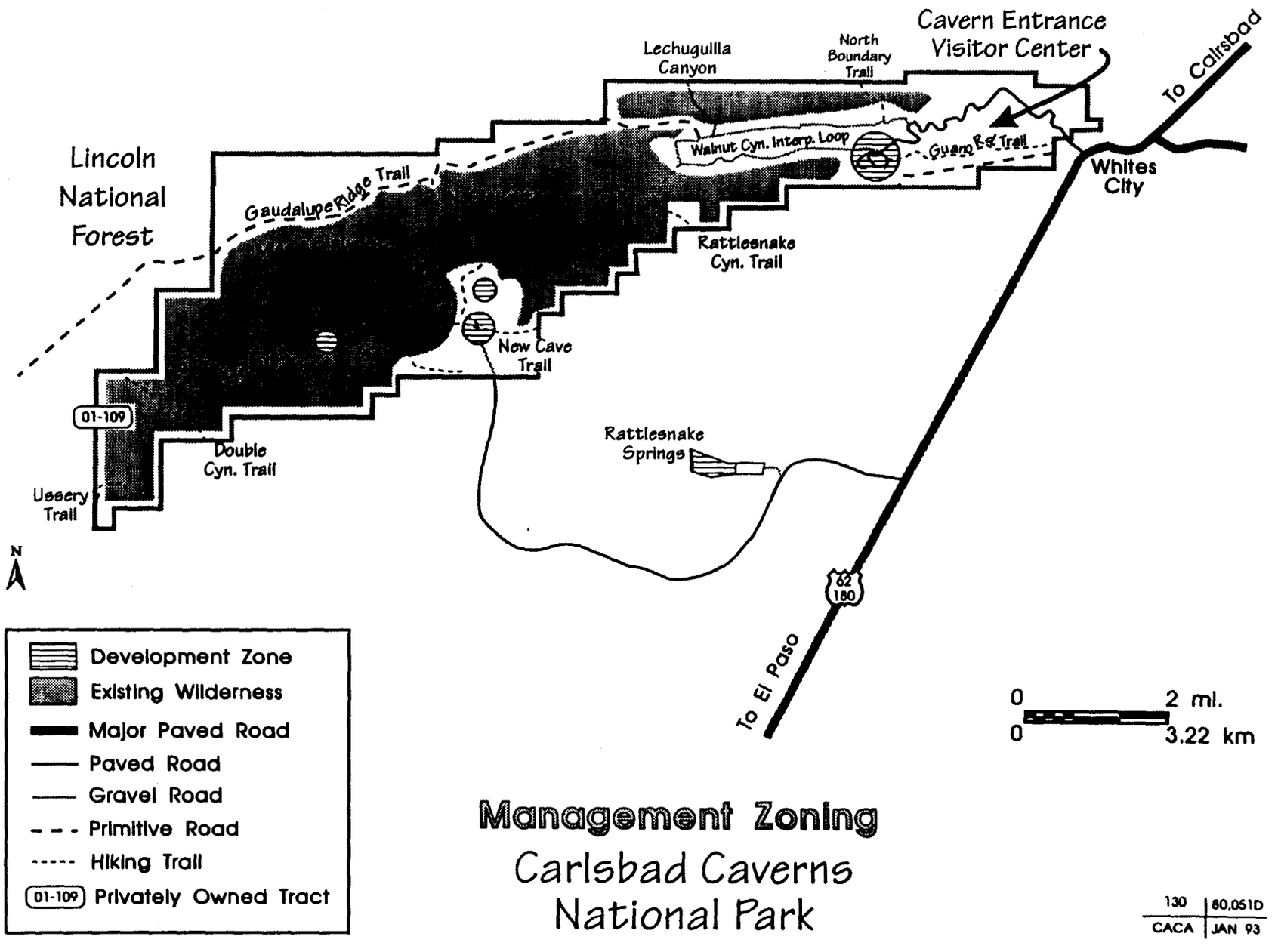

Management Zoning
Carlsbad Caverns National Park

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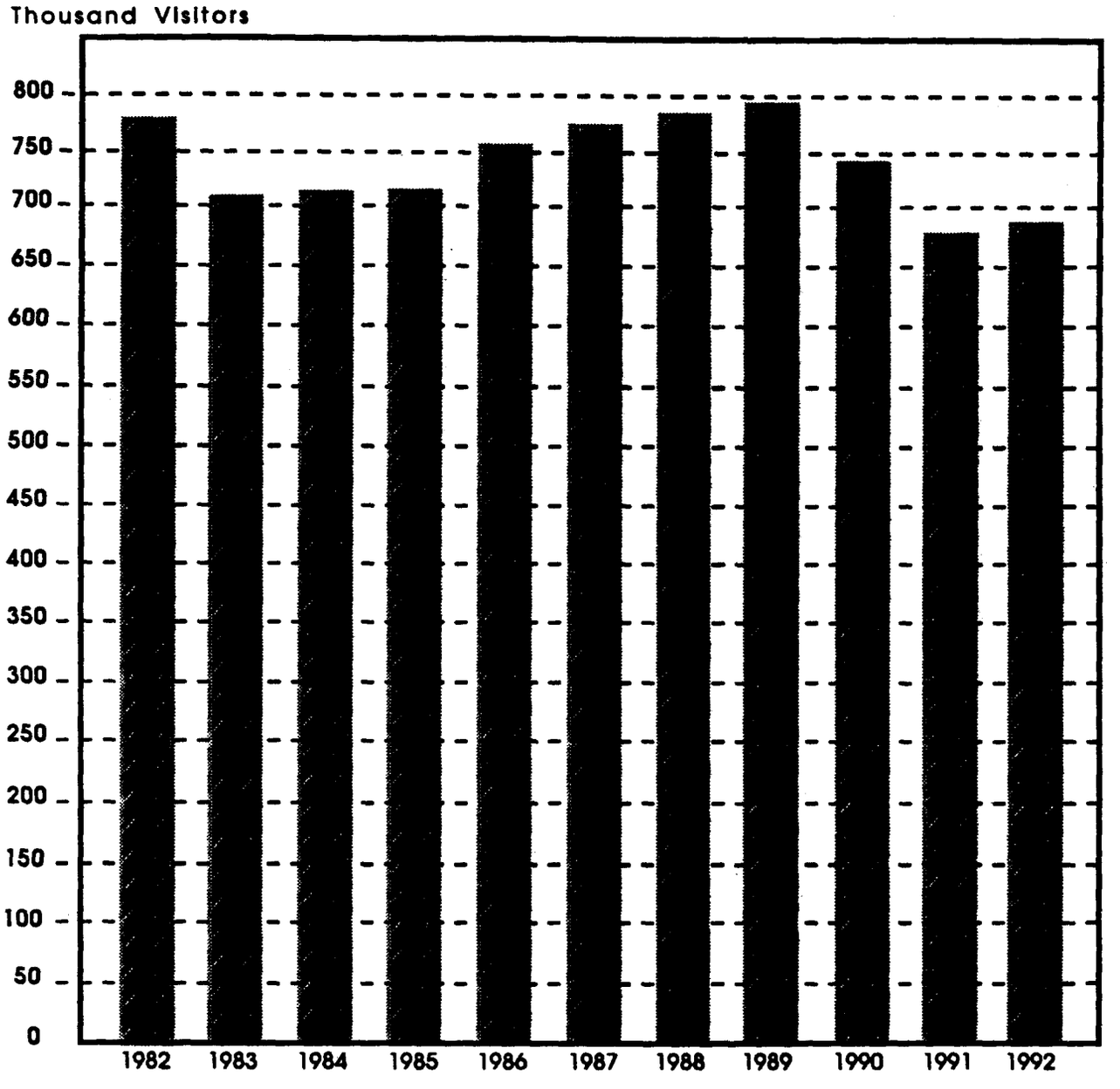
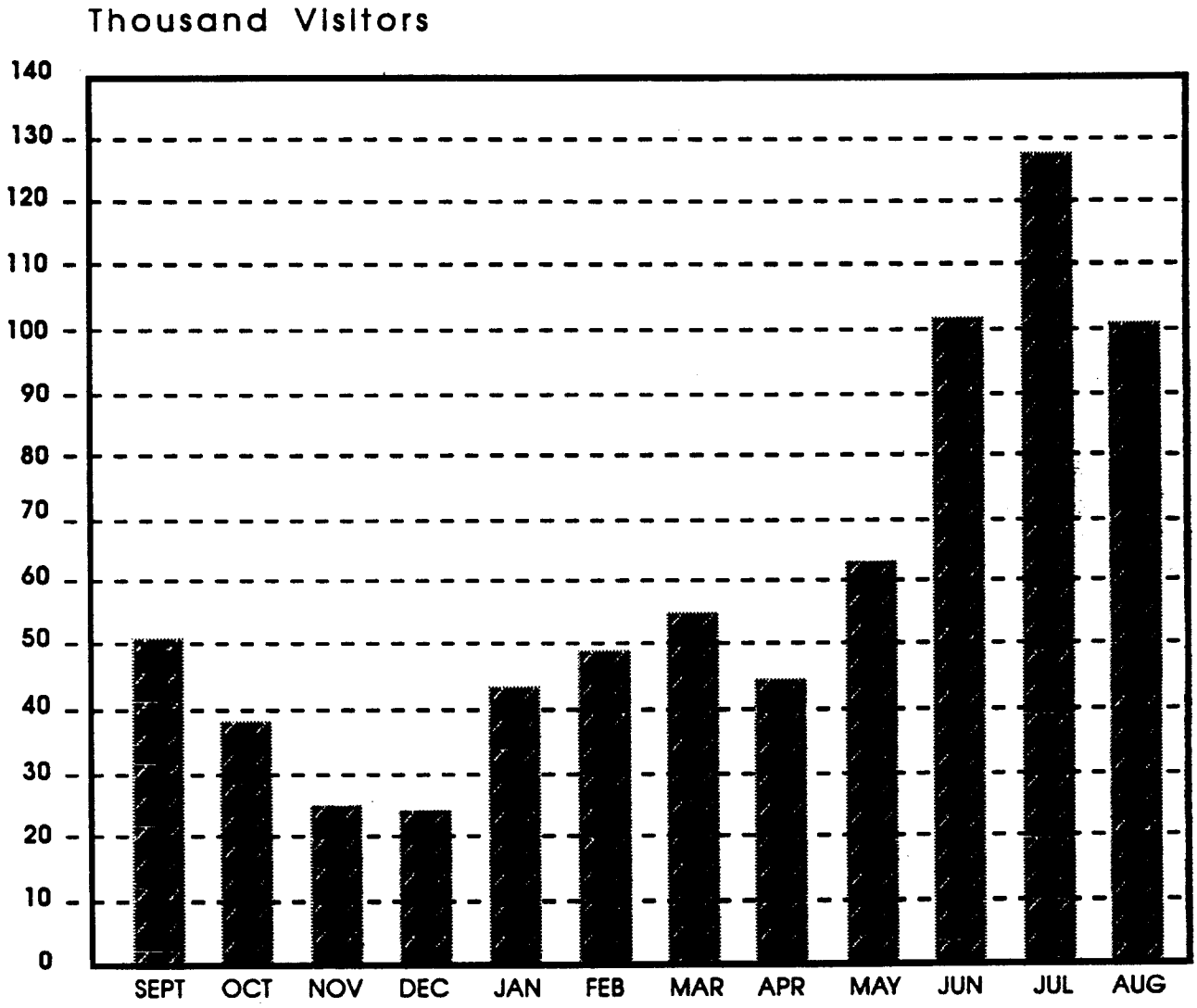
Ten Year Visitation



Carlsbad Caverns National Park

NEW MEXICO

Fiscal Year 1992 Visitation



Carlsbad Caverns National Park

New Mexico

21. Carlsbad Caverns National Park

An Act To establish the Carlsbad Caverns National Park in the State of New Mexico, and for other purposes, approved May 14, 1930 (46 Stat. 279)

Carlsbad Caverns National Park, N.Mex. Name changed to. Vol. 34, p. 225; vol. 43, p. 1929, amended.

Be it enacted by the Senate and House of Representatives of the United States of America in Congress assembled, That the tract of land heretofore known as the Carlsbad Cave National Monument, in the State of New Mexico, established and designated as a national monument under the Act of June 8, 1906, entitled "An Act for the preservation of American antiquities," and by presidential proclamation of October 25, 1923, be, and the same is hereby, declared to be a national park and dedicated as a public park for the benefit and enjoyment of the people under the name of the Carlsbad Caverns National Park, under which name the aforesaid national park shall be entitled to receive and to use all moneys heretofore or hereafter appropriated for the Carlsbad Cave National Monument. (U.S.C., 6th supp., title 16, sec. 407.)

Moneys for use of.

Administration by National Park Service. Vol. 39, p. 535. See p. 9.

SEC. 2. That the administration, protection, and development of said Carlsbad Caverns National Park shall be exercised under the direction of the Secretary of the Interior by the National Park Service, subject to the provisions of the Act of August 25, 1916, entitled "An Act to establish a National Park Service, and for other purposes," and Acts supplementary thereto or amendatory thereof. (U.S.C., 6th supp., title 16, sec. 407a.)

Water Power Act not applicable. Vol. 41, p. 1063.

SEC. 3. That the provisions of the Act of June 10, 1920, known as the Federal Water Power Act, shall not apply to or extend over the land hereby or hereafter reserved and dedicated as the Carlsbad Caverns National Park. (U.S.C., 6th supp., title 16, sec. 407b.)

Enlargement of boundaries authorized.

SEC. 4. That the boundaries of said Carlsbad Caverns National Park may be enlarged by subsequent proclamation or proclamations of the President upon the recommendations of the Secretary of the Interior, to include any or all of the following-described lands, to wit:

Description.

Sections 1, 12, and 13, township 24 south, range 22 east; sections 1 to 18, inclusive, 20 to 28, inclusive, and 33 to 36, inclusive, township 24 south, range 23 east; the entire township 24 south, range 24 east; sections 6, 7, 18, and

19, and 27 to 34, inclusive, township 24 south, range 25 east; sections 24, 25, 35, and 36, township 25 south, range 22 east; the entire township 25 south, range 23 east; north half of township 25 south, range 24 east; sections 5, 6, 7, 8, 17, and 18, township 25 south, range 25 east; sections 1, 2, 11, 12, 13, and 14, and 19 to 36, inclusive, township 26 south, range 22 east; west half of township and sections 22 to 26, inclusive, township 26 south, range 23 east; all with respect to the New Mexico principal meridian. (U.S.C., 6th supp., title 16, sec. 407c.)

WORLD HERITAGE NOMINATION - IUCN SUMMARY

CARLSBAD CAVERNS NATIONAL PARK (USA)

Summary prepared by IUCN/WCMC (March 1995) based on the original nomination supplied by the United States Department of the Interior, National Park Service. This original and all documents in support of this nomination will be available for consultation at the meetings of the Bureau and the Committee.

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1. LOCATION

Lies at the foothills of the Guadalupe Mountains, in southwestern Eddy county, New Mexico.

2. JURIDICAL DATA

Carlsbad Caverns was first designated as a national monument in 1923 and redesignated a national park in 1930. Approximately two thirds of the area were also gazetted as wilderness in 1978.

3. IDENTIFICATION

The park covers an area of 18,926ha and overlies a segment of the Permian fossil Capitan Reef. An extensive cave system has developed within the reef as a result of sulphuric acid dissolution and of the 81 known caves, Carlsbad Cavern is the largest. Exploration of the Lechuguilla Cave has been undertaken only over the past decade and has shown it to be one of the most pristine, extensive and decorated caves in the world.

Vegetation communities range from desert to coniferous forest. Some 800 plant species have been identified, of which three are internationally threatened: Sneed pincushion cactus, Lee pincushion cactus and Lloyd's hedgehog cactus. The faunal inventory includes 64 mammals, 331 bird and 44 herpetofauna species. The caves are noted for their migratory bat species, especially the Mexican free-tailed bat whose population is estimated at one million individuals. Various species of fungi and bacteria growing in the caves are of particular scientific and medical interest.

4. STATE OF PRESERVATION/CONSERVATION

Disturbances within the park include permanent damage incurred to speleothems and the cave ecosystem from tourism, decline in bat populations from the use of DDT as well as attempts to eradicate them in Mexico, oil and gas exploration, grazing by trespassing livestock, invasion by exotic fauna and the hunting of puma.

The National Park Service employs 85 permanent and 40 temporary staff and an updated management plan is due to be completed later this year. Separate plans have been prepared for visitor use and research of specific caves, particularly Lechuguilla.

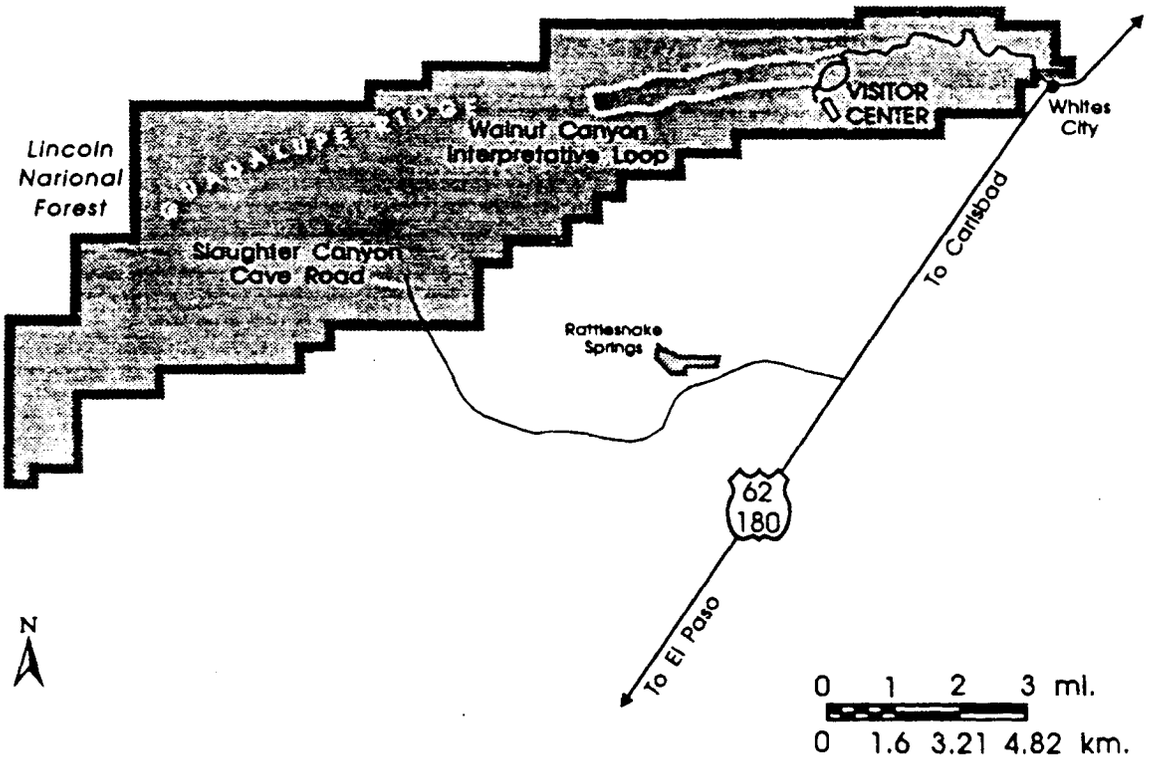
5. JUSTIFICATION FOR INCLUSION ON THE WORLD HERITAGE LIST

The Carlsbad Caverns National Park nomination, as prepared by the United States Department of the Interior, provides the following justification for designation as a World Heritage natural property:

(i) **Contains examples of the major stages of the earth's history and outstanding geological features** The Capitan Reef complex dates back to the Permian period, some 280 million to 225 million years ago. The exposed sections of this reef lying within the park are among the best preserved in the world accessible for scientific study. Geologists are able to study the rock formations not only through cave passages which penetrate the reef but also in exposures uncovered through erosion. Fossils include bryozoans, pelecypods, gastropods, echinoderms, brachiopods, fusulinds, sponges, trilobites and algae.

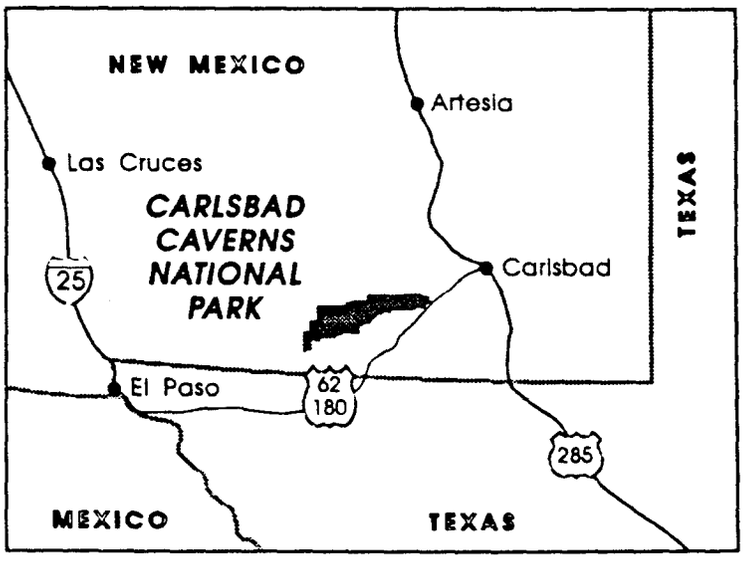
On-going geological processes are most apparent in the active portions of caves where rare speleothems continue to form. The most notable example of this is in Lechuguilla Cave, where helctites are forming underwater, a process which has never been described from any other cave in the world. Many other rare and unique speleothems such as the world's largest and most diverse collection of bacterially assisted "biothems" have been found within Lechuguilla Cave.

(iii) **Contains superlative natural phenomena or natural beauty** The large rooms in Carlsbad Cavern make this cave unique amongst other known and accessible caves throughout the world. Lechuguilla Cave contains the world's largest and most extensive accumulations of gypsum chandelier speleothems, many of which measure over 6m long and hang from the ceiling in large transparent selenite crystals. The cave also holds the world's largest accumulation of hydromagnesite balloons, subaqueous helictites, aragonite "Christmas Trees" and in-cave elemental sulphur and has an abundance of other calcite and gypsum formations.



Vicinity and Boundary

Carlsbad Caverns National Park



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WORLD HERITAGE NOMINATION - IUCN TECHNICAL EVALUATION

CARLSBAD CAVERNS NATIONAL PARK (USA)

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1. DOCUMENTATION

i) IUCN/WCMC Data Sheet (8 references)

ii) Additional Literature Consulted: Herak M. & Stringfield V.T. 1972. Karst; Courbon P. et. al. (ed.). 1989. Atlas of the Great Caves of the World 369pp; Middleton J. & Waltham T. 1986. The Underground Atlas. 239pp; DuChene H.R. et al. 1993. Report of the Guadalupe Caverns Geology Panel to the National Park Service; USNPS. 1994. National Cave and Karst Research Inst. Study. 36pp + annex.

iii) Consultations: 11 external reviewers, USNPS local park staff and cave specialists.

iv) Field Visit: March, 1995. Jim Thorsell.

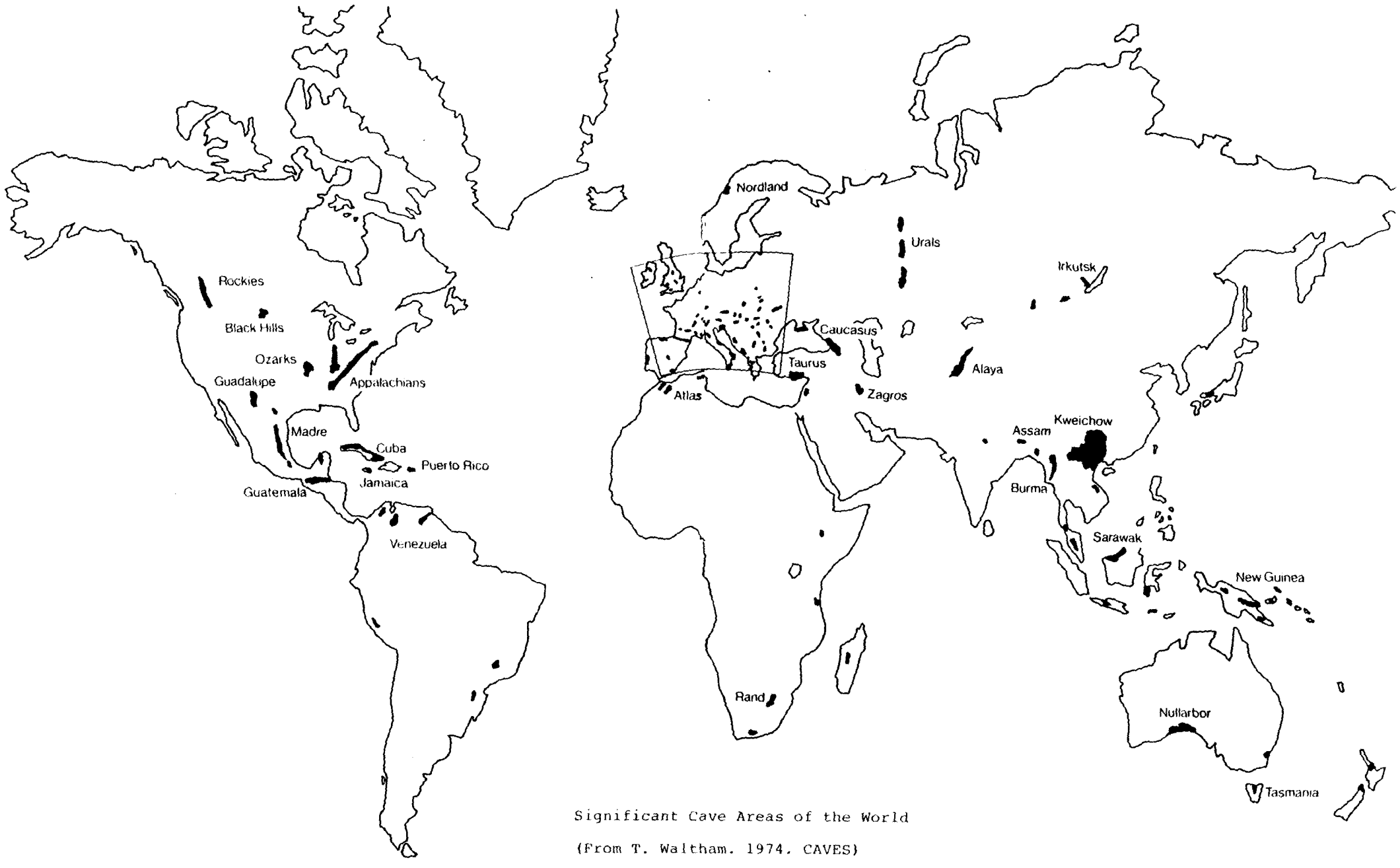
2. COMPARISON WITH OTHER AREAS

Karst cave systems are widespread natural features found in many parts of the world. The attached map indicates the location of some of the more significant cave regions. The USA alone has over 20 karst regions (see Map 2) and a total of more than 30,000 caves. Two sites have been inscribed on the World Heritage List for their karst features alone: Mammoth Cave in Kentucky and Skocjan Cave in Slovenia. Other very significant caves are associated features of other natural World Heritage sites in the Canadian Rockies, Nahanni, Grand Canyon, Tasmanian Wilderness, and the Australian Mammal fossil site. Other world class caves exist in Sarawak at Gunung Mulu and in Australia at Nullabor. In addition, the Agglatek cave and karst region in Hungary/Slovakia has also been nominated as a World Heritage site.

Reasonably complete inventories of the world's cave systems are available in the above cited references. These provide "Guinness lists" of the longest, deepest, and largest which are continually being revised as exploration continues. In assessing all cave nominations, IUCN has close liaison with the International Union of Speleology and carefully weighs their opinions in cave evaluations. In the specific case of Carlsbad Caverns National Park (CCNP), this Union as well as outside reviewers all agreed on the high natural values of the area. The relatively recently discovered Lechuguilla cave in the park was confirmed as having particularly exceptional features which, under strict protection, remain in an essentially undisturbed natural condition.

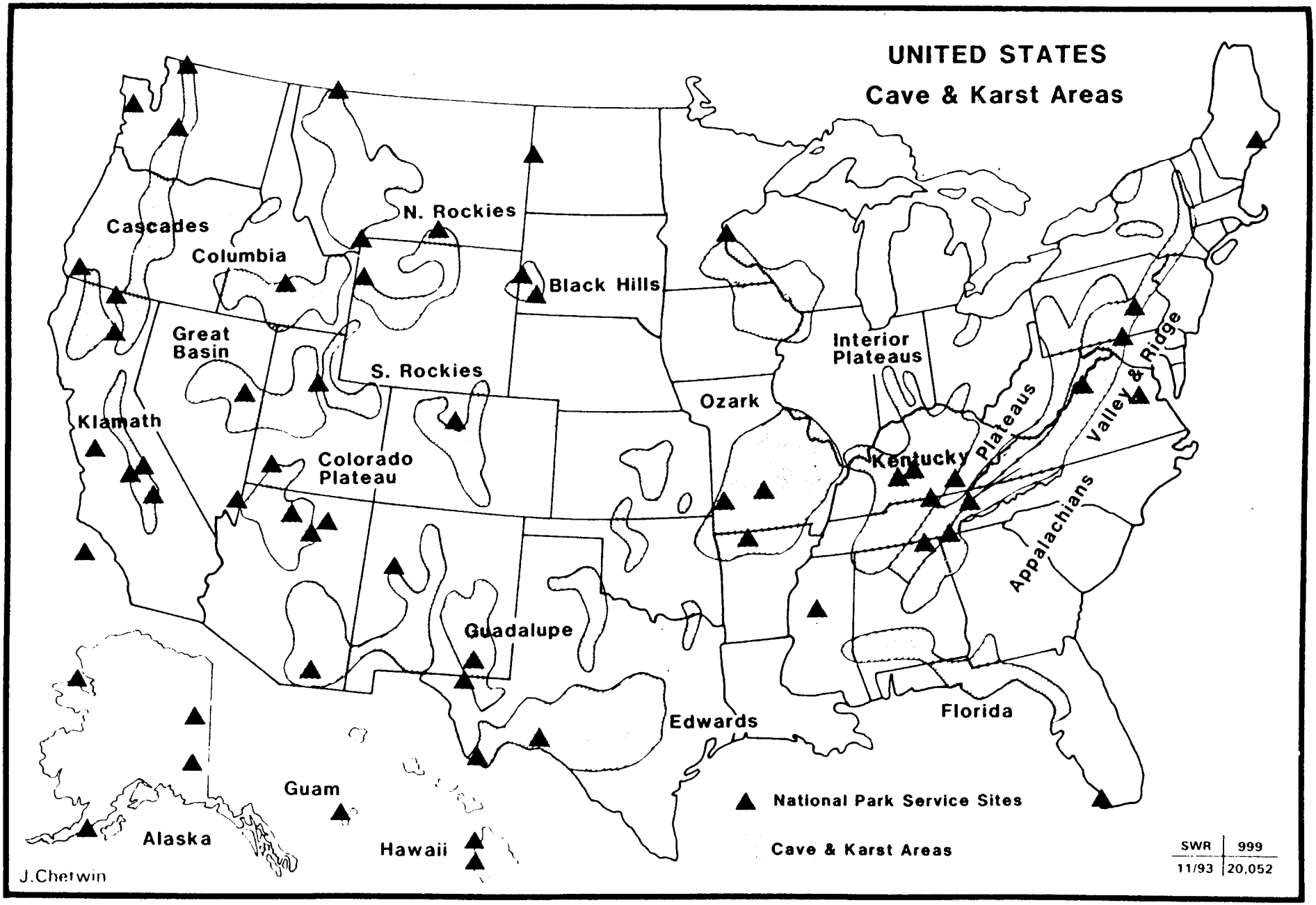
Carlsbad is radically different from the other two existing World Heritage caves. Mammoth Cave is notable for its enormous length, large level passages and jagged domepits. Skocjan is famous for its awesome river canyons and textbook portrayal of karst hydrogeology. CCNP is distinguished by its huge chambers which are far larger than those in Mammoth or Skocjan as well as for its decorative mineral features which also far surpass the other two. Carlsbad also contains 81 known caves, a very high concentration, with Lechuguilla now accepted as the single most outstanding of these and one of the most significant caves in the world in terms of scientific values.

In conclusion, CCNP contains some of the most outstanding caves in the world. It has spectacular beauty and its speleogenesis and biota and the natural condition of most of the caves put CCNP in a class of its own. Its features are distinctive from existing World Heritage cave sites and it does not duplicate values found elsewhere.



Significant Cave Areas of the World

(From T. Waltham. 1974. CAVES)


UNITED STATES
Cave & Karst Areas
Cascades
Columbia
N. Rockies
Black Hills
Great Basin
S. Rockies
Klamath
Colorado Plateau
Ozark
Interior Plateaus
Kentucky Plateaus
Valley & Ridge
Appalachians
Guadalupe
Edwards
Florida
Guam
Alaska
Hawaii
National Park Service Sites
Cave & Karst Areas
J.Chetwin
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CCNP is found within the Chihuahuan Biogeographical Province along with 22 other protected areas on the UN List of National Parks and Protected Areas. As its surficial environment is not a feature that is being considered, a comparison on this basis is not relevant. Nevertheless, it should be noted that the park has nationally significant values in terms of its Chihuahuan desert flora and fauna as well as important cultural heritage resources.

3. INTEGRITY

Mining for guano and tourism have had some effects on the integrity of some of the 81 caves found in CCNP. During the period 1903-1923 an estimated 100,000 tons of bat guano was removed by hand tools from the entrance areas of the accessible caves. Other human impacts from tourism became noticeable but in the 1970s various management measures were adopted which have largely brought these within acceptable limits. The park's updated management plan is due for approval in 1995 and various other specific cave management plans have been prepared. Since its initial exploration a decade ago Lechuguilla cave has been strictly managed allowing only closely monitored visits by researchers.

One unfortunate cave-related loss has been the decline in the Mexican free-tailed bat population which has declined from 5 million plus in the 1920s to less than a million today. As the bat flight to and from the caves is truly a wildlife spectacle, efforts are being made to reduce further losses. As the losses occur when the bats migrate to Mexico this requires international cooperation.

The one threat that IUCN would underline as serious is the potential for oil and gas exploration along the park's boundaries and the associated construction of transmission and storage areas that would accompany it. The problem has been studied by a panel of geologists who have recommended a "cave protection" zone outside of the northern boundary of the CCNP. If the Committee decides to inscribe the site a recommendation supporting the findings of the Panel's report should also be sent to the American authorities.

4. ADDITIONAL COMMENTS

The nomination, submitted in September 1994, used the former criteria for natural sites that expired in 1993. IUCN has re-written the summary of the nomination in conformity with the now existing criteria. The US authorities have been notified of this revision.

5. EVALUATION

Of the many thousands of caves occurring in North America and in the nearby Guadalupe Mountains, the caves within the CCNP are among the most outstanding. They are also notable worldwide because of the size, their mode of origin and the abundance, diversity and beauty of the decorative rock formations (speleothems) they contain. The Lechuguilla cave is particularly noteworthy as an underground laboratory where geological processes can be studied in a virtually undisturbed environment. The site clearly meets natural criteria *i* and *iii* and fulfills all conditions of integrity. The only threat that faces the park is oil and gas exploration near its borders. A decision for inscription should be accompanied by an expression of support for creation of a cave protection zone to the north of the park (i.e. condition of integrity *vi*).

6. RECOMMENDATION

Carlsbad Caverns National Park meets natural criteria *i* and *iii* and should be inscribed on the World Heritage list.

DÉSIGNATION POUR LA LISTE DU PATRIMOINE MONDIAL - RÉSUMÉ UICN

PARC NATIONAL DES GROTTES DE CARLSBAD (ETATS-UNIS D'AMÉRIQUE)

Résumé UICN/CMSC (mars 1995) préparé d'après la désignation d'origine soumise par le Département américain de l'intérieur, Service des parcs nationaux. L'original et tous les documents présentés à l'appui de cette désignation seront disponibles pour consultation aux réunions du Bureau et du Comité.

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1. SITUATION

Au pied de la cordillère de Guadalupe, au sud-ouest du comté d'Eddy, Nouveau Mexique.

2. DONNÉES JURIDIQUES

Les Grottes de Carlsbad ont été désignées «monument national» en 1923 et sont devenues «parc national» en 1930. Environ les deux tiers de la zone sont également classés «zone de nature sauvage» depuis 1978.

3. IDENTIFICATION

D'une superficie de 18 926 ha, le Parc couvre un segment du récif fossile du Capitan, datant du Permien. Un vaste réseau de grottes s'est formé à l'intérieur du récif suite à une dissolution par acide sulfurique et, des 81 grottes connues, celle de Carlsbad est la plus grande. L'exploration de la Grotte de Lechuguilla a été entreprise dans les dix dernières années et a révélé une des grottes les plus intactes, les plus vastes et les plus décorées du monde.

Les communautés végétales vont du désert à la forêt de conifères. On a identifié environ 800 espèces de plantes dont trois sont menacées au plan international: les cactus de Sneed, Lee et Lloyd. L'inventaire faunique décrit 64 mammifères, 331 oiseaux et 44 espèces appartenant à l'herpétofaune. Les grottes sont connues pour les espèces de chauve-souris migratrices qu'elles accueillent , en particulier la tadaride du Mexique dont la population est estimée à un million d'individus. Diverses espèces de champignons et de bactéries poussent dans les grottes et présentent un intérêt scientifique et médical particulier.

4. ETAT DE PRÉSERVATION/CONSERVATION

Le parc subit de nombreuses perturbations parmi lesquelles on peut citer: des dommages permanents causés par le tourisme aux spéléothèmes et à l'écosystème des grottes; le déclin des populations de chauve-souris en raison de l'utilisation du DDT ainsi que de tentatives d'extermination perpétrées au Mexique; l'exploration gazière et pétrolière; le pâturage par des animaux domestiques qui entrent illégalement; l'invasion par une faune exotique et la chasse au puma.

Le Service national des parcs emploie 85 permanents et 40 temporaires. Un plan de gestion mis à jour devrait être terminé à la fin de 1995. Des plans séparés ont été préparés pour les visiteurs et pour les chercheurs qui étudient certaines grottes, notamment Lechuguilla.

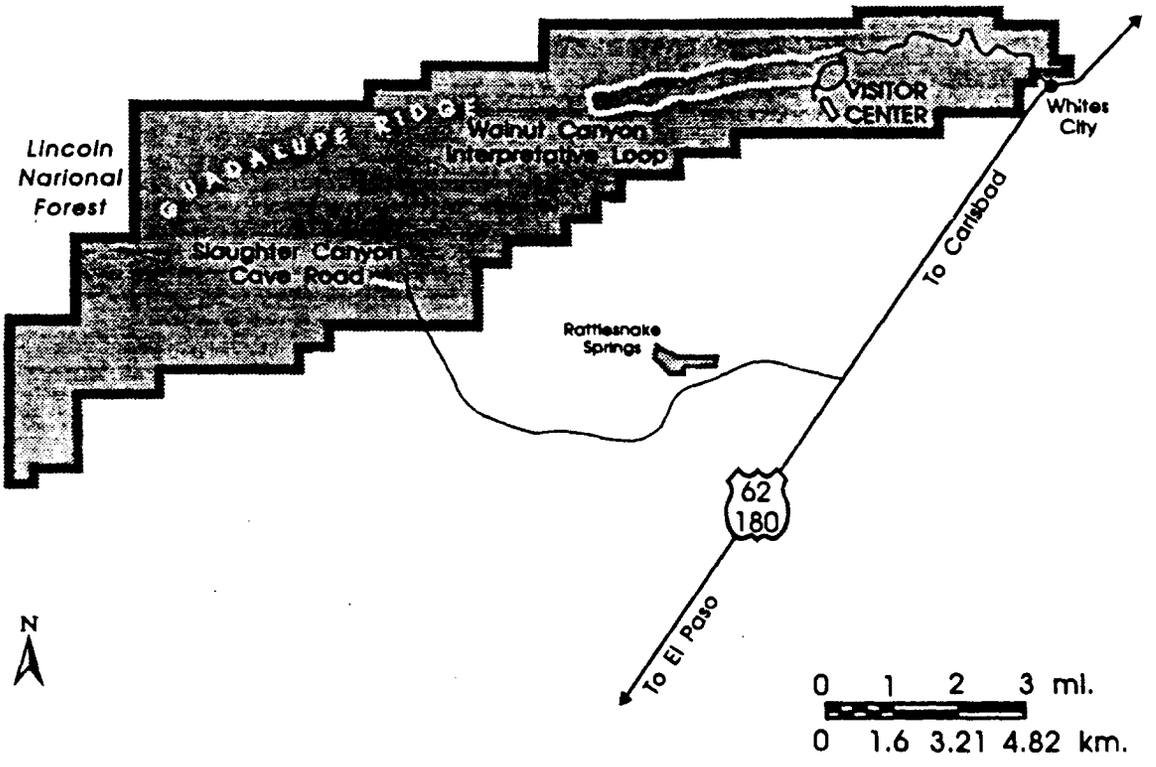
5. RAISONS JUSTIFIANT L'INSCRIPTION A LA LISTE DU PATRIMOINE MONDIAL

Pour justifier la désignation du Parc national des grottes de Carlsbad pour la Liste du patrimoine mondial, le Département de l'Intérieur des Etats-Unis d'Amérique donne les raisons suivantes:

(i) **Contient des exemples des grands stades de l'histoire de l'évolution de la Terre et des caractéristiques géologiques exceptionnelles.** Le complexe récifal du Capitan date du Permien, il y a entre 280 et 225 millions d'années. Les sections exposées du récif qui se trouvent dans le parc sont parmi les mieux préservées du monde et accessibles pour la recherche scientifique. Les géologues peuvent étudier les formations rocheuses non seulement dans les couloirs des grottes qui pénètrent à l'intérieur du récif mais aussi dans les parties exposées, découvertes par l'érosion. On y trouve des fossiles de bryozoaires, pélécypodes, gastropodes, échinodermes, brachiopodes, fusulines, éponges, trilobites et algues.

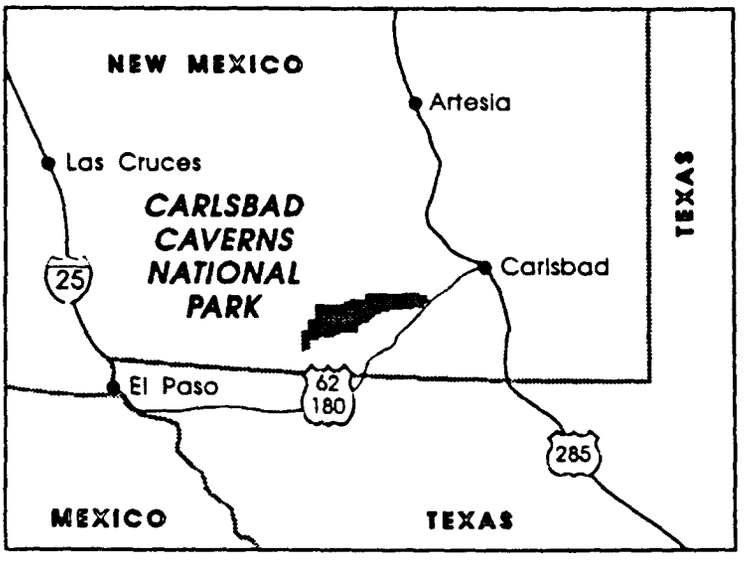
(ii) **Contient des exemples exceptionnels de processus biologiques en cours.** Les processus géologiques sont surtout apparents dans les secteurs actifs des grottes où des spéléothèmes rares sont en formation. L'exemple le plus remarquable se trouve dans la grotte de Lechuguilla où des hélictites se forment sous l'eau, processus qui n'a jamais encore été décrit. Dans la grotte de Lechuguilla, on a trouvé nombre d'autres spéléothèmes rares et uniques, par exemple la collection la plus vaste et la plus diverse au monde de «biothèmes» formés avec l'assistance de bactéries.

(iii) **Contient des phénomènes éminemment remarquables ou de beauté naturelle exceptionnelle.** Les grandes salles des grottes de Carlsbad font que ce complexe n'a pas son pareil parmi les grottes connues et accessibles de la planète. La grotte de Lechuguilla contient les accumulations les plus grandes et les plus étendues de spéléothèmes-chandeliers de gypse: beaucoup mesurent plus de 6 m de long et pendent du plafond en immenses cristaux transparents de sélénite. La grotte contient aussi la plus grande accumulation au monde de concrétions d'hydromagnésite, d'hélictites subaquatiques, «d'arbres de Noël» en aragonite et de soufre élémentaire à l'intérieur d'une grotte. Elle possède, en abondance, d'autres formations de gypse et de calcite.



Vicinity and Boundary

Carlsbad Caverns National Park



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DÉSIGNATION POUR LE PATRIMOINE MONDIAL - EVALUATION TECHNIQUE UICN

PARC NATIONAL DES GROTTES DE CARLSBAD (ETATS-UNIS D'AMÉRIQUE)

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1. DOCUMENTATION

i) Fiches de données UICN/CMSC (8 références)

ii) Littérature consultée: Herak M. & Stringfield V.T. 1972. Karst; Courbon P. et. al. (ed.). 1989. Atlas of the Great Caves of the World 369pp; Middleton J. & Waltham T. 1986. The Underground Atlas. 239pp; DuChene H.R. et al. 1993. Report of the Guadalupe Caverns Geology Panel to the National Park Service; USNPS. 1994. National Cave and Karst Research Inst. Study. 36pp + annex.

iii) Consultations: 11 examinateurs indépendants; personnel local du Service américain des parcs nationaux; spécialistes des grottes.

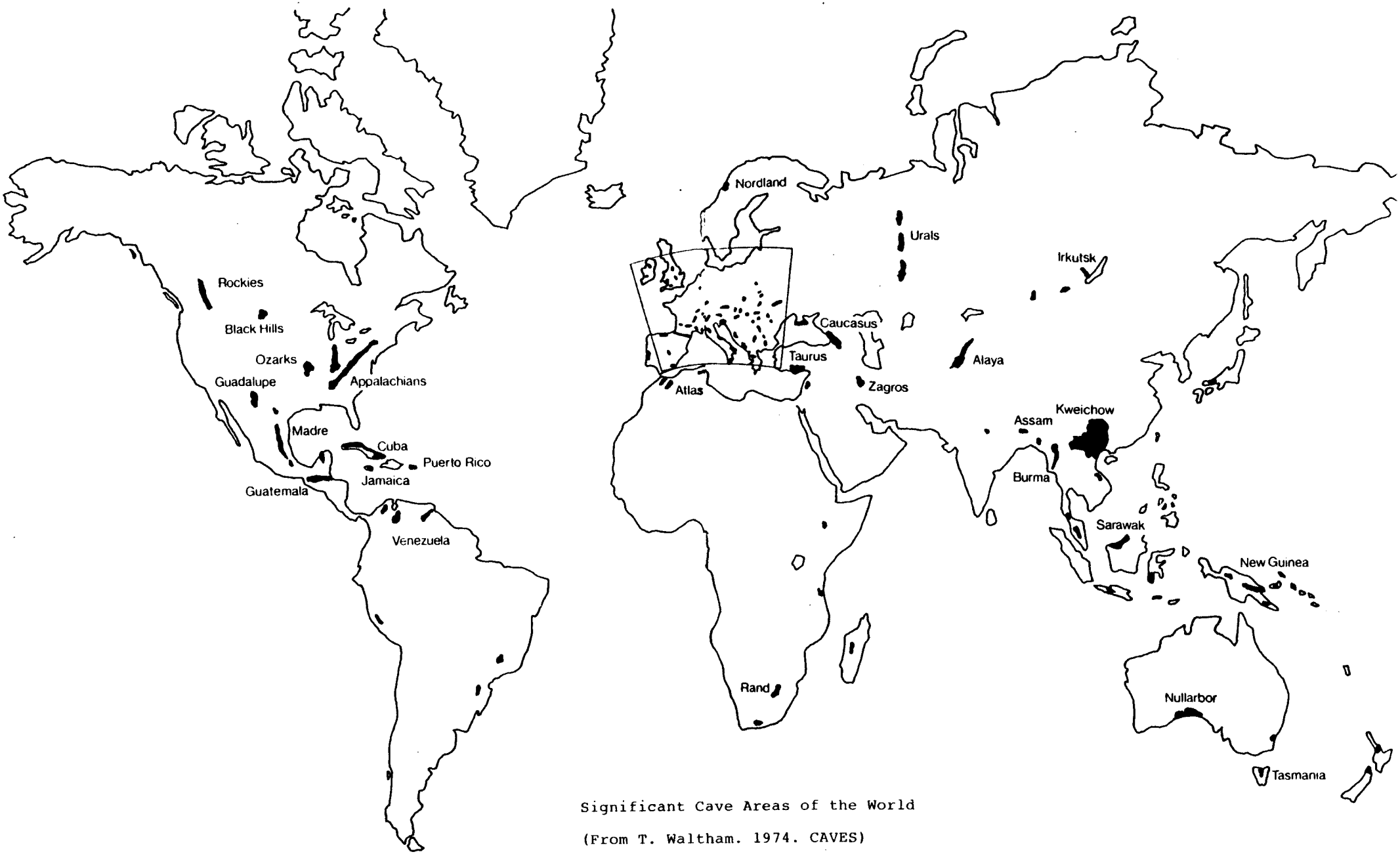
iv) Visite du site: mars 1995. Jim Thorsell.

2. COMPARAISON AVEC D'AUTRES AIRES

Les réseaux de grottes karstiques sont des phénomènes naturels courants que l'on trouve un peu partout dans le monde. La carte ci-jointe indique l'emplacement des grottes les plus importantes de la région. Aux Etats-Unis seulement, il y a plus de 20 régions karstiques (voir Carte 2) et plus de 30 000 grottes. Deux sites ont été inscrits sur la Liste du patrimoine mondial pour leurs seules structures karstiques: Mammoth Caves, dans le Kentucky et les grottes de Skocjan, en Slovénie. On trouve d'autres grottes importantes dans d'autres Biens du patrimoine mondial: les Rocheuses canadiennes, Nahanni, Grand Canyon, la Zone de nature sauvage de Tasmanie et le Site fossilifère de mammifères, en Australie. D'autres grottes d'importance mondiale se trouvent à Gunung Mulu, au Sarawak et à Nullabor, en Australie. Enfin, les grottes d'Aggtelek et la région du karst hongrois/slovaque ont été désignées pour inscription sur la Liste du patrimoine mondial.

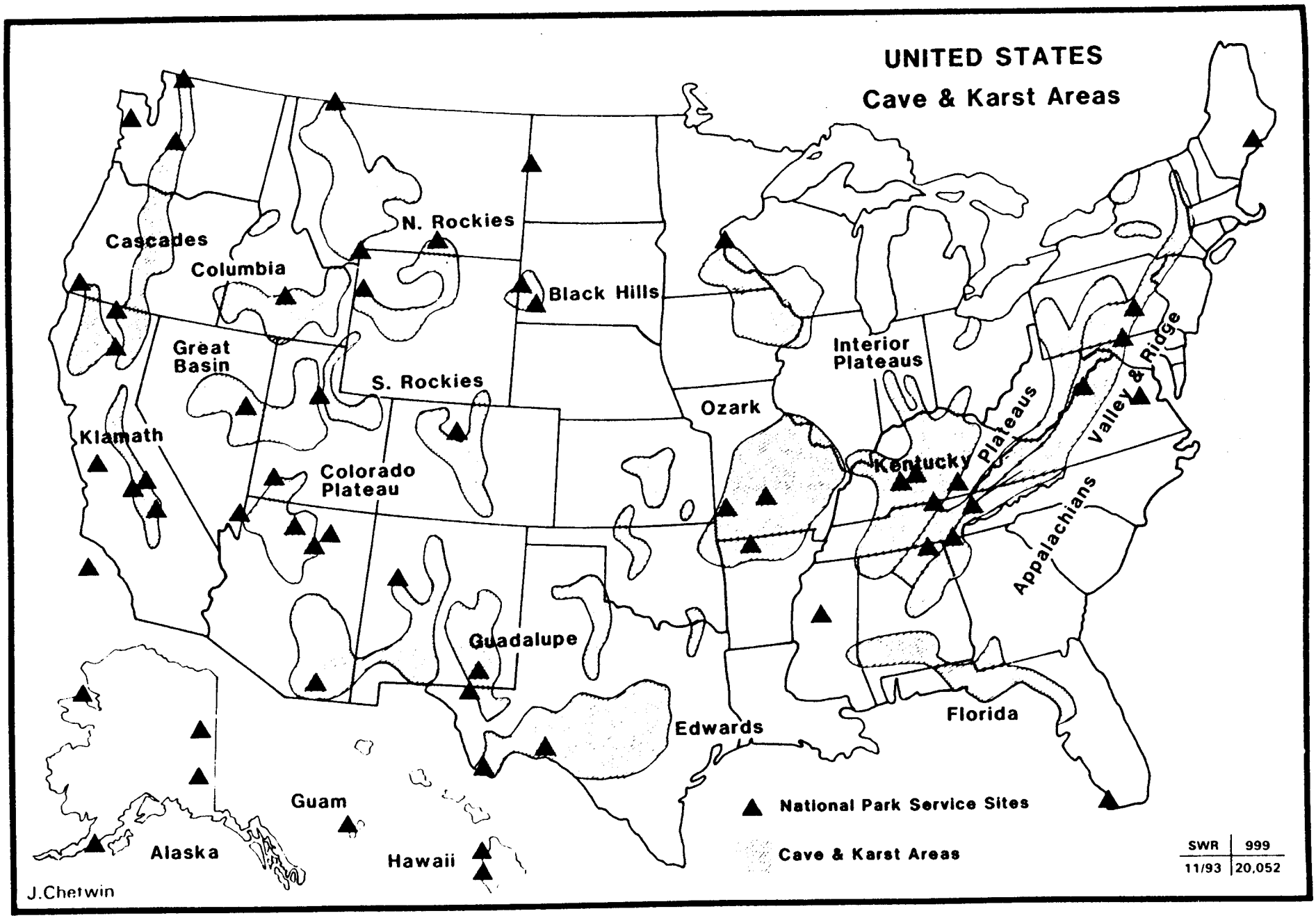
Nous avons cité, ci-dessus, en référence, des inventaires relativement complets des réseaux de grottes du monde. On y trouve des listes type «Livre Guinness des records» qui citent la plus longue, la plus profonde, la plus large et qui sont révisés en permanence, au fur et à mesure de nouvelles découvertes. Pour évaluer les désignations concernant des grottes, l'UICN collabore avec l'Union internationale de spéléologie (UIS) et tient rigoureusement compte de l'avis des experts de l'UIS. Dans le cas du Parc national des grottes de Carlsbad (PNGC), l'UIS et les examinateurs indépendants sont tous du même avis et soulignent la grande qualité naturelle de l'aire. Ils confirment que la Grotte de Lechuguilla, récemment découverte dans le Parc, présente des caractéristiques naturelles particulièrement exceptionnelles qui, bénéficiant d'une protection intégrale, sont essentiellement intactes.

Les grottes de Carlsbad sont radicalement différentes de celles qui se trouvent dans les deux autres biens du patrimoine mondial. Mammoth Cave est remarquable par sa longueur, ses larges passages à niveau et ses salles dentelées en forme de cloche. Le site de Skocjan est célèbre pour ses canyons vertigineux et parce qu'il est l'illustration même de l'hydrogéologie karstique. Les grottes de Carlsbad se distinguent par leurs vastes salles, beaucoup plus grandes que celles de Mammoth ou de Skocjan et pour leurs structures minérales décoratives qui surpassent, de loin, celles des deux autres sites. Carlsbad contient 81 grottes connues - ce qui est une concentration très élevée - dont celle de Lechuguilla considérée comme la plus exceptionnelle de toutes et l'une des plus importantes au monde du point de vue scientifique.



Significant Cave Areas of the World

(From T. Waltham. 1974. CAVES)


UNITED STATES
Cave & Karst Areas
Cascades
Columbia
N. Rockies
Black Hills
Great Basin
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Klamath
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Kentucky Plateaus
Appalachians
Guadalupe
Edwards
Florida
Guam
Alaska
Hawaii
National Park Service Sites
Cave & Karst Areas
SWR 999
11/93 20,052
J.Chetwin

En conclusion, le PNGC contient certaines des grottes les plus extraordinaires du monde. Par sa beauté spectaculaire, la genèse de ses grottes, sa faune et sa flore ainsi que l'état naturel dans lequel se trouvent la plupart des grottes, Carlsbad se place dans une catégorie à part. Carlsbad se distingue des grottes déjà inscrites au patrimoine mondial et ses éléments caractéristiques ne font pas double emploi avec ceux que l'on trouve ailleurs.

Le PNGC est situé dans la Province biogéographique de Chihuahua tout comme 22 autres aires protégées répertoriées dans la Liste des Nations Unies des parcs nationaux et des aires protégées. Le milieu superficiel n'étant pas considéré, une comparaison sur cette base est inutile. Il convient, toutefois, de noter que le parc est d'importance nationale car il contient une faune et une flore du désert de Chihuahua et d'importants vestiges culturels.

3. INTÉGRITÉ

La récolte du guano et le tourisme ont eu des impacts sur l'intégrité de certaines des 81 grottes. Entre 1903 et 1923, on estime que 100 000 tonnes de guano de chauves-souris ont été extraits manuellement de l'entrée des grottes accessibles. D'autres impacts, dus au tourisme, commençaient à se faire sentir mais, dans les années 70, des mesures de gestion ont été prises pour ramener ces impacts dans des limites tolérables. Le plan d'aménagement du parc, mis à jour, devrait être approuvé en 1995 et divers autres plans spécifiques d'aménagement des grottes ont été préparés. Depuis son exploration initiale, il y a dix ans, la grotte de Lechuguilla est strictement gérée: seules des visites de chercheurs, étroitement surveillées, sont autorisées.

Un des problèmes regrettables est le déclin de la population de tadarides du Mexique, passée de plus de 5 millions en 1920 à moins de 1 million aujourd'hui. Les chauves-souris qui entrent et sortent des grottes donnant un véritable spectacle naturel, des efforts sont faits pour enrayer le déclin. Or, comme les pertes surviennent au moment de la migration vers le Mexique, il faudra instaurer une coopération internationale.

La seule menace que l'UICN considère comme grave est la prospection gazière et pétrolière potentielle, en périphérie du PNGC et la construction de zones de transit et de stockage qui en résulterait. Le problème a été étudié par un groupe d'experts géologues qui a recommandé l'instauration d'une zone de «protection des grottes» à l'extérieur des limites septentrionales du Parc. Si le Comité décide d'inscrire le site, il devrait envoyer, aux autorités américaines, une recommandation appuyant les conclusions du rapport du groupe d'experts.

4. AUTRES COMMENTAIRES

La désignation, soumise en septembre 1994, s'appuie sur les critères pour les sites naturels qui sont devenus caduques en 1993. L'UICN a réécrit le résumé selon les nouveaux critères et les autorités américaines ont été notifiées de cette révision.

5. EVALUATION

Parmi les milliers de grottes que l'on trouve en Amérique du Nord et dans les montagnes voisines de Guadalupe, celles du PNGC sont parmi les plus exceptionnelles. Elles sont aussi remarquables dans le contexte mondial du fait de leurs dimensions, de leur origine et de l'abondance, de la diversité et de la beauté des formations rocheuses décoratives (spéléothèmes) qu'elles contiennent. La grotte de Lechuguilla est particulièrement remarquable: c'est un laboratoire souterrain où l'on peut étudier les processus géologiques dans un milieu pratiquement intact. Le site satisfait clairement aux critères naturels *i* et *iii* et remplit toutes les conditions d'intégrité. La seule menace est la prospection pétrolière et gazière à proximité de ses limites. La décision d'inscrire le site devrait s'accompagner d'une note appuyant la création d'une zone de protection des grottes, au nord du parc (condition d'intégrité *iv*).

6. RECOMMANDATIONS

Le Parc national des grottes de Carlsbad satisfait aux critères naturels *i* et *iii* et devrait être inscrit sur la Liste du patrimoine mondial.