National Park Service
Department of the Interior

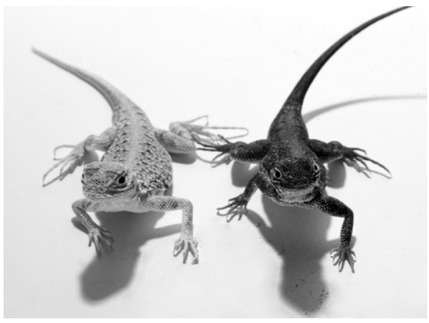
White Sands National Monument

The Big Questions
Recent Research at White Sands

Why did the world's largest gypsum dunefield form here? Which plants and animals call this strange place home? What can this landscape tell us about other worlds? Behind the scenes at White Sands, scientists are working to unravel these mysteries and more. Their research reveals a place unlike any other on earth—formed through a rare mix of geologic forces and colonized by ingeniously adapted life. And the more we learn, the more questions we can ask.

What have *you* always wondered about the white sands?

Lighter Lizards
How quickly can life adapt?



All over the world biologists find animals that blend in with their surroundings. But at White Sands, this process is in fast-forward—it has taken less than 7,000 years for three species of lizards and numerous other animals to adapt lighter coloration, while their darker cousins continue to live just outside the dunefield. That makes this a great place for biologists to study evolution in action.

So why is lighter better in the dunefield? Biologists think predation may be the answer. Current research is testing whether lighter lizards are less likely to be eaten by predators and more likely to survive long enough to pass on their genes. Past research has looked at other physiological differences between light and dark lizards and the genetics behind lighter coloration.

(left) Light and dark earless lizards

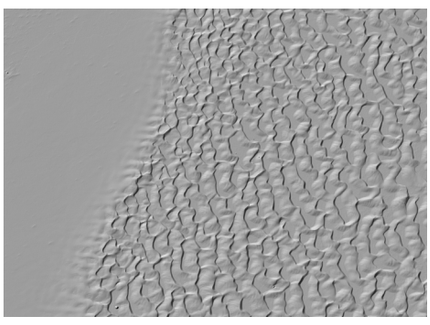
Just Add Water
Does anything live in Lake Lucero?

An ephemeral lake, with water only a few months a year, isn't the most obvious home for an aquatic animal. But at Lake Lucero in the southwest corner of the dunefield, just add water, and like an old-fashioned sea monkey kit, it teems with tiny brine shrimp and other crustaceans. The rest of the year these creatures lie dormant in the sand and mud, waiting for rain. If necessary, they can stay dormant for a hundred years or more!

Researchers also wait for rain, and during the rare times when Lake Lucero fills with water, they come with their nets to sample these hardy animals, called zooplankton. Their work is part of a large-scale ecological survey to better understand what lives in the waters of the Chihuahuan Desert. Many of the species here may live nowhere else on earth.

(left) Collecting zooplankton at Lake Lucero

LIDAR Survey
Is the dunefield changing over time?



The dunes at White Sands are on the move. You can see evidence of this whenever you spot a plant half-buried by sand. But how is the dunefield as a whole changing? Is it growing? Do plants affect the formation and movement of dunes? To answer those questions and more, researchers performed a LIDAR survey—an aerial topographical scan—of a 15-mile stretch of land from Alkali Flat to the eastern edge of the dunefield.

The survey records elevation with incredible accuracy, forming a detailed record of even small ripples in the sand. This information provides a great starting point for tracking the dunefield over time. Already the data has revealed ancient lake shorelines from periods when the Tularosa Basin was much wetter than it is today.

(left) LIDAR showing Alkali Flat and dunes

Prehistoric Trackways
What has passed this way before?

Ellis Wright first discovered ancient trackways in the monument in 1932. He speculated they were made by an enormous human and led a manhunt through the dunes to find him. Today, we know the tracks were made 30,000 years ago by a mammoth as it lumbered along the muddy shores of ancient Lake Otero. Recently, many more ancient trackways have been uncovered, including some made by camels and perhaps even dire wolves.

Researchers at White Sands are working to find and record these fragile tracks, which survive thousands of years buried under sand but erode away within a couple of years after the wind exposes them. In recent years, researchers have discovered trackways at an incredible rate. There may be thousands more in the basin.

(left) Tracing mammoth tracks on Mylar

Mesocarnivores
What comes out at night?

In the glare of the midday sun the dunefield can seem barren and lifeless. But at night this place comes alive. Biologists are looking into the nightlife of White Sands to learn about the top of the food chain here—the mesocarnivores, or medium-size meat-eating mammals. Like many desert animals, mesocarnivores are nocturnal (active primarily at night), so finding them is a challenge.

Biologists use infrared and motion-sensor cameras to capture kit foxes, coyotes, bobcats, badgers, and porcupines on the prowl in the monument. The data from these cameras, as well as from surveys of favorite food sources such as cottontail rabbits and mice, will give biologists a more complete picture of where the biggest animals at White Sands roam.

(left) Coyote caught on film

Parabolic Dunes
Why so slow?

Crescent-shaped parabolic dunes are the slowest moving dunes at White Sands, some shifting only a few inches to a couple of feet per year. Their slow movement poses geologists with a "which came first, the chicken or the egg?" question. Geologists want to know: is vegetation is holding these dunes in place or are plants taking hold because the sands are already steady. Or, as is often the case, is it some combination of the two?

Current research combines fieldwork—counting and measuring plants on parabolic dunes—with analysis of satellite imagery to try to better understand how these dunes have shifted in the past twenty to thirty years. Data from this study may reveal how the borders of the dunefield change over time.

(left) Parabolic dunes covered with plants

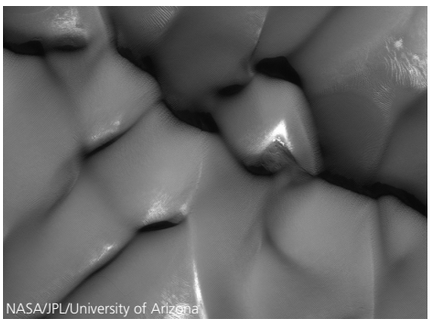
New Species
What lives only at White Sands?

In 2008, a volunteer researcher brought his lifelong passion for moths to White Sands. Eric Metzler has dedicated his retirement to capturing, identifying, and describing the moths of White Sands and the Carlsbad area. In the three years since his project began, Mr. Metzler and his associate, Dr. Greg Forbes, have found and described an incredible fourteen new species of moths that can be found only at White Sands.

One night each month, Mr. Metzler sets up moth traps throughout the monument. The traps are equipped with blacklights to attract moths, and after only one night, he has enough specimens to spend the rest of the month sorting and identifying them. Mr. Metzler has said that he will continue studying the moths of White Sands for as long as he can. Imagine how many species await his discovery.

(left) *Euxoa lafontainei*

Other Worlds
Are we alone in the universe?



NASA's Fundamental Mars Research Laboratory wants to answer one of the BIG questions of humankind: are we alone in the universe? Our unique dunefield might help them find an answer. Photos and other data from the Mars rover *Opportunity* suggest that the dunes of White Sands are similar to some parts of Mars in both composition and surface features. Mars even has small sulfate dunefields around its northern pole.

That is exciting news for Mars researchers because in order to find life, they first need to find evidence of water. Water is central to the story of how the White Sands dunefield formed and continues to develop. Researchers from NASA are studying how water affects the gypsum at White Sands so they can better understand what they see on Mars.

(left) Sand dunes on Mars