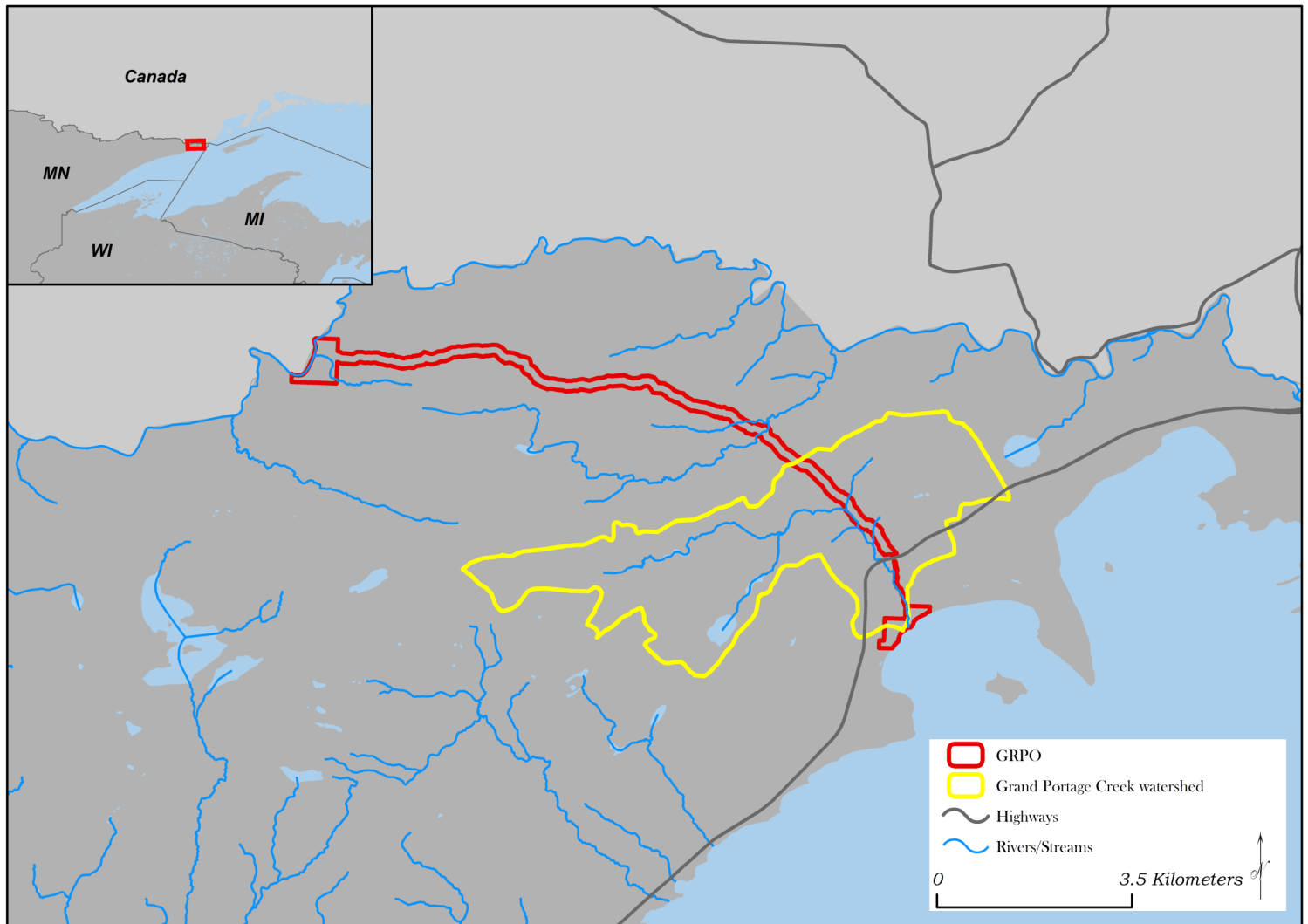




Landscape Dynamics in the Grand Portage Creek Watershed



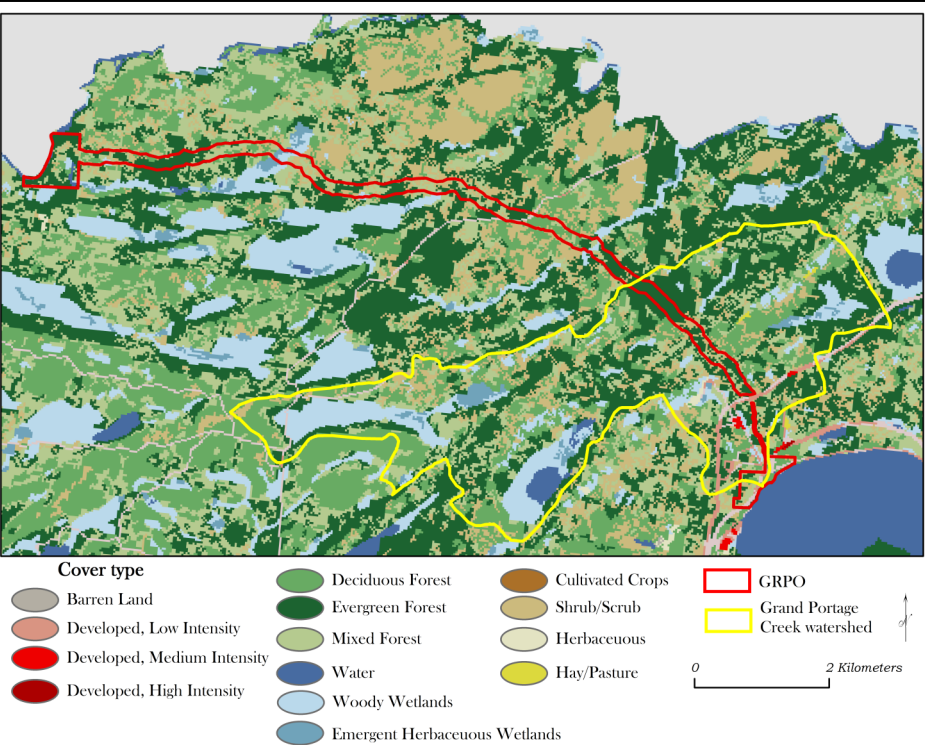
The Grand Portage Creek watershed (yellow line) drains an area 1,816 hectares (4,487 acres) in size, most of which is beyond the borders of the national monument.



In support of a geomorphic assessment of Grand Portage Creek (funded by the Great Lakes Restoration Initiative), we summarized landscape disturbances in the Grand Portage Creek watershed for the period 1985 to 2012.

Disturbance sites were identified using a combination of Landsat satellite imagery and high resolution aerial photos and a program called LandTrendr. LandTrendr analyzed the Landsat imagery to track vegetation changes in and around the park and highlight areas of apparent disturbance. Then, the airphotos were used to substantiate evidence of a disturbance, and to define what caused it.

Disturbance agents such as fire, forest harvest, development, forest pathogens, and blowdowns were identified and recorded, along with the pre- and post-disturbance land cover types.



Land cover types, circa 2006, for Grand Portage National Monument (red border) and surrounding lands. The area of the Grand Portage Creek watershed is shown in yellow. Data from 2006 National Land Cover Dataset.

Findings

Not surprisingly, more than 75% of the analysis area was forested, with evergreen forests making up the majority of those areas and the balance nearly evenly divided between deciduous and mixed forests (*Figure 1*). There was also a significant amount of woody wetlands present (approx. 15% of the total area), which typically were either black spruce forests or sparsely treed wetland areas.

Summary analyses of the 26-year period showed that, in total, 13% of the watershed (0.5% per year) experienced some type of disturbance. Of this 13%, ten percent was due to a forest pathogen outbreak in 1999 (*Figure 2, Table 1*). To keep this single event from overshadowing the entire dataset, we split the data into two time frames: 1955–1998 and 1999–2012 (*Figure 2*). Viewed in this

way, we can see that the amount of area affected by partial harvests (non-clearcuts) increased between the two time periods, but the proportion of land affected by clearcuts was roughly the same (*Figure 3*).

The vast majority of the forest that was disturbed from 1999–2012 remained in the “closed” forest vegetation type, indicating that the amount of forest canopy removed was less than 40% (*Figure 4*). The bulk of the disturbances occurred in the southwestern half of the watershed, south and west of the monument’s boundary. However, there were some small disturbances due to development that occurred near the park boundary and closer to the lakeshore (*see Figure 2*). ●

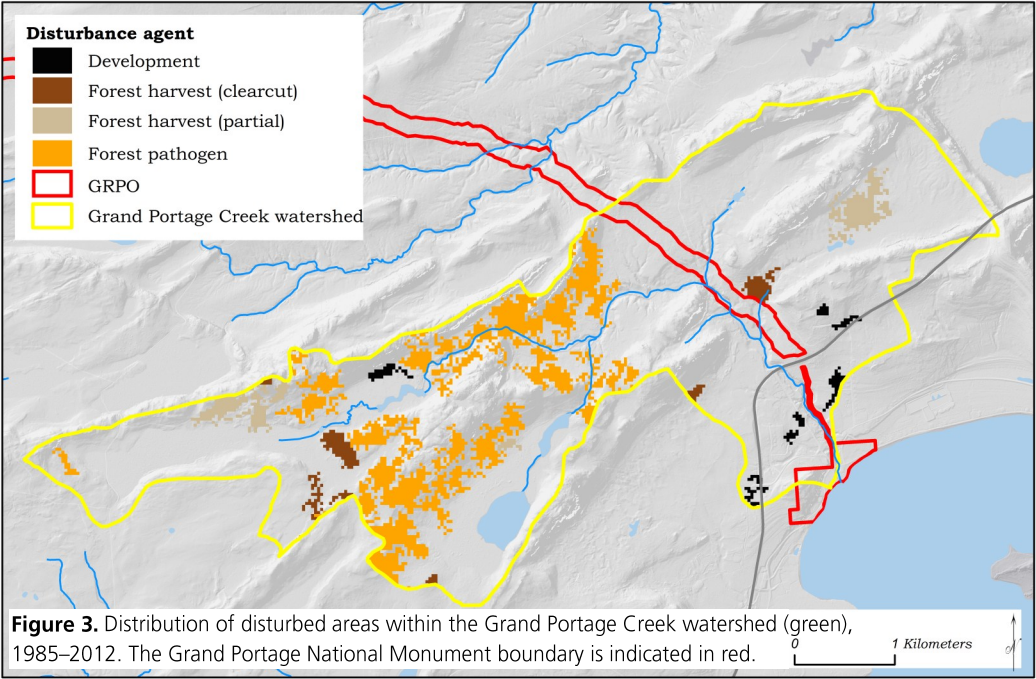


Figure 3. Distribution of disturbed areas within the Grand Portage Creek watershed (green), 1985–2012. The Grand Portage National Monument boundary is indicated in red.

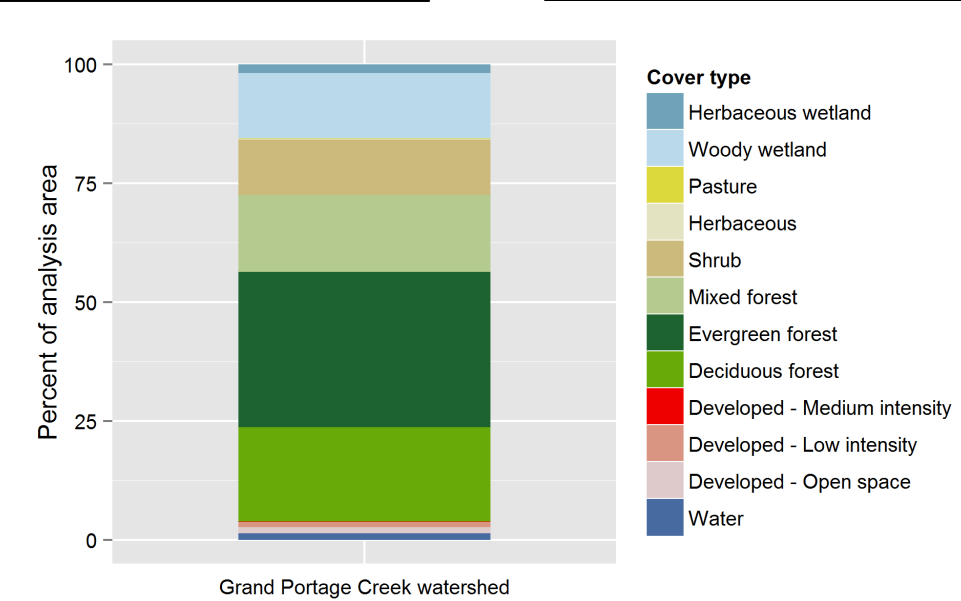


Figure 1. Average proportions of land cover types in the analysis area, circa 2006. Land cover is classified according to the 2006 National Land Cover Dataset (NLCD).

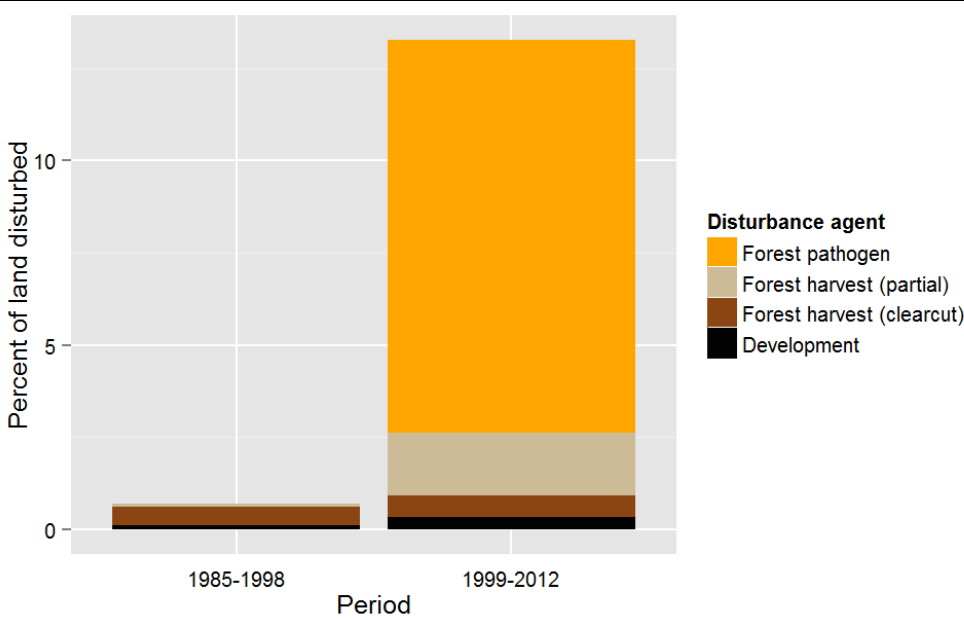


Figure 2. Percent of land disturbed within the analysis area, by disturbance agent, for the periods 1985–1998 and 1999–2012.

Table 1. Land area (in hectares) disturbed in the Grand Portage Creek watershed, by disturbance agent and year, 1985–2012.

Year	Area Disturbed (ha) by Agent				Total per Year
	Development	Forest pathogen	Forest harvest (clearcut)	Forest harvest (partial)	
1985	0	0	0	0	0
1986	0	0	0	0	0
1987	0.77	0	0	0	0.77
1988	0	0	0	0	0
1989	1.08	0	0	0	1.08
1990	0	0	7.85	0	7.85
1991	0	0	0	0	0
1992	0	0	0.95	1.54	2.49
1993	0	0	0	0	0
1994	0	0	0	0	0
1995	0	0	0	0	0
1996	0	0	0	0	0
1997	0	0	0	0	0
1998	0	0	0	0	0
1999	0	185.53	0	0	185.53
2000	2.47	2.07	0	12.12	16.65
2001	0	0	1.71	0	1.71
2002	0.76	0	1.17	0	1.92
2003	0	0	0	16.28	16.28
2004	0.32	0	7.38	0	7.70
2005	0.55	0	0	0	0.55
2006	0	0	0	0	0
2007	0.32	0	0	0	0.32
2008	0	0	0	0	0
2009	1.10	0	0.41	1.24	2.75
2010	0.20	0	0	0	0.20
2011	0	0	0	0	0
2012	0	0	0	0	0
Total per agent	7.56	187.60	19.47	31.18	245.81

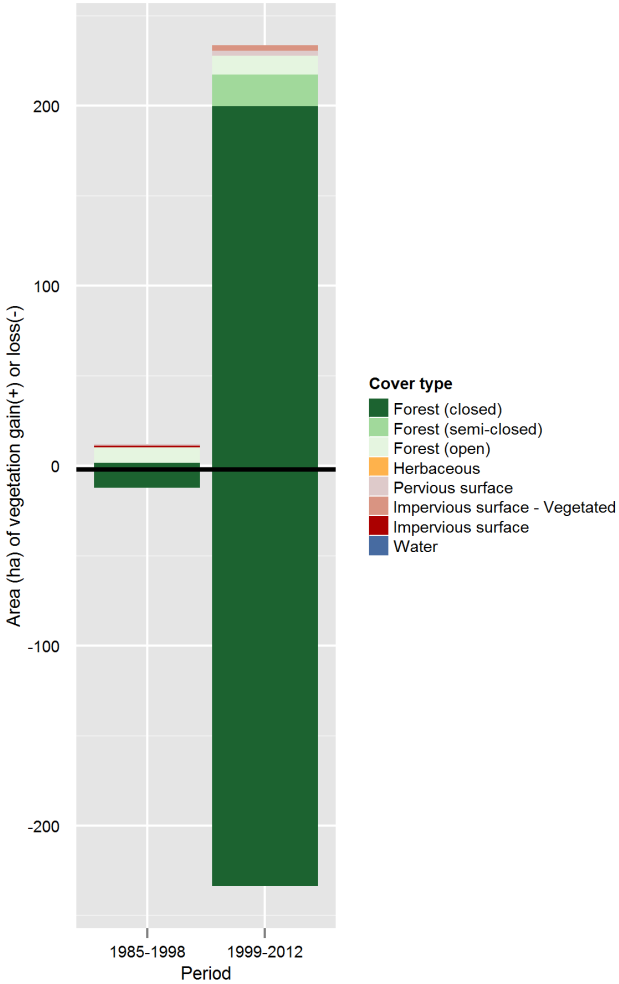


Figure 4. Area (in ha) of cover type lost (-) and gained (+) within the analysis area, 1985–2012. Where loss and gain of a cover type is the same, that cover type has been affected by a disturbance but not severely enough to alter the cover type.

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Pictured Rocks National Lakeshore
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Voyageurs National Park

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