



Landscape Dynamics at Pictured Rocks National Lakeshore

Why and How We Monitor

- Disturbances such as fire, windstorms, and insect or disease outbreaks are an important part of how ecosystems function. These changes can affect animal movements, vegetation composition and diversity, water quality, and the carbon cycle.
- Monitoring these disturbances through time provides valuable information about historic disturbance regimes that can be compared to present conditions and be used to identify potential future trends.
- Disturbances in and around Pictured Rocks (PIRO) were delineated for six years (2006–2011) using Landsat satellite imagery and a program called LandTrendr. High resolution aerial photos were then used to identify the disturbance agents.

What We're Finding

Summary analyses of the park and non-park areas showed that **disturbances in the park's interior buffer zone (PIRO-IBZ) and outside the park were dominated by forest harvest** (*Figure 1*). However, this is not a surprise considering that the IBZ is primarily in state and industrial forest ownership. Of the forest harvests occurring within the IBZ, two were >200 ha (494 acres) in size and came up to the border of the core zone.

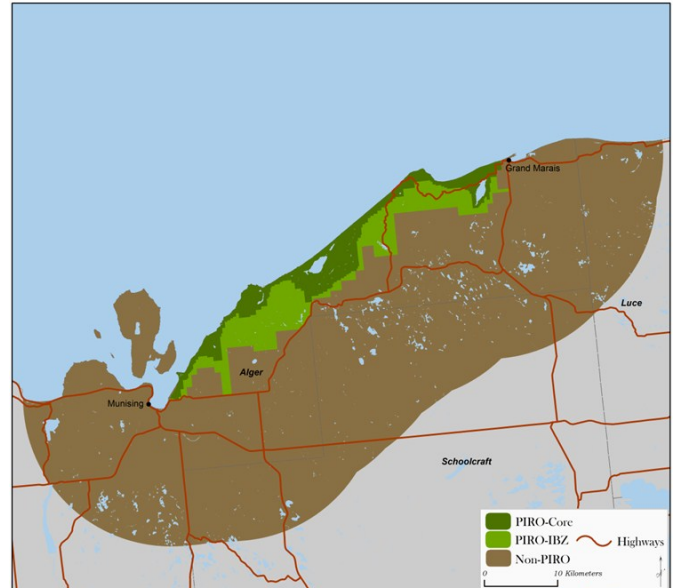
Within the park 'core' area (PIRO-Core), forest pathogen was the major disturbance agent, peaking in 2006 when almost 5% of the land area within the core was affected. The bulk of the forest pathogen disturbance was due to beech bark disease spreading westward across the park and resulting in beech tree mortality (*Figure 2*).

Outside the park administrative boundary, the bulk of the forest harvests occurred in the eastern portion of the analysis area. One large block of forest harvest (partial and clearcut) occurred between 2006 and 2011 and consumed an area of nearly 5,000 ha (12,355 acres; *see purple box in Figure 2*). Forest pathogens were a minor component of disturbances outside the park boundary.

Among the major ownership types, over half of all disturbances occurred on private lands, followed by the State of Michigan (*Figure 3*). Private ownership also comprised the largest proportion of land in the analysis area, encompassing nearly 40% of the total. Interestingly, the State of Michigan and the U.S. Forest Service had nearly equal proportions of clearcuts-to-partial harvests, whereas forest harvest on private lands was dominated by partial cuts (*Figure 3*).

Management Implications

Identification and quantification of disturbances in and around Pictured Rocks National Lakeshore allows park resource managers to see the locations of disturbances not only inside the park, but also on neighboring lands. The disturbance map



The analysis area. A total of 230,084 hectares (568,550 acres) both within and outside the national lakeshore boundary were included in the disturbance analyses.

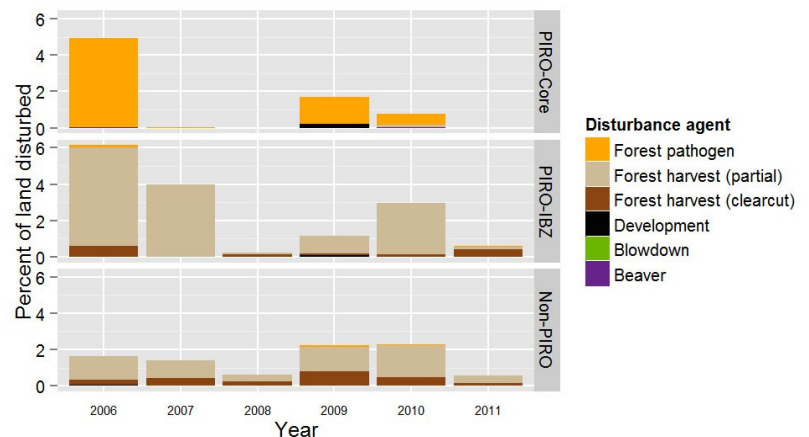


Figure 1. Percent of land area disturbed by disturbance agent within each analysis area zone.

(Figure 2) provides insight to where disturbances are occurring on the landscape, and their proximity to resources that could potentially be affected. This information could also be used as a tool to guide the placement of beech restoration projects in the future. The large areas affected by forest pathogen may be a good place to start restoration/rehabilitation before invasive/exotic species become established in these open areas.

Additionally, it may be useful to view the type (clearcut or partial) and location of forest harvests occurring near the park's core boundary. Some of these large clearcuts have the ability to influence small mammal movement or amphibian dispersal.

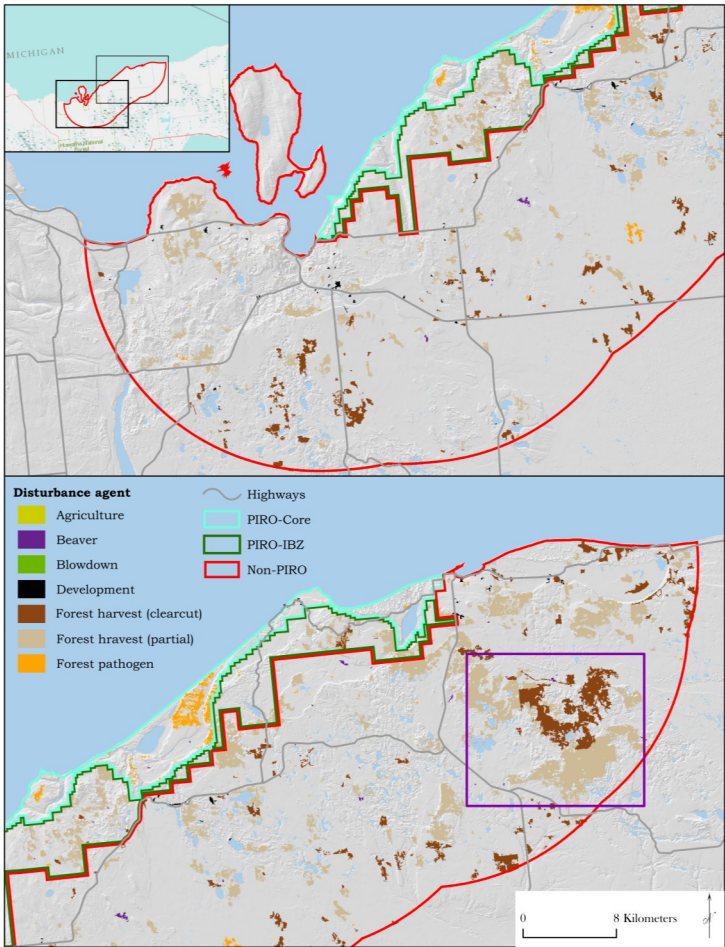


Figure 2. Disturbances detected within the western (top) and eastern (bottom) halves of the analysis area, 2006–2011. Purple box encompasses nearly 5,000 hectares (12,355 acres) of forest harvests.

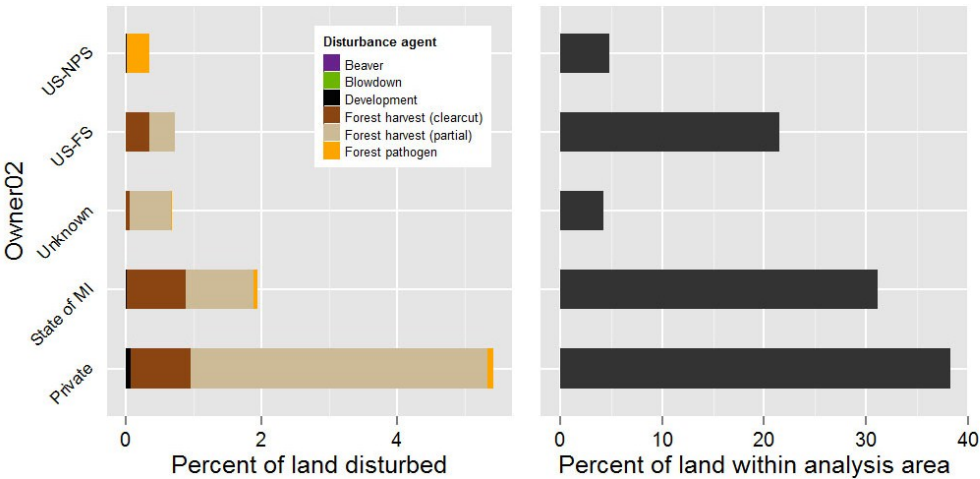


Figure 3. Percent of land disturbed within the entire analysis area by ownership type (left) and the percent of the analysis within each ownership type (right).