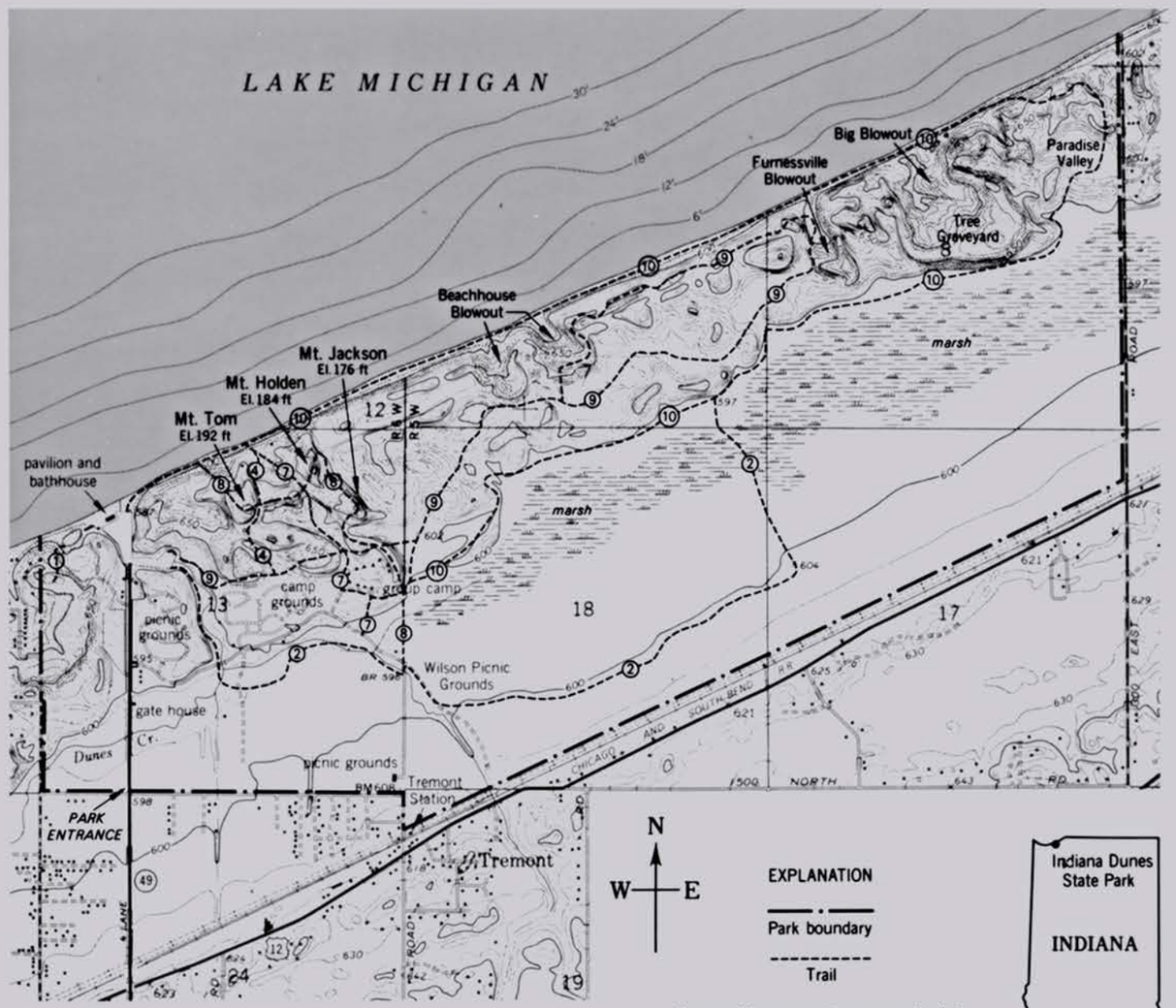

Base modified from U. S. Geological Survey 7½′ Dune Acres topographic quadrangle map, 1968.

Topographic *contour lines* connect points of equal elevation. The vertical distance between lines, the *contour interval*, on this map is 10 feet.

TOPOGRAPHIC MAP OF INDIANA DUNES STATE PARK, PORTER COUNTY, INDIANA

because of excessive wind erosion, an increase in beach width, or the sudden removal of vegetative cover. Moving in the direction of the prevailing wind, migrating dunes can engulf entire forests. They stabilize as sand supplies diminish and vegetative control is reestablished.

The interdunal marsh as viewed from the bridge on trail 8 near the Wilson Picnic Grounds

THE INTERDUNAL MARSH

Between the recent and relict foredunes of the earlier lake stages is a flat-lying marsh bordered by numerous secondary dunes that formed in recent time. The marsh is maintained by a high water table that remains at or near lake level. Deflation of the interdunal area by wind erosion is restricted to the elevation of the water table, which accounts for the broad, flat expanse of the marsh. Dune encroachment into the swamp, however, is common and is the reason for the lack of mature plant communities in this area. Trails 8 and 10 offer good views of the marsh in contrast with the densely wooded dunes around it.

Glacial Geologist John R. Hill
Photography – George R. Ringer

State Park Guide 8

GEOLOGIC STORY OF DUNES STATE PARK

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INTRODUCTION

The Indiana Dunes State Park is in a unique geologic setting at the southern tip of one of America's largest freshwater lakes. A product of waning glacial ice, Lake Michigan is the last significant contribution of the great Ice Age to northwestern Indiana. Today park visitors enjoy expansive sand beaches and rolling dunes—features that beautifully illustrate the effects of wind and water in reshaping the surface of the land since the departure of the glacier from this region some 12,000 years ago.

The beach—an endless supply of sand for the ever-changing dunes

LAKE MICHIGAN IS BORN

As ice of the last major glaciation of North America retreated northward in response to a worldwide warming trend, enormous volumes of meltwater were released. Part of this deluge was impounded by an arcuate ridge of glacial deposits called the Valparaiso Moraine (named for Valparaiso in Porter County, Ind.) that circumscribed approximately the southern quarter of the Lake Michigan basin. Trapped between the melting ice lobe and the moraine, the newly formed lake marked the birth of what became Lake Michigan. As the ice continued to recede (punctuated by at least two minor readvances into northwestern Indiana), more and more of the ice-locked basin was exposed and filled with meltwater. Simultaneously, the Valparaiso Moraine was breached, which formed drainage outlets to the south and southwest. This resulted in a gradual lowering of lake level. A complex history of ice-front fluctuations within the lake basin, together with variations in discharge through the outlets, created a series of different lake levels, each with its corresponding beach and dune complex.

Evidence for only three of the numerous lake levels and their corresponding beaches is recognized in the area including the Dunes State Park. The lake levels are called, from oldest to youngest: the Glenwood Beach and level at 640 feet above sea level, the Calumet Beach and level at 620 feet, and the Toleston Beach and level at 605 feet. Modern-day Lake Michigan is about 580 feet above sea level and has probably occupied nearly that elevation for the past 1,500 to 2,000 years. Most of the Dunes State Park is restricted to the Toleston and Recent beaches, although the southern boundary of the state property includes a small part of the Calumet Beach and its dune relics.

Looking west from the summit of Mt. Tom

MOUNTAINS OF SAND

Sediments left behind by the melting glacier were sorted and transported by streams flowing into the newly formed lake as well as by the action of currents and waves of the lake itself. The heavier materials, such as sand and gravel, settled in the nearshore region while the fine particles of clay and silt remained in suspension until they reached the deep, quiet waters of the open lake, where they settled to form dense bottom muds. Transported by longshore currents, which move in a southerly direction along the eastern and western shores and meet at the south end of the lake, the sand was then washed ashore by low rolling waves. Once on the open beach, winds blowing off the lake whisked the sand inland, which formed sinuous ridges known as foredunes. The same processes of sediment transport are, of course, still active today and account for the ever-changing character of the modern beach and foredune.

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.

Rapidly growing grasses and other ground cover help to stabilize the dunes

BLOWOUTS AND MIGRATING DUNES

Blowouts usually begin as a narrow channel on the crest of the foredune where vegetation has been removed by either man or nature. This confined breech acts to accelerate wind velocities greatly and results in intense erosion immediately behind the opening. The sand from this excavation is piled high atop the lee slope of the steep-walled depression, which creates an amphitheater-like topography. Both Mt. Tom and Mt. Holden, towering nearly 200 feet above the beach, are examples of highly developed blowouts. Beach House, Furnessville, and Big Blowouts (trails 9 and 10) are also typical of this type of dune. Long-buried trees, sometimes exhumed during blowout development, reveal evidence of older forest cover that had succumbed to a rapid growth of the foredune at some time between the Toleston and Recent lake levels. The tree graveyard exposed at Big Blowout (trail 10) was once a living forest that probably grew on the foredunes during Toleston time.

Migrating dunes, which are closely related to blowouts, form when sand supply suddenly increases

Big Blowout at the east end of the park