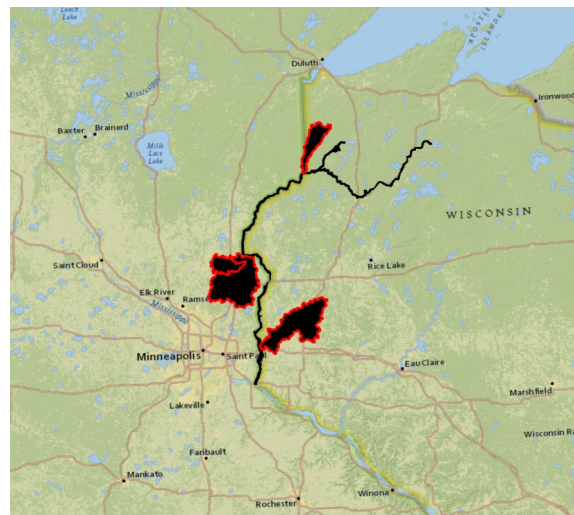




Monitoring Landscape Dynamics in the St. Croix Riverway

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 resource 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 (GLKN) used Landsat satellite imagery and high resolution aerial photos to analyze land use and disturbance over a six-year period (2005-2010) along the river corridor and in four of the St. Croix's sub-watersheds. Comparing the riverway proper with areas outside the riverway boundaries gives a fuller picture of what influences the St. Croix Riverway.



The St. Croix River corridor and four sub-watersheds of the St. Croix Riverway (north to south—Upper Tamarack, North Branch Sunrise, Sunrise, and Willow rivers) were analyzed for land use and disturbance during the six-year period 2005-2010.

What We're Finding

Summary analyses of the riverway and four sub-watersheds showed that **disturbances inside and outside the riverway boundary were dominated by forest harvest** (Figure 1). The majority of these harvests occurred in the Upper Tamarack watershed and in the northern half of the St. Croix river corridor (Figure 2).

When summarized by ownership, the highest percentage of land disturbed was on properties owned by Douglas County (Wisconsin), even though those lands accounted for <10% of the land within the analysis area. The next highest percentage of disturbed land was on privately-owned properties (Figure 3), which comprised nearly 80% of the analysis area and contributed approximately equally to the disturbance total (Figure 1). The main difference between these two ownership types was the large proportion of development on private land, a disturbance type nearly absent on Douglas County properties.

The greatest amount of disturbance in the analysis area occurred within the river corridor itself (Figure 1), and most of those disturbances occurred in the northern half of the corridor (Figure 2). Thus, it is no surprise that, among the four sub-watersheds analyzed, the

Upper Tamarack (northern-most of the four) experienced the highest rate of disturbance—nearly three times as much as the next closest sub-watershed (Figure 2). Yet, this sub-watershed comprises a relatively small proportion of the total analysis area (one-third the size of the Willow and Sunrise). Part of the reason for this is the great deal of forest harvest that occurs in the northern reaches of the Riverway. However, it is worth noting that **disturbance caused by forest harvest results in a much different landscape and land use pattern than disturbance caused by development** because,

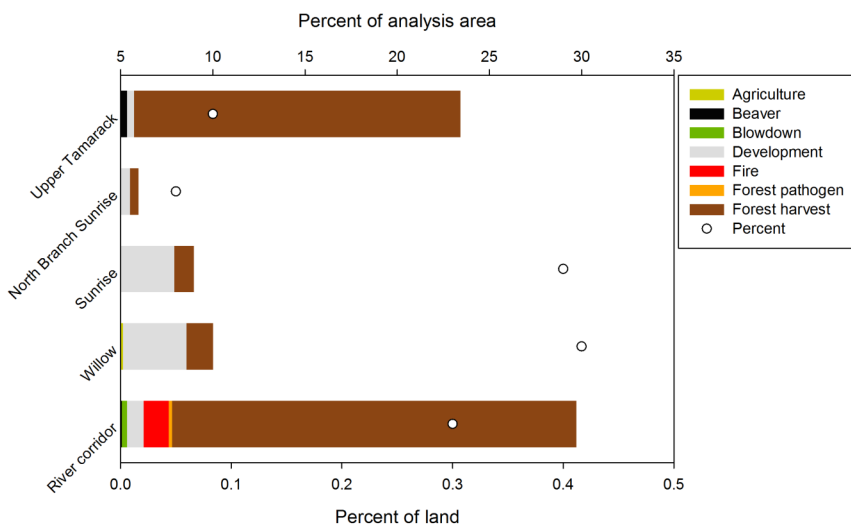


Figure 1. Percent of land disturbed inside the entire analysis area by subwatershed and all other land (river corridor), overlaid by percent of analysis area within each zone.

while land disturbed by forest harvest quickly returns to a forested landscape, development activities typically change the vegetation permanently, mostly into urban use classes.

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

Identification and quantification of disturbances in the greater St. Croix Riverway area allows park managers to view the locations of disturbances not only inside the park, but also on neighboring lands and sub-watersheds. Figure 2 provides insight to where the greatest number of disturbances are occurring within the river system, and where the resulting impacts are originating, which may ultimately affect water and other park resources.

In addition to the ecological importance of monitoring disturbances in the watersheds flowing into the St. Croix and Namekagon rivers, this monitoring data could also be used as a tool for monitoring scenic easements.

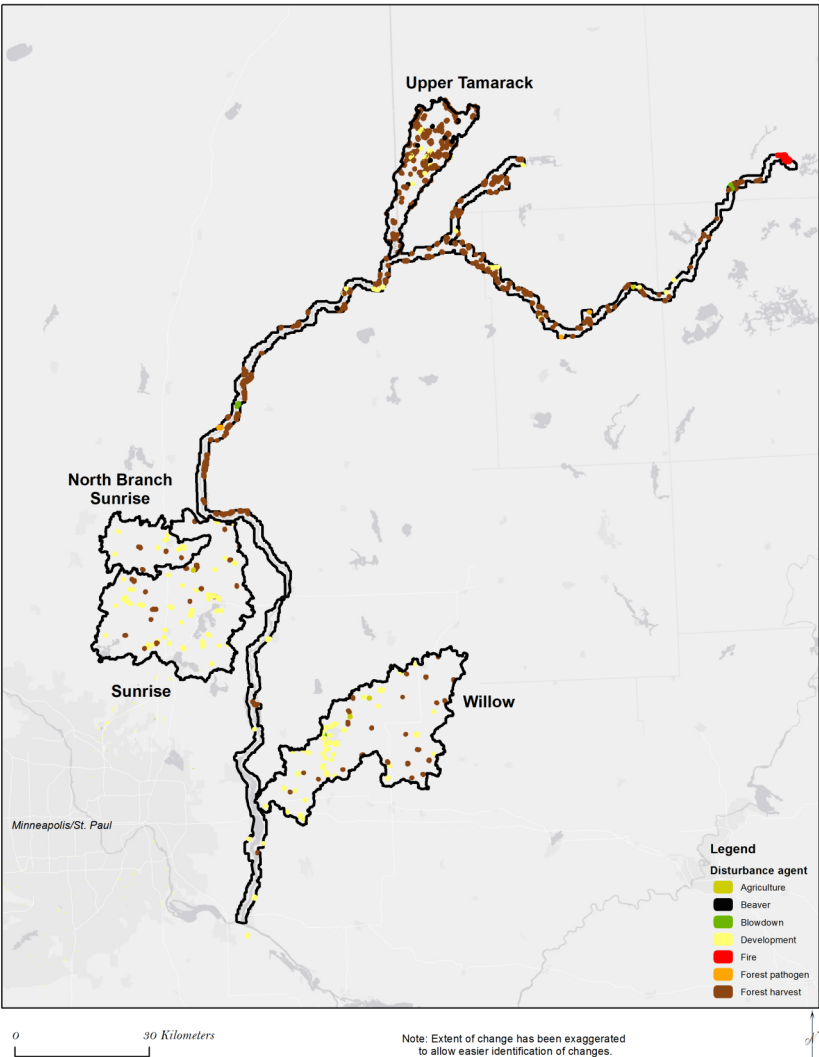


Figure 2. Disturbances detected within the analysis area (solid black line), 2005-2010.

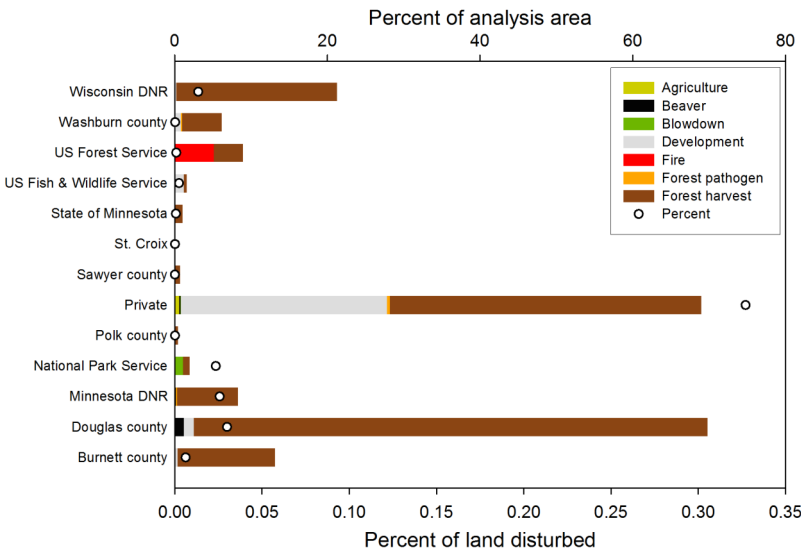


Figure 3. Percent of land area disturbed within the entire analysis area by land owner, overlaid by percent of analysis area within each ownership class.