



Assessing Windstorm Damage at Sleeping Bear Dunes



The sky turned dark just after 4:00 p.m. on Sunday, August 2, 2015. A shelf cloud appeared over Lake Michigan, a sign that a very strong weather front was about to move through. Then the wind came. Afterwards, the National Weather Service would report that straight-line winds reached an estimated 80 to 100 miles per hour in Sleeping Bear Dunes National Lakeshore and in the nearby town of Glen Arbor, Michigan. The strongest winds blew for about 22 minutes, knocking over thousands of trees. Fortunately, no one was killed or injured.

News accounts reported that more than 1,000 total acres were affected by the storm, though many sites were less than one acre in size. To determine the extent and degree of damage the storm inflicted within the park boundaries, we compared pre- and post-disturbance imagery (aerial and satellite photography), looking for gaps in the forest canopy and drawing polygons around identified sites (*Figure 1*). When mapping was completed in the spring of 2016, network staff went to Sleeping Bear Dunes to visit randomly selected sites and validate the map's accuracy.

The storm that struck the park came off Lake Michigan from the northwest, and this can be seen in the polygons, as nearly all the sites were oriented in a northwest to southeast direction. A total of 335 polygons were identified inside the park, representing 705 acres (285 ha) (*Figure 2*). Eighty-one percent (81%) of the delineated windthrow areas were in the Alligator Hill Trail area.

We visited 37 of the delineated polygons and found only five (14%) were falsely identified in the office. Severity of the damage within individual polygons varied, with most of the heavily damaged sites being in the Alligator Hill area. The largest single polygon was also on Alligator Hill, where 108 acres were affected, and collectively, the greater Alligator Hill area was hardest hit by the straight line winds with 573 acres (232 ha) affected by windthrow.

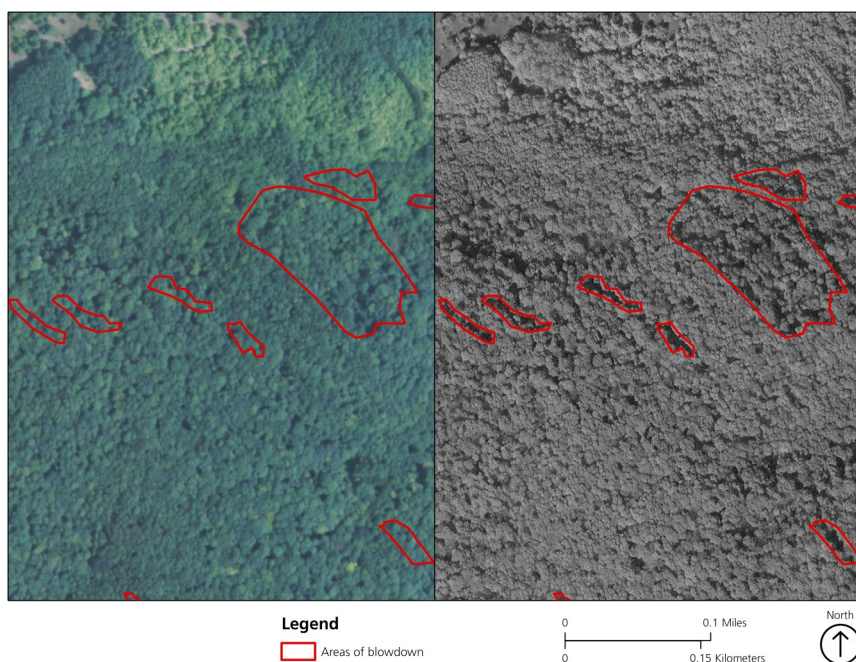


Figure 1. To identify and delineate windthrow areas, scientists compared aerial images from before the storm (2014; *left*) and after the storm (fall 2015; *right*), looking for gaps in the forest canopy. Red polygons drawn around the identified sites provide measures of the windthrow area.

Nature Resets Itself

This is one of the most dramatic kinds of landscape disturbance in the Great Lakes region, with effects continuing to be seen for decades. Windthrow changes the density, structure, and species composition of forest ecosystems, but amid the destruction, there is new life.

Park managers now have an opportunity to study and document how the forest recovers and changes as a result of this natural disturbance. Canopy openings will allow more light to reach the forest floor, encouraging the growth of saplings and ground cover plants such as wildflowers. But openings and increased light also provide ideal conditions for the undesirable introduction and establishment of invasive plants. Park staff have already started monitoring for the presence of invasive plants on Alligator Hill, and they will more closely watch the data coming from the network's three forest vegetation monitoring plots there to see how the plant community changes.

Park managers have also evaluated the fire risks presented by all the down wood. They are doing some fuel reduction along the perimeter of the area and along roads.

As we gain a better understanding of how the forest is changing, other appropriate management activities will be implemented. ●

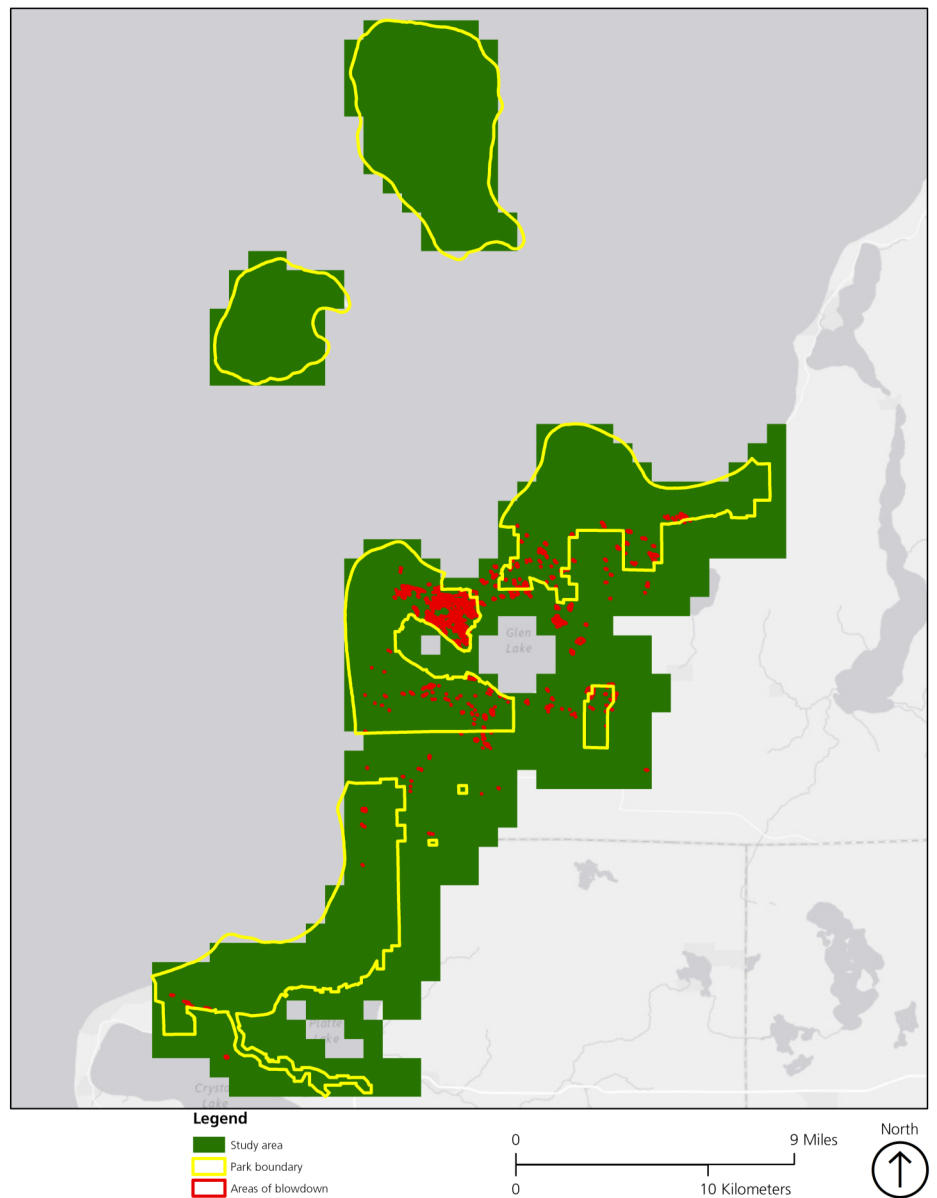


Figure 2. Total area affected by the windstorm. Green represents the analysis area, yellow outline indicates the park boundary, and red indicates mapped areas of windthrow.



New openings in the forest canopy allow sunlight to reach more of the forest floor, encouraging the growth of sapling trees and ground cover plants such as wildflowers.