



At the northern end of the Chihuahuan Desert lies a mountain-ringed valley, the Tularosa Basin. Rising from the heart of this basin is one of the world's great natural wonders—the glistening white sands of New Mexico. Here, great wave-like dunes of gypsum sand have engulfed 275 square miles of desert and have created the world's largest gypsum dune field. The brilliant white dunes are

ever changing: growing, cresting, then slumping, but always advancing. Slowly but relentlessly the sand, driven by strong southwest winds, covers everything in its path. Within the extremely harsh environment of the dune field, even plants and animals adapted to desert conditions struggle to survive. Only a few species of plants grow rapidly enough to survive burial by moving dunes, but

several types of small animals have evolved a white coloration that camouflages them in the gypsum sand. White Sands National Monument preserves a major portion of this gypsum dune field along with the plants and animals that have successfully adapted to this constantly changing environment.

Cover photo by Jeff Gnass



Interdune flats



Bleached earless lizard



Full moon rising



Sand verbena

Photos by Glenn Van Nimwegen

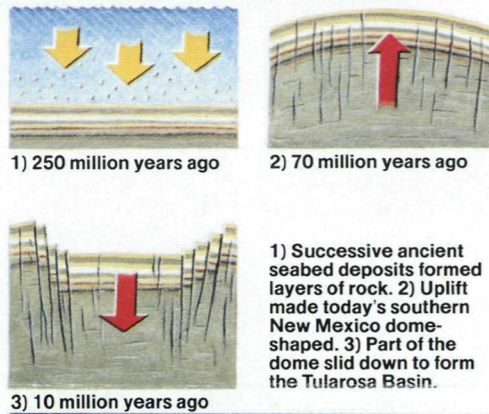
White Sands

White Sands National Monument
New Mexico

National Park Service
U.S. Department of the Interior

How the Dunes Formed

The Tularosa Basin The gypsum that forms the white sands was deposited at the bottom of a shallow sea that covered this area 250 million years ago. Eventually turned into stone, these gypsum-bearing marine deposits were uplifted into a giant dome 70 million years ago when the Rocky Mountains were formed. Beginning 10 million years ago, the center of this dome began to collapse and create the Tularosa Basin. The remaining sides of the original dome formation now form the San Andres and Sacramento mountain ranges that ring the basin.



Dune Growth and Movement



A Rare Form of Sand

The common mineral gypsum, a hydrous form of calcium sulfate ($\text{CaSO}_4 \cdot 2\text{H}_2\text{O}$), is rarely found in the form of sand because it is soluble in water. Rain and snow that fall in the surrounding mountains dissolve gypsum from the rocks and carry it into the Tularosa Basin. Normally, dissolved gypsum would be carried by rivers to the sea. But no river drains the Tularosa Basin. The water, along with the gypsum and other sediments it contains, is trapped within the basin.



Satellite photo: Eroding mountains filled the Tularosa Basin 2,000 feet deep with sediments, including the gypsum forming its white sands.

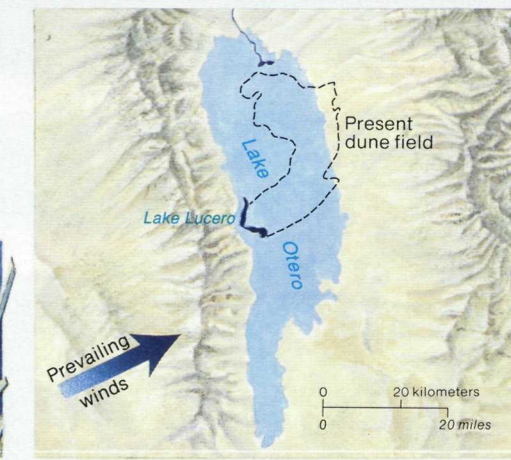
Lake Lucero

With no outlet to the sea, water flowing into the Tularosa Basin either sinks into the ground or pools up in low spots. One of the lowest points in the basin is a large playa called Lake Lucero. Occasionally, this dry lake bed fills with water. As the water evaporates, the dissolved gypsum is deposited on the surface. Even more gypsum deposition occurred during the last Ice Age when a larger lake, Lake Otero, covered much of the basin. The Alkali Flat area

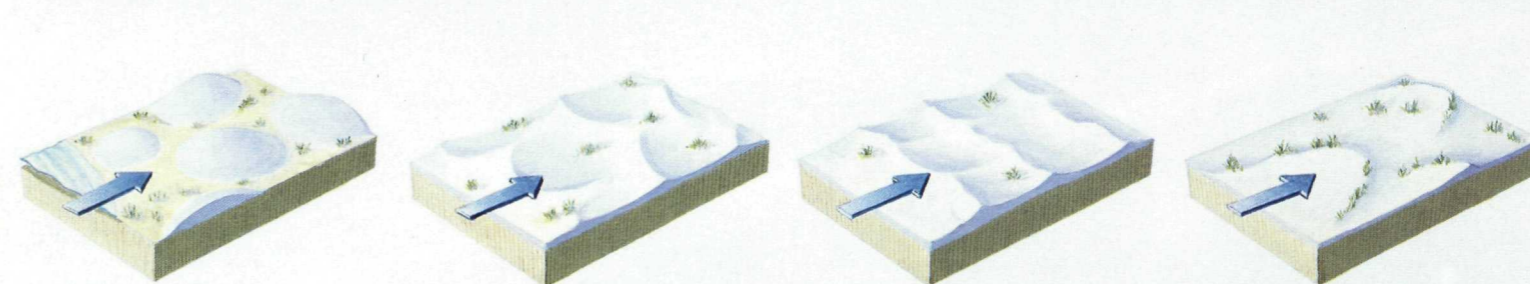
is the exposed bed of this Ice Age lake.

Crystal beds In wet periods, water evaporating slowly on the playa floor causes gypsum to be deposited in a crystalline form called selenite. Along Lake Lucero's shore and in the Alkali Flat, beds of selenite crystals—some three feet long—cover the ground. The forces of nature—freezing and thawing, wetting and drying—

eventually break down the crystals into sand-size particles light enough to be moved by the wind.



Four Types of Dunes at White Sands



Dome dunes The first dunes to form downwind of Lake Lucero are low mounds of sand that move up to 30 feet per year.

Barchan dunes Crescent-shaped dunes form in areas with strong winds but a limited supply of sand.

Transverse dunes In areas with ample sand, barchan dunes join together into long ridges of sand.

Parabolic dunes On the dune field edges, plants anchor the arms of barchans and invert their shape.

Visitor Activities

The Dunes Drive leads from the visitor center 8 miles into the heart of the dunes. Wayside exhibits en route interpret the park's natural history, and pullouts allow you to leave your car and explore the dunes on foot. The self-guiding Big Dune Nature Trail winds one mile through the edge of the dune field where plants and animals are most common.

Be sure to stop at the visitor center. This historic adobe building contains geology exhibits and a diorama that explain the formation of the dunes. Ask at the information desk about park programs and ranger-led activities. The visitor center also houses a bookstore. An adjacent gift shop sells souvenirs and refreshments.



Kit fox

Wildlife in the park, as in other desert areas, mostly remains underground in burrows during the heat of the day and emerges at night. Tracks of rodents, rabbits, foxes, coyotes, porcupines, and other nocturnal animals can be seen in the sand the following morning. Lizards, beetles, and birds are active during the day and can be observed in vegetated areas. A few species of animals—a pocket mouse, two lizards, and several insects—have evolved a white coloration to blend with the sands. The oryx, an African antelope, was introduced by the State of New Mexico onto the White Sands Missile Range. Oryx have successfully adapted to the area, multiplied, and spread into the park. The National Park Service considers this exotic animal to be a threat to the park's native plants and animals.

Photography is best in morning and evening when low light produces interesting shadows and colors. Photographing dunes can be difficult. White dunes usually come out gray if exposed as indicated by your camera's internal meter. For manual cameras, if the picture includes mostly dunes, overexpose the shot by one or two stops to bring out the sand's whiteness. If the subject is a person or a plant, meter off the subject for a proper reading. A polarizing filter will enhance contrast.



Yucca



Yucca

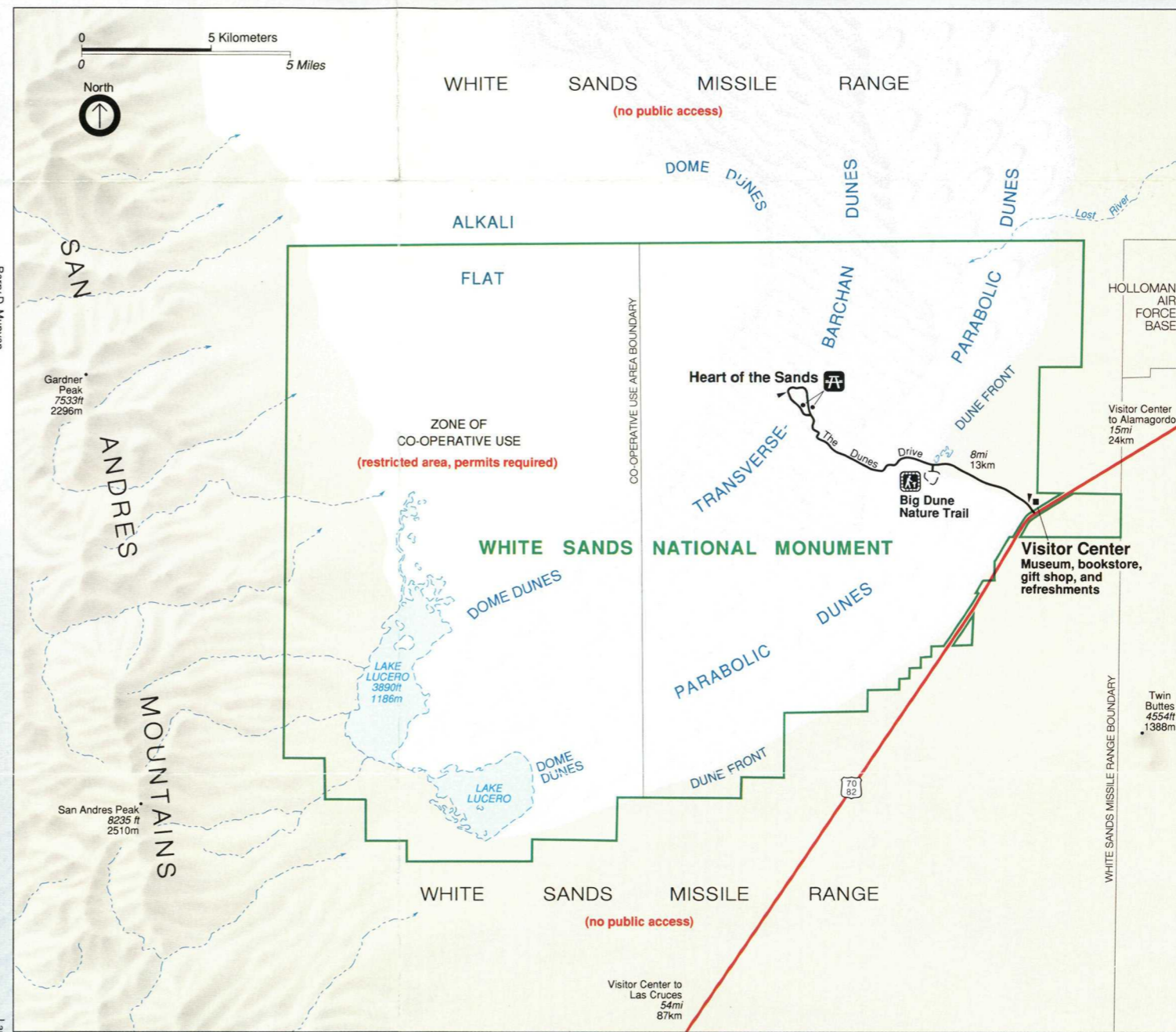
Even desert plants and animals have difficulty surviving among shifting dunes. A small number of plants have made remarkable adaptations to avoid burial by moving sand. The soaptree yucca can elongate its stem to keep its leaves above the sand, growing upward as much as a foot per year. Other plants can anchor part of a dune with their roots and continue to grow on a pedestal of sand after the dune moves on.

Ranger-guided activities offered during the summer include orientation talks, nature walks, evening slide programs, and star talks. Auto caravans to Lake Lucero are offered monthly (advance reservations required). Motorcoach tours and other organized groups can arrange special programs in advance.



On a ranger-led walk.

Illustrations by Robert Tope



Park Closures

White Sands Missile Range completely surrounds the park. The range was first used as a military proving grounds after World War II for testing rockets that were captured from the German armed forces. The 4,000-square-mile range continues to be an important testing site for experimental weaponry and space technol-

ogy. For safety reasons, both the park and Highway 70/82 between the park and Las Cruces may be closed while tests are conducted on the missile range. These closures occur on an average of twice a week. They generally last from one to two hours.



Stink bug photo by Robert Thayer

The National Park Service and the Department of Defense appreciate your cooperation and patience during these closures.

Visitor Information

Information White Sands National Monument lies 15 miles southwest of Alamogordo, N. Mex., on U.S. 70/82. For information write to: Superintendent, White Sands National Monument, P.O. Box 1086, Holloman AFB, NM 88330-1086, or call 505-479-6124. No public transportation serves the park. Cars may be rented in Alamogordo or Las Cruces.



Claret cup cactus

Regulations Removal or disturbance of archeological or natural objects, sand, selenite crystals, plants, or animals is prohibited. Help keep the sands clean by using the grills and trash containers. Ground fires are prohibited. Glass containers and all types of beer kegs are prohibited. Possession or drinking of alcoholic beverages by persons under 21 years of age is prohibited. **Pets** must be leashed or under physical restraint at all times. **Speed limits** are posted and enforced. Driving or parking on dunes or outside established parking areas is not permitted.

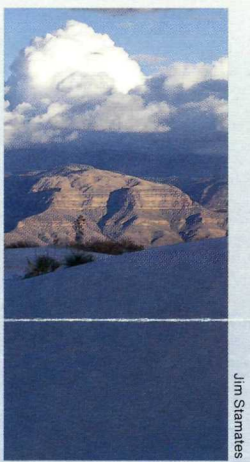
Safety Natural conditions in the white sands can be hazardous. Do not tunnel into the sand dunes. Tunnels collapse

easily and can cause rapid suffocation. Injuries can occur when sand surfing, so be careful. Never sand surf near the roadway.

It is easy to become lost when hiking, especially during sandstorms. Don't hike alone. Do not stop on the road. Pull off the road into an established parking area before stopping. Pedestrians in picnic areas should be careful of heavy traffic. Be alert and watch your children. Secure your vehicle and safeguard your property.

Picnicking Picnic areas are found near the end of the scenic drive. All have tables, charcoal grills, and restrooms. Drinking water is available only at the visitor center.

Camping There is no campground in the park, but three public campgrounds lie within 35 miles or less of the park.



A primitive backcountry campsite is available on a first-come, first-served basis. No reservations, but you must register at the park visitor center.

White Sands National Monument is a unit of the National Park System, which consists of more than 360 parks representing important examples of our country's natural and cultural inheritance.

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