

White Sands



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. Great wave-like dunes of gypsum sand have engulfed 275 square miles of desert here and created the largest gypsum dune field in the world.

The dunes, brilliant and white, are ever changing. They grow, crest, then slump but always advance. 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 the moving dunes, but several types of small animals have evolved white colorations to camouflage them in the gypsum sand. White Sands National Monument preserves a major part of this gypsum dune field, along with the plants and animals that have adapted successfully to this constantly changing environment.

COVER PHOTO: DUFF GNASS



Interdune flats



Bleached earless lizard



Full moon rising



Sand verbena

PHOTOS: GLENN VAN NIMWEGEN

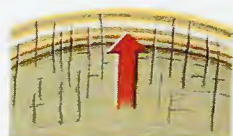
Exploring White Sands

How the Dunes Formed

Tularosa Basin The gypsum that forms the white sand was deposited at the bottom of a shallow sea covering 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



1) 250 million years ago Successive ancient seabed deposits formed layers of rock.



2) 70 million years ago Uplift shaped today's southern New Mexico like a dome.



3) 10 million years ago Then part of the dome slid down, forming the Tularosa Basin.

Dune Growth and Movement

Wind direction

Sand movement

Strong winds blowing across the playa pick up gypsum particles and then carry them downwind. As sand grains accumulate as a dune, they bounce up the gentle windward slope and ripple its surface. At a dune's steep leading edge, sand builds up until gravity pulls it down the slip face, moving the dune forward.

A Rare Form of Sand

The common mineral gypsum ($\text{CaSO}_4 \cdot 2\text{H}_2\text{O}$), hydrous calcium sulfate, is rarely found as sand because it is soluble in water. Rain and snow in the mountains dissolve gypsum from the rocks and carry it into the Tularosa Basin. Rivers would usually carry dissolved gypsum to the sea, but no river drains the Tularosa Basin. The water, with the gypsum and

other sediments, is trapped in the basin.

Crystal beds In wet periods, water evaporating on the playa floor causes gypsum to be deposited in crystal-line form as selenite. Along Lake Lucero's shore and in the Alkali Flat, beds of selenite crystals—some three feet long—cover the ground. Freezing and thawing and wetting

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



Selenite crystals

Sources of the Sand

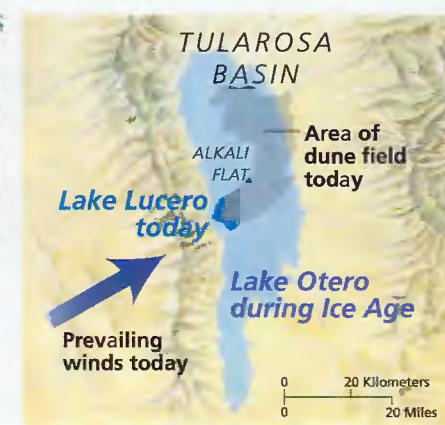
With no outlet to the sea, water flowing into the Tularosa Basin sinks into the ground or pools up in low spots.

One of the basin's lowest points is the large playa, Lake Lucero. This dry lake bed occasionally fills with water that then evaporates and deposits dissolved gypsum on the surface. More gypsum deposi-

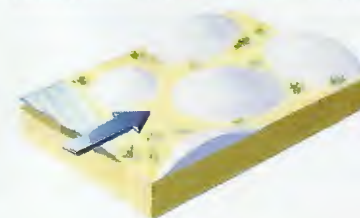


tion occurred in the last Ice Age when larger Lake Otero (right), covered much of the basin. The Alkali Flat area is its exposed lake bed. The eroding

mountains (above) have now filled the Tularosa Basin 2,000 feet deep with sediments, including the gypsum that forms its white sands.



Four Types of Dunes at White Sands



Dome dunes First to form downwind of Lake Lucero, these low mounds can move 30 feet a year.



Barchan dunes Crescent-shaped dunes form where winds are strong but the sand supply is limited.



Transverse dunes Where sand supplies are ample, barchan dunes join together as long ridges of sand.



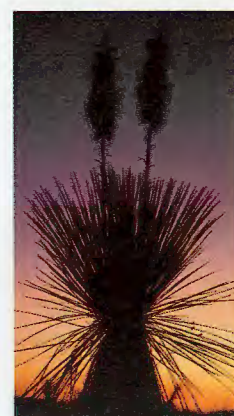
Parabolic dunes On dune field edges, plants anchor the arms of barchans and invert their shape.

ILLUSTRATIONS BY ROBERT TOPE

Things To See and Do

The **Dunes Drive** leads from the visitor center eight miles into the heart of the dunes. Wayside exhibits along the Dunes Drive interpret the geology and natural history of the white sands. Four marked trails, including the wheelchair-accessible Interdune Boardwalk, allow you to park and leave your car for exploring the dunes on foot.

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.



Yucca, soaptree variety

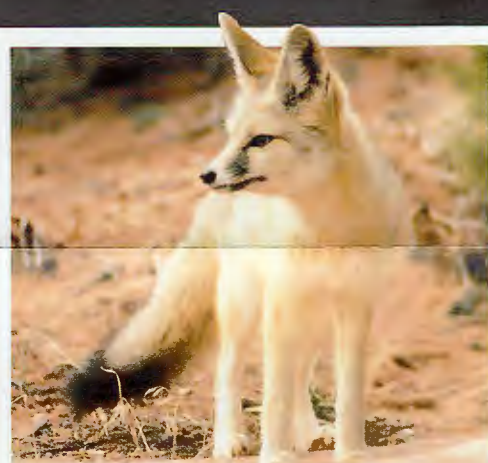
Adaptations

Even desert plants and animals have difficulty surviving among shifting dunes. A few plants are remarkably adapted to avoid burial by moving sand. The soaptree yucca elongates its stem to keep its leaves above the sand, growing upward a foot per year. Some plants anchor parts of a dune with their roots and keep growing on a sand pedestal even after the dune moves on.

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



On a ranger-led walk

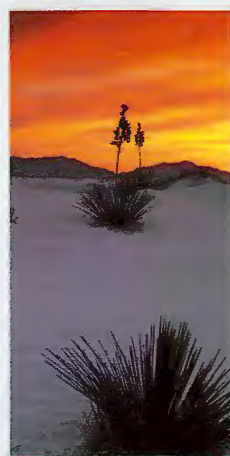


Kit fox

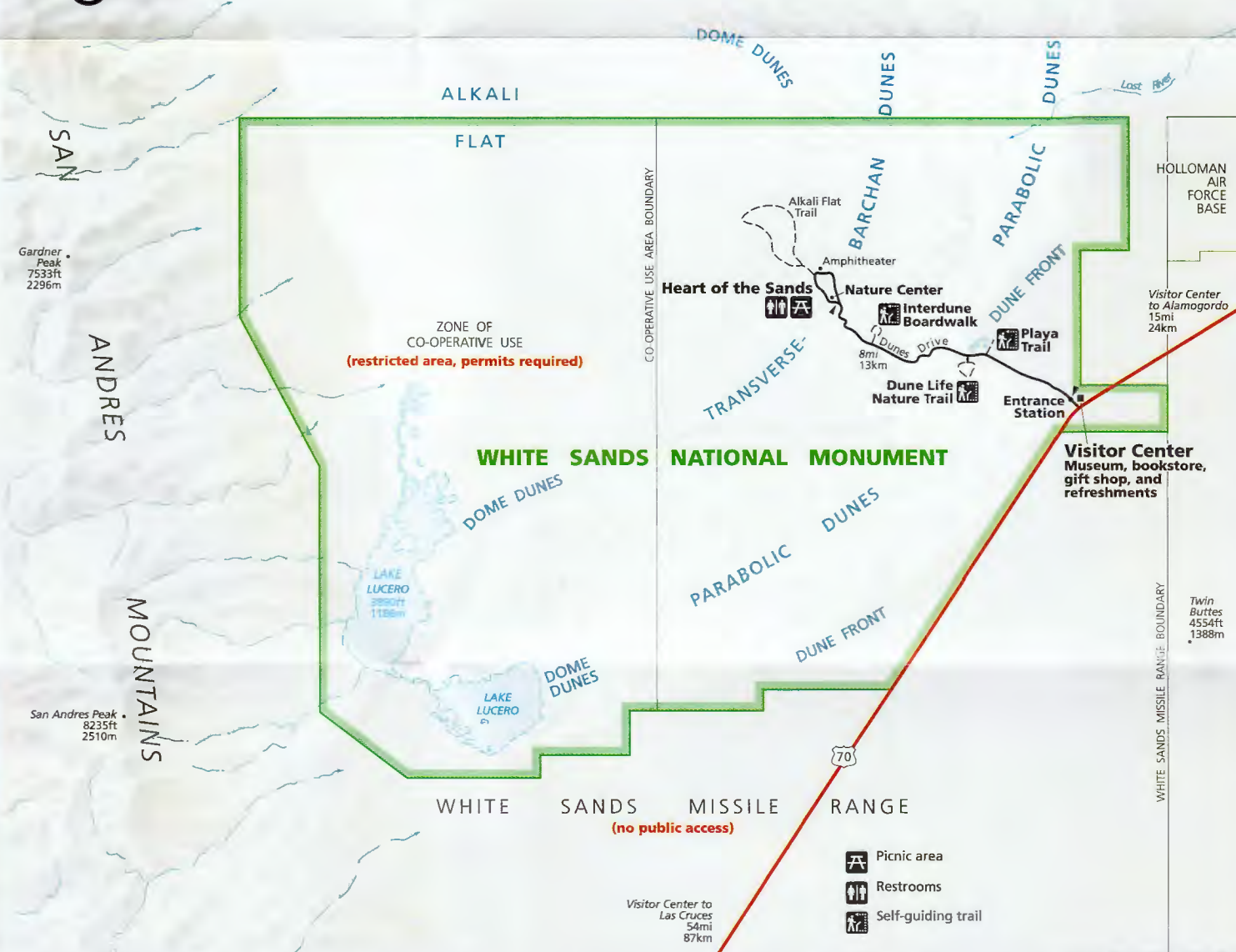
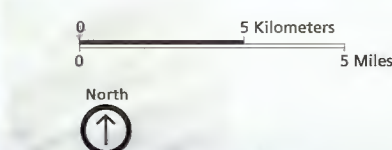
Wildlife here, as in other desert areas, mostly stays underground in burrows in the heat of day, emerging at night. Tracks of rodents, rabbits, foxes, coyotes, porcupines, and other nocturnal animals are seen in the sand in the morning. Lizards, beetles, and birds active in daylight can be seen in vegetated areas. A few animals—a pocket mouse, two lizards, and several insects—have evolved white colorations to blend with the sand. 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 Photography is best in the low light of morning or evening. Photographing dunes can be tricky. The white dunes usually come out gray if exposed as a camera's internal meter shows. With manual cameras, overexpose the photo by one or two stops to bring out the sand's whiteness.

For people or plants, meter off the subject to get a better reading. Polarizing filters will enhance the contrast.



Sunset on the sands



Park Closures

White Sands Missile Range surrounds the park. It was first used as a military proving grounds after World War II for testing rockets captured from German armed forces. The 4,000-square-mile range is still an important site for testing

experimental weapons and space technology. For safety, both the park and U.S. 70 between the park and Las Cruces may be closed during missile range tests. Closures average twice a week, generally lasting one to two hours.

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

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Visitor Information

White Sands National Monument is on U.S. 70, 15 miles southwest of Alamogordo, N. Mex. No public transportation serves the park.

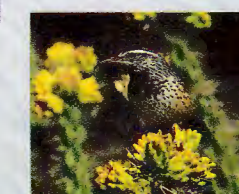
Picnicking There are picnic areas near the end of the scenic Dunes Drive. All have tables, charcoal grills, and restrooms. Drinking water is available only at the visitor center.



Claret cup cactus

Camping There are no campgrounds in the park, but three public campgrounds lie within 35 miles or less. A primitive backcountry campsite is available on a first-come, first-served basis. Backpackers need to register in person at the visitor center. No advance reservations.

Regulations Removal or disturbance of any archeological or natural objects, sand, selenite crystals, plants, or animals is prohibited. Please help keep the sands clean by using the grills and trash containers provided. Ground fires are prohibited within the park at certain times of the year. Check at

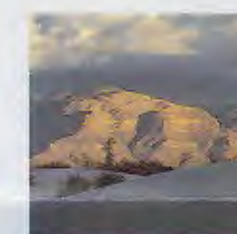


Cactus wren

the visitor center for specific restrictions. Pets must be leashed or under physical restraint at all times. Posted speed limits are enforced. Do not drive or park on dunes or outside established parking areas.

Safety Conditions in the white sands can be hazardous. Don't tunnel into dunes. They easily collapse, causing rapid suffocation. Injuries can happen when sand surfing, so be careful. Never sand surf near the roadway. Hikers easily get lost, especially during a sandstorm. Do not hike alone.

Don't stop on the road. Pull into an established parking area before you stop. Pedestrians in picnic areas must be careful of heavy traffic. Be alert and watch children.



San Andres Mountains

Secure your vehicle and safeguard property.

White Sands National Monument is one of over 390 parks in the National Park System. Visit www.nps.gov to learn about parks and National Park Service programs in America's communities.

More Information

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