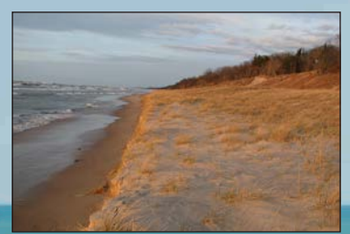
SHAPED BY WIND AND WATER

Indiana Dunes National Park resides in a unique geologic setting at the southern tip of one of America's largest freshwater lakes. A product of melting glacial ice, Lake Michigan is the last significant contribution of the Ice Age to northwestern Indiana. The expansive beach, rolling dunes, and wide wetland features illustrate the effects of water, wind, and vegetation growth in reshaping the surface of the land since the departure of the glacier from this region about 18,000 years ago.

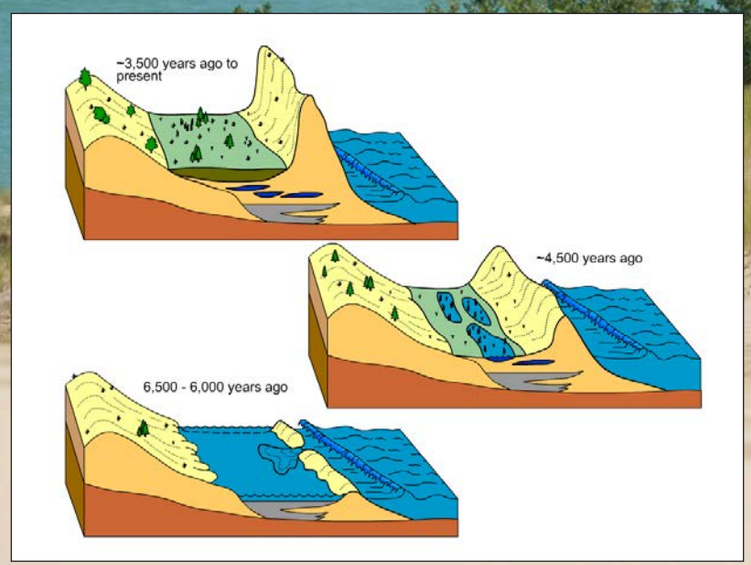


Dune Sites

Foredunes are long ridges that form parallel to the shoreline as sand is saltated, or blown, onshore by wind. Bowl-shaped blowout dunes extend landward owing to the erosion of the foredune.

Vegetation Control

Dune grasses are part of a sand dune's first line of defense from erosion. Thriving in high winds, these important plant species use fast-growing rhizomes to stabilize the sand and maintain the delicate ecosystem.



Dune Development

The modern shoreline began when a small ridge of sand and gravel developed as lake levels rose about 6,000 years ago. At 4,500 years, water level in Lake Michigan dropped and sand was exposed and swept into U-shaped dunes and foredunes. During the past 3,500 years, these dunes have migrated and new ones have formed, shaping the landscape into what we see today.

Photos provided by the Ind. Dept. of Natural Resources and the Indiana Geological & Water Survey.

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Along the South Shore

Indiana Dunes National Park, located in Porter County, is home to 2,182 acres of forested dune landscape along the southern shore of Lake Michigan. Part of the Northern Moraine and Lake physiographic region, this area of Indiana is characterized by glacial moraines, natural lakes, and sand dunes.

THE GEOLOGIC STORY

of Indiana Dunes National Park

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The Rises and Falls of Lake Michigan

As ice from the last major glaciation slowly retreated northward, several curved ridges of glacial sediment (called moraines) were left behind along the southern rim of a deep basin. Meltwater ponded between the moraines and the ice margin to produce early Lake Michigan. As the glacial margin fluctuated, channel outlets opened and closed, influencing lake level in the basin. The rise and fall of the water level while glacial ice was still in the basin produced many shorelines along the southern rim of the lake. Only two of these ancient shorelines were preserved as dune-capped sandy ridges. Located south-southeast of the park, Glenwood Beach (older) and Calumet Beach mark the former shorelines of Lake Michigan approximately 17,000 to 13,500 years ago.

During the development of the younger Calumet Beach, lake level was 30 to 40 feet higher than today. Starting 12,000 years ago, lake level began to fall very rapidly as glacial ice retreated far enough northward to open an outlet, allowing water to flow northward across Ontario and into the St. Lawrence Seaway. Lake Michigan's water level fell more than 100 feet and stayed low for about 2,000 years. At 9,400 years, lake level slowly began to rise when the outlet to the north was elevated by the rebound of the earth's crust. This water level rise reached current lake levels 6,000 years ago and continued to rise another 25 feet. Ultimately, lake level peaked 4,500 years ago before immediately falling again. Over the next 1,000 years, lake level fell almost 15 feet; the remaining lowering occurred slowly during the last 3,500 years.

Mountains of Sand

A shoreline began building along the Indiana coast about 6,000 years ago. Sediment brought by water currents accumulated in a small ridge with a landward lagoon. As storms washed over the ridge, it grew larger and moved further landward. The upward growth kept pace as the lake level rose. When lake level peaked, a dune-capped ridge of sand and gravel was deposited along the Indiana shore. Geologists call this new shoreline the Tolleston Beach.

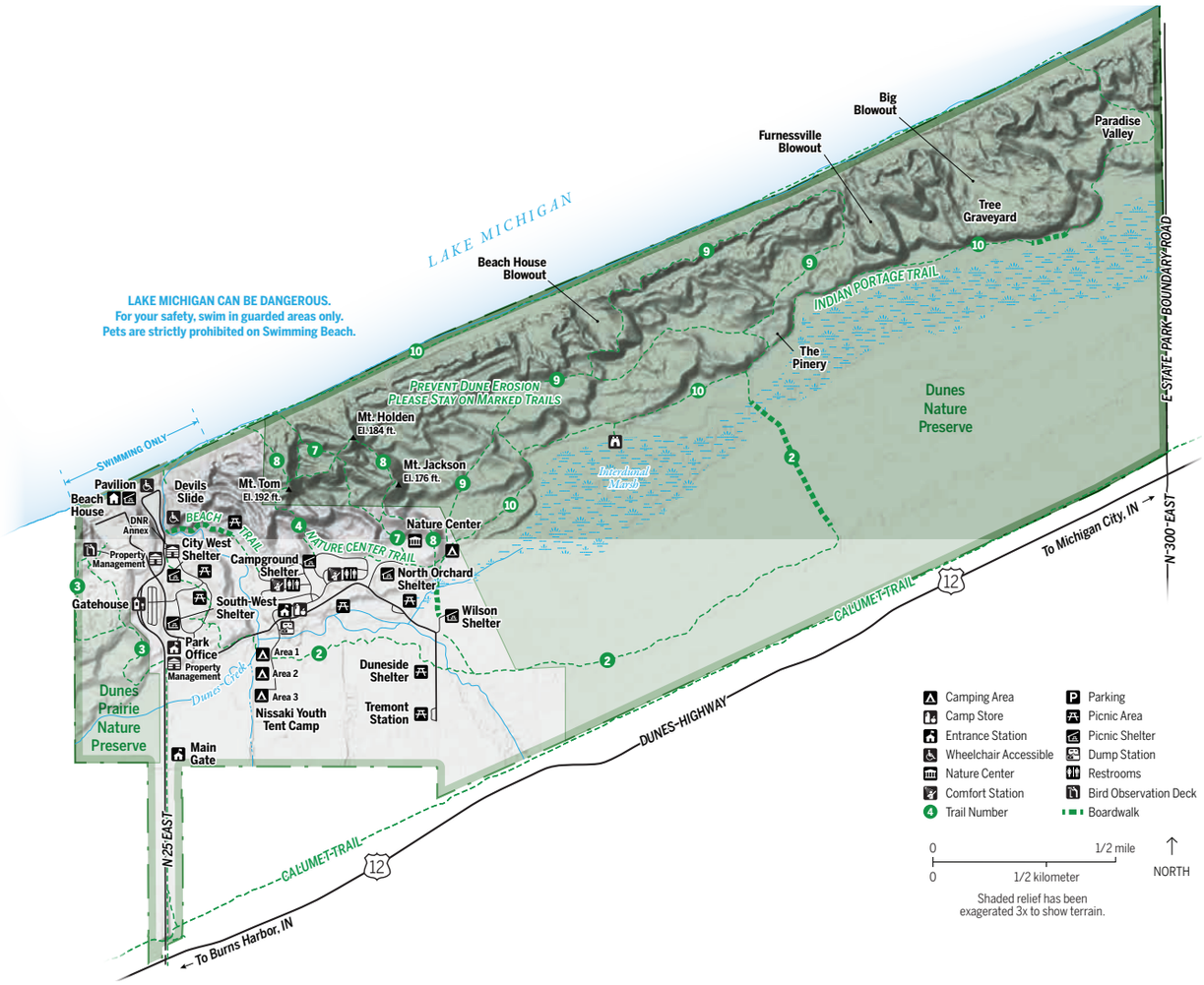
The rapid lake level drop 4,500 years ago dramatically changed the Tolleston Beach. As water level fell, vast areas of sand were exposed and swept up by wind to form large, U-shaped dunes. The dunes migrated away from the shore and obliquely landward into the lagoon, which by this time was becoming vegetated and changing into a fen wetland. It was at this time that the Indiana Dunes area began to take on the character we see today. In the past 3,500 years, additional sand has been blown into the Tolleston Beach by winds off the lake. This added sand resulted in foredunes, the linear ridges that run parallel to Lake Michigan.

A Woody Wall of Defense

Sand dunes are usually thought of as transient features whose form and position are constantly changing. Yet when vegetation takes hold, they can become reasonably stable landforms, as illustrated by the persistence of dunes formed thousands of years ago. Vegetative control begins with the invasion of fast-growing grasses, huckleberry, wintergreen, goldenrod, and other ground cover. Once the sand becomes relatively stable, species of willow, grape, and cherry soon appear and are followed by jack pine, aspen, and finally oak. The wind-shelter effect of the trees and undergrowth, together with the holding power of their root systems, anchors the sand and results in the dune types that are common in this area.

Blowouts and Migrating Dunes

Blowouts usually begin as a narrow channel on the crest of the foredune where vegetation has been removed by either foot traffic or nature. This confined opening allows wind velocity to accelerate and create extreme erosion. Sand blown out of the foredune is piled high atop the lee (landward) slope, creating a bowl or amphitheater-like topography. Both Mt. Tom and Mt. Holden, towering nearly 200 feet above the beach, are examples of complexly developed blowouts. Beach House, Furnessville, and Big Blowout are also typical of this type of dune. Long-buried trees, sometimes exhumed during blowout development



(like the tree graveyard at Big Blowout), reveal evidence of older forests buried by dune migration between the early development of the Tolleston Beach and today.

Migrating dunes form when sand supply suddenly increases because of excessive wind erosion, an increase in beach width, or the sudden removal of vegetative cover. Moving in the direction of the predominant wind, migrating dunes can engulf entire forests. Dunes stabilize when sand supply diminishes, and vegetative control is reestablished.

The Great Marsh

Landward of Tolleston Beach is an interdunal wetland area called the Great Marsh. Initially a shallow, open-water lagoon, this area changed into a series of isolated marl ponds that vegetated over during the fall from the peak lake level at 4,500 years ago Water-loving vegetation has accumulated throughout much of the area, producing up to 5 feet of peat. Trails 2 and 10 offer good views of the marsh in contrast with the densely wooded dunes around it.

Maps: Indiana Geological & Water Survey.