

## Sleeping Bear Dunes National Lakeshore, Michigan

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### LOCATION

Sleeping Bear Dunes National Lakeshore, T.27 to 32N., R.13 to 16W., Benzie and Leelanau counties, Michigan; North Manitou, Maple City, Empire, and Frankfort, Michigan, 15-minute quadrangles. The Sleeping Bear Dunes National Lakeshore begins just north of Point Betsie in Benzie County and extends northward along the Lake Michigan shoreline to Good Harbor Bay in Leelanau County (Fig. 1). The national lakeshore also includes both North and South Manitou islands. Access to the national lakeshore by automobile is by Michigan 22. Access to the Manitou Islands is by private or charter boat service. Charter boat service is from Leland, Michigan, and is provided by Manitou Island Transit from June through December. Service is round trip once daily. The driving of vehicles in Sleeping Bear Dunes National Lakeshore is restricted to established, maintained roads. The driving of offroad recreational vehicles is restricted to designated roadways; offroad travel in sand dunes areas is prohibited. Pets are not allowed on the Manitou Islands.

### LEGEND OF THE SLEEPING BEAR

Indian legend states that long before the coming of the white man, Mishe-Mokwa, the mother bear, and her twin cubs were driven from the shores of Wisconsin by fire and famine into the waters of Lake Michigan. Having no other choice, the three set out for the distant shoreline of Michigan. Their hearts were filled with fear, for their journey seemed impossible.

After swimming many hours, the Michigan shoreline came into view. However, the effort had taken its toll, and exhausted by the long swim, the cubs, one at a time, disappeared below the water. Mishe-Mokwa, longing for her cubs, stood upon the shore and waited for them day after day, to no avail. Finally, she laid down to sleep and wait forever.

The Great Spirit Manitou, deeply sensing Mishe-Mokwa's love and longing, caused her two cubs to rise above the waters as islands and named them, in her honor, for himself—South and North Manitou. To mark the resting place from which Mishe-Mokwa would maintain her eternal vigil, the Great Spirit gently covered her with sand, forming the Sleeping Bear Dune.

### SIGNIFICANCE

The land-sculpting effect of continental glaciation in northwest Michigan is clearly illustrated in the geologic features of the Sleeping Bear Dunes region. Glacial features such as terminal moraines, kettles, kames, eskers, drumlins, and sand dunes are identifiable. The most spectacular features are the massive perched dunes of the Sleeping Bear Dune complex that rise more than 460 ft (140 m) above Lake Michigan. Additional features such as wave-cut bluffs, beach terraces, sand bars, ridge and swale formations, and ancient lake plains can be seen and related to the rise and fall of the ancient Great Lakes.

The Sleeping Bear Dunes National Lakeshore was authorized by Congress in October 1970. Including North and South Manitou islands, the national lakeshore comprises approximately 72,000 acres of land and deeded lake surface area.

### DESCRIPTION

During the Pleistocene, continental glaciers spread southward from Canada across the Michigan Basin. When the glacial advance halted and then slowly began its retreat, huge quantities of glacially derived sediments were deposited. These deposits formed the numerous glacial landforms now evident in the region of the Sleeping Bear National Lakeshore. In relation to the Sleeping Bear Dunes, the most significant glacial landform is the terminal moraine near Glen Lake, Michigan (Fig. 2). This moraine, called the Manistee moraine, marks the farthest extent of glaciers in the area during the last ice advance and is considered the major glacial landform controlling the development of surficial geology in the Sleeping Bear area.

As ice advanced during the last period of glaciation, immense headlands, formed during previous ice advances along the shores of ancient Lake Michigan, resisted the force of the ice mass and directed the ice flow into existing valleys. The ice lobes scoured debris from the valley floors and walls and deposited it along the sides of the valleys and at the glaciers front. These deposits became the prominent north-south-facing moraines of the Sleeping Bear region (Fig. 2).

As the glaciers began to retreat, many of the valley entrances became blocked by ice in the Lake Michigan basin, causing the valleys to fill with water. The moraine at Glen Lake (Alligator Hill) became an island between the unmelted ice still occupying the Lake Michigan basin and the adjacent moraines. These adjacent moraines are known as Prospect Hill, Miller Ridge, and the Sleeping Bear Plateau.

Meltwaters flowing southward from the receding glacial front formed vast outwash plains in southern Leelanau and northern Benzie counties (Fig. 2). A major southern drainage way sliced through the Manistee moraine forming the extensive out-wash area south of the

moraine called the Platte Plains. The southward flow of these drainage channels is opposite to the directions in which the area streams run today; when ice blockage in the Lake Michigan basin cleared, the flow reversed and the streams began to run into the Lake Michigan basin (Kelley and Farrand, 1967). The movement of a thinning sheet of ice north of the Manistee moraine formed several vast drumlin fields (Fig. 2). The long, rounded drumlin hills are useful in interpreting the Sleeping Bear area because they are oriented in the direction of ice flow. As ice thickness dropped below the level of the Manistee moraine, ice border lakes were formed. Many of these border lakes still exist in modern form (Fig. 2).

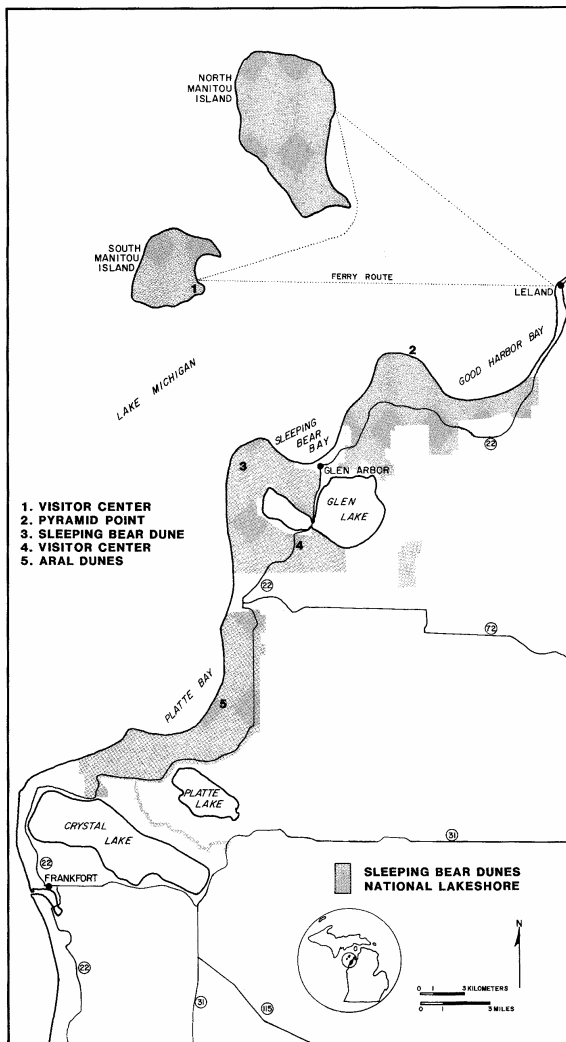


Figure 1. Location of Sleeping Bear Dunes National Lakeshore, Michigan.

As the glacial ice retreated northward, the immense volume of meltwater filled the Lake Michigan basin to form postglacial Lakes Algonquin, Nipissing, Algoma, and Chippewa. The water elevation and extent of these ancient Great Lakes was dependent on the elevation of the lowest outlet available to the sea and blockage by ice still remaining. Evidence of these lakes can be seen in the national lakeshore through features such as wave-cut bluffs, sandbars, beach terraces, ridge and swale formations, and sandy lake plains.

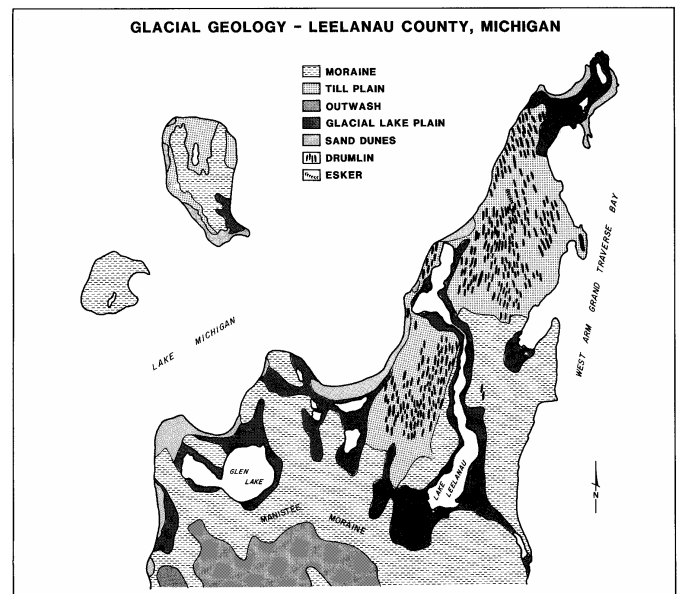


Figure 2. Generalized glacial geology of Leelanau County, Michigan.

The fluctuating water levels had tremendous impact on landforms in the region. When water receded, current-carried drift was deposited, building sandbars and spits across channels, damming the waters, and forming many smaller lakes in the embayed areas (Wilson, 1980), for example, Glen Lake (Figs. 1 and 2). When water levels dropped significantly, sand deposits would dry out. Driven before the prevailing westerly winds off ancient and modern Lake Michigan, the blown sand formed the complex variety of dunes in the Sleeping Bear region. The most common dune forms along the national lakeshore are beach dunes and perched dunes (Buckler, 1979).

Beach dunes, or foredunes, are found adjacent and parallel to the lakeshore and are seldom higher than 50 ft (15 m; Kelley, 1971). The Aral Dunes, along Platte Bay's north shore, are good examples of beach dunes. Perched dunes, on the other hand, sit high above the shore on plateaus. In the case of the Sleeping Bear Dune complex, these plateaus are moraines. As the water level in Lake Michigan changed, the dunes migrated. When the shoreline retreated, the dunes stabilized. If the proper conditions were available, new dunes formed along the new shoreline. The older dunes, formed at a higher lake level or atop moraines, remained constant. As the shoreline advanced with a rising lake level, older stable beach and dunes were eroded. The eroded materials were then recycled into the dune building process, creating new dunes or adding to the height of existing perched dunes. The continued inland migration and expansion of the Sleeping Bear Dune complex has forced the move of many buildings in the area as the shifting sand threatens to cover them. The most significant move involved shifting the U.S. Coast Guard Station from Sleeping Bear Point to Glen Haven. Numerous stands of trees have been buried by the migrating sand. As the dunes move on, "ghost forests" of dead trees are exposed. These stark

reminders of the dunes' passing are littered throughout the national lakeshore.

The migrating sand dunes of the Sleeping Bear area have effectively buried and preserved numerous fossil vertebrates of the Late Pleistocene and other postglacial ages. Pruitt (1954) and Wilson (1967) described and identified 17 different varieties of mammal and fish skeletons from Sleeping Bear Dune.

The two Manitou Islands are within the authorized boundaries of the national lakeshore. These islands represent the southernmost limit of an island chain that extends north to the Straits of Mackinac. The island chain represents the crest of a high bedrock ridge covered with a blanket of drift.

The west side of South Manitou Island is characterized by high bluffs topped with perched sand dunes. Gull Point on the northeast corner of the island is the nesting ground for a large colony of Herring and Ring-Billed gulls. While the colony is off limits to hikers, surrounding hills afford a good view. The Valley of the Giants, a grove of virgin white cedar trees, is located on the island's southwest corner. The world record white cedar is located within the grove. It measures 17.6 ft (5 m) in circumference and stands more than 90 ft (27 m) tall. A total of 528 growth rings were counted on one of the fallen trees in the grove, dating their existence prior to Columbus. North Manitou Island is undeveloped and will remain a wilderness area. The island is mostly low, sandy open dune country, interfingered with high sand hills and blowout dunes. On the west and northwest sides of the island, 300-ft-high (91 m), deeply gullied bluffs form the shoreline.

Because of its diverse geological character, the Sleeping Bear Dunes region exhibits a wide variety of plant and animal life. At least six terrestrial community types exist within the lakeshore; these include dune, forest, plain, meadow, swamp, and aquatic environments. These communities are home to more than 326 species of birds, 49 species of mammals, 15 species of reptiles, 17 species of amphibians, and 80 species of fish.

Camping spots are plentiful at 12 area campgrounds, and the national lakeshore has numerous hiking trails of varying lengths and difficulty. The Sleeping Bear Point Maritime Museum, the wreck of the merchant ship Francisco Morazan, several historic lighthouses, and the dune climb at the Sleeping Bear Dune are all interesting family stops within the National Lake-shore. Additional information about Sleeping Bear Dunes National Lakeshore can be obtained by writing Sleeping Bear Dunes National Lakeshore, 400 Main Street, Frankfort, Michigan 49635.

## REFERENCES CITED

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