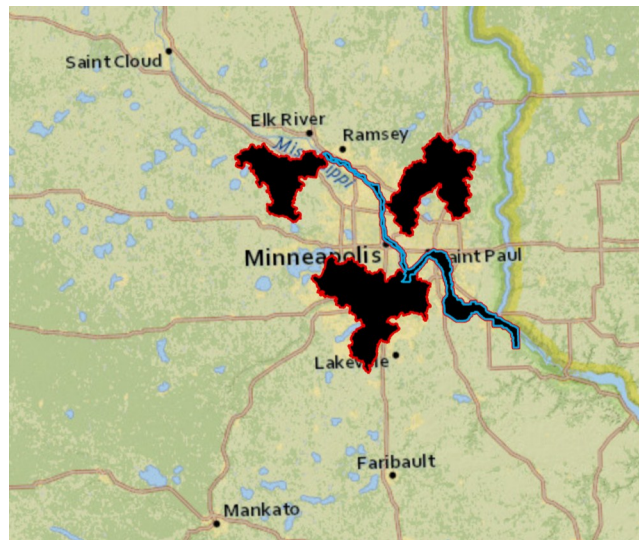




Monitoring Landscape Dynamics in the Mississippi NRR

Why and How We Monitor

- Natural disturbance, whether it comes in the form of windstorm, flood, or fire, is an important part of how ecosystems function. These changes can affect animal movements, vegetation composition and diversity, water quality, and the carbon cycle.
- Monitoring landscape disturbances through time provides valuable information regarding historic disturbance regimes compared to present and future conditions and trends. In addition, park managers gain valuable knowledge of disturbance patterns outside the park boundary, areas not monitored by other Network or park programs due to limited resources.
- The Great Lakes Inventory and Monitoring Network used Landsat satellite imagery and high resolution aerial photos to analyze land use and disturbance over a six-year period (2005-2010) along the Mississippi National River and Recreation Area (MNRRA) corridor and in three of the river's sub-watersheds. Comparing the riverway proper with areas outside the riverway boundaries gives a fuller picture of what influences waters within the MNRRA.



The MNRRA corridor and three of its sub-watersheds—Crow River, Rice Creek, and Minnesota River—and were analyzed for land use and disturbance during the six-year period 2005-2010.

What We're Finding

Disturbance agents such as fire, forest harvest, development, flooding due to beaver activity, forest pathogens, and blowdowns were identified and recorded (Figure 1).

When comparing disturbance rates among sub-watersheds, **the largest percentage of change occurred in the Rice Creek sub-watershed**, even though it does not contain the largest amount of land within the analysis area (Figure 2). The largest sub-watershed, the Minnesota River, had the second highest percentage of disturbances, nearly all the result of development. The Crow River sub-watershed experienced the lowest amount of disturbance; it is also the furthest from the Twin Cities Metro area.

The vast majority of disturbance in the analysis area was the result of land development. This is expected in an urban area, but it is noteworthy that development represents a more permanent shift in the land type than that created by something like forest harvest (logging); it often creates more impervious surface area as well.

When the disturbances are totaled by year and disturbance agent, there is a very evident trend in development activity (Figure 3). **Since 2006, there has been a precipitous drop in land development in the analysis area, which reflects a similar trend in the number of housing starts across the United States.**

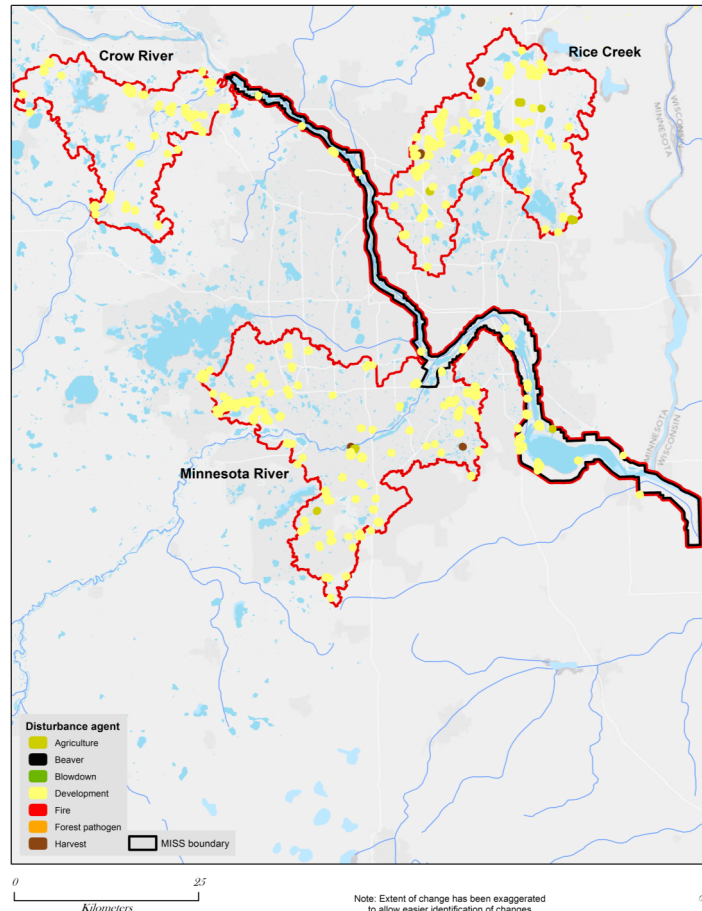


Figure 1. Disturbances detected along the MNRRA corridor and in three sub-watersheds, 2005-2010.

It should be noted that this analysis does not account for shifts in agricultural practices which greatly influence the water quality of the river. In other words, the conversion of a hay/pasture/grassland to row crops such as soy beans and corn is not captured in this analysis, but there may be observable differences in water quality due to increased application of fertilizers, increased runoff, and/or increased sedimentation.

Management Implications

Identifying and quantifying land use and disturbances in and around MNRRA allows park managers to see trends in land changes within the park and on neighboring lands and in sub-watersheds that influence the Mississippi River corridor.

The spatial extent of the analysis area allows us to view large areas outside the park boundary that will likely affect the ecological integrity of the riverway itself. As the population of the Metro area continues to grow and expand, we expect to see this manifested in increased development pressure on the Crow River watershed.

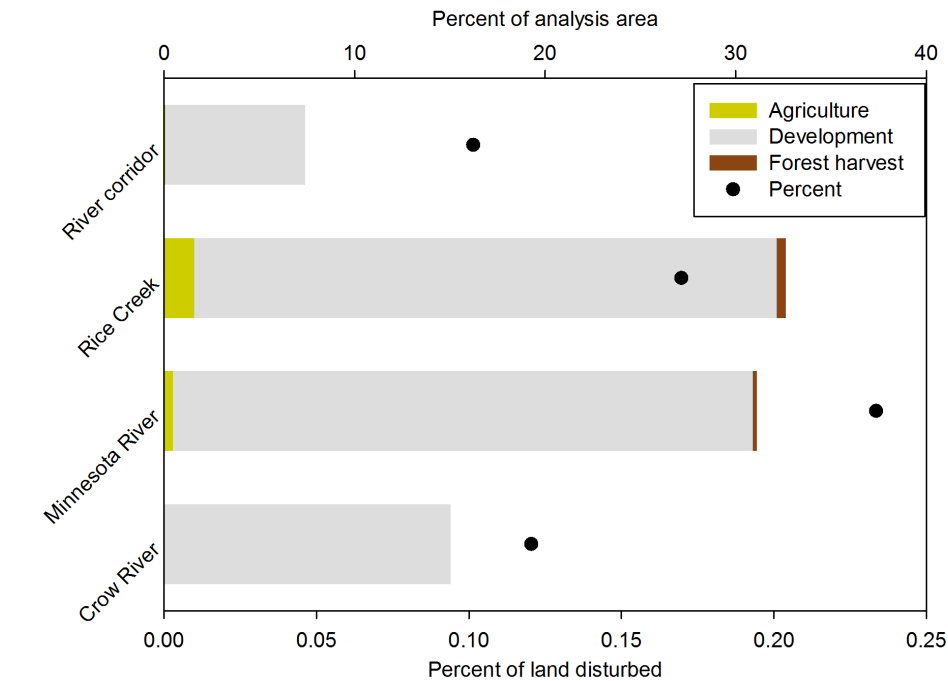


Figure 2. Percent of land disturbed (bars) within the river corridor and each sub-watershed, 2005-2010, and the proportion of land each sub-watershed occupies within the analysis area (black circles).

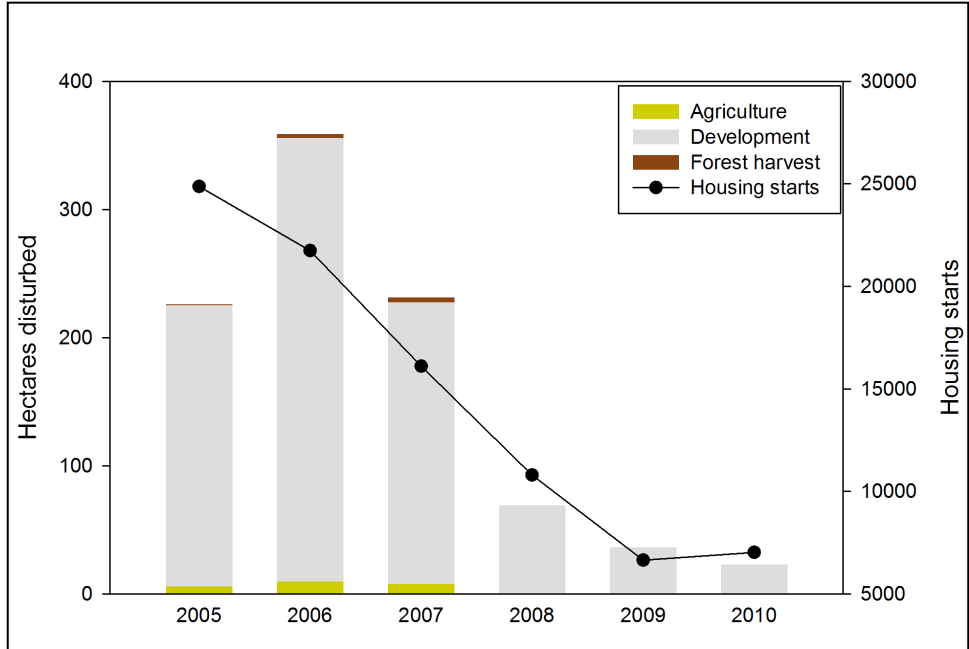


Figure 3. Total area disturbed inside the analysis area each year by disturbance agent, 2005-2010, compared to total housing starts per year in the United States. Housing data from U.S. Department of Commerce, Census Bureau, and made available through the Economic Research website of the Federal Reserve Bank of St. Louis (<http://research.stlouisfed.org/fred2/>).