



Great Lakes Environmental Indicators

EPA STAR E_aGL_e

Vegetative Indicators of Condition, Integrity, and Sustainability of Great Lakes Coastal Wetlands

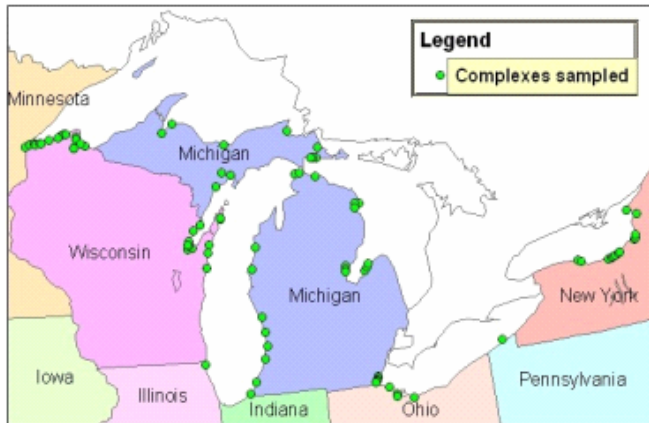


Figure 1. Wetland complexes sampled.

Background

The Wetland Vegetation group of the Great Lakes Environmental Indicators (GLEI) project focuses on plants as indicators of wetland condition. Objectives of the subproject are to: (1) identify vegetative indicators of condition of Great Lakes coastal wetlands, (2) develop relationships between environmental stressors and those vegetative indicators, and (3) make recommendations about indicators to managers.

GLEI Wetland Vegetation Partners

Four academic institutions are involved in this indicator development: South Dakota State University, the University of Minnesota Duluth, the University of Wisconsin-Madison, and Cornell University. We also collaborate with the EPA Mid-Continent Ecology Division-Duluth.

Approach

We measured herbaceous plant species within 90 coastal wetland complexes during 2001, 2002, and 2003 (Figure 1). We estimated the proportion of ground covered by plant species within 1 x 1 m plots scattered throughout each wetland; a total of 2,015 plots were sampled. All plants in the plots were identified to the lowest taxonomic level possible, usually to species. Indicators derived from those measurements are being related to measures of anthropogenic stressors (e.g., land use, chemical discharge) within and upslope of the wetlands studied.

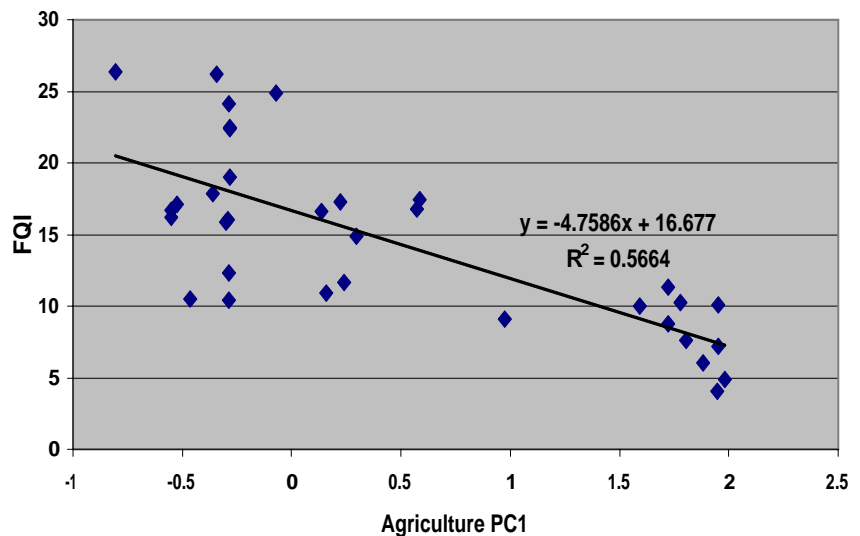


Figure 2. FQI for open-coast and protected wetlands significantly decreases with increasing agricultural chemicals in the Laurentian mixed forest province (Wisconsin and Michigan).

Floristic Quality Index

The Floristic Quality Index (FQI) is based on species richness (a count of the number of plant species present in a wetland), weighted by the average "coefficient of conservatism" (CC). The CC is a value between 0 and 10 that indicates species fidelity to remnant natural plant communities, with 0 indicating a weed and 10 indicating a plant that only occurs in remnant natural plant communities. The values for CC are assigned by botanical experts. Within the Great Lakes basin, CC values have been compiled for plant species in Wisconsin, Michigan, and Ohio. The floristic quality of open-coast and protected wetlands declines with increasing anthropogenic stress (Figure 2). The FQI has been applied in seven states and one Canadian province, but our work demonstrates its value as a diagnostic indicator by comparing it with anthropogenic stressors across a wide geographic area covering a wide range of disturbance.

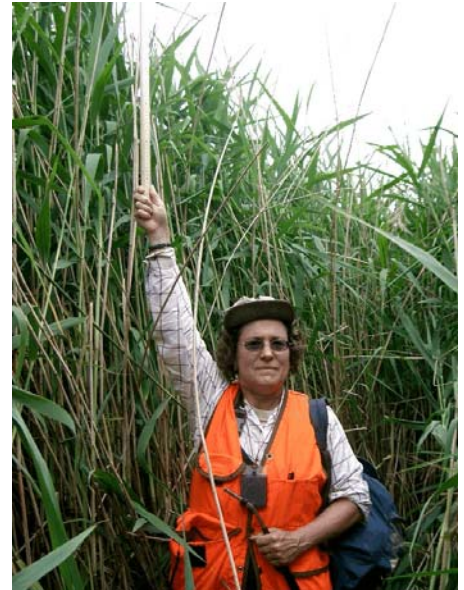


Figure 3. Giant reed grass that is 3 meters tall invades a Green Bay wetland.

Proportion of Invasive Plants

Some plants tend to take over wetland vegetation, displacing native plant species and reducing the diversity of wetland plant communities. We developed a list of ten such invasive plants for the Great Lakes, and computed their proportion of all plant taxa present in the wetlands we sampled. Included in the list of ten are hybrid cattail (*Typha x glauca*), narrow-leaved cattail (*Typha angustifolia*), giant reed grass (*Phragmites australis*), reed canary grass (*Phalaris arundinacea*), and purple loosestrife (*Lythrum salicaria*). The percent of invasive taxa increased significantly with increasing anthropogenic stress (Figure 4). Proportion of invasive plants has been proposed as an indicator by the State of the Lakes Ecosystem Conferences, which are hosted by the US EPA and Environment Canada.

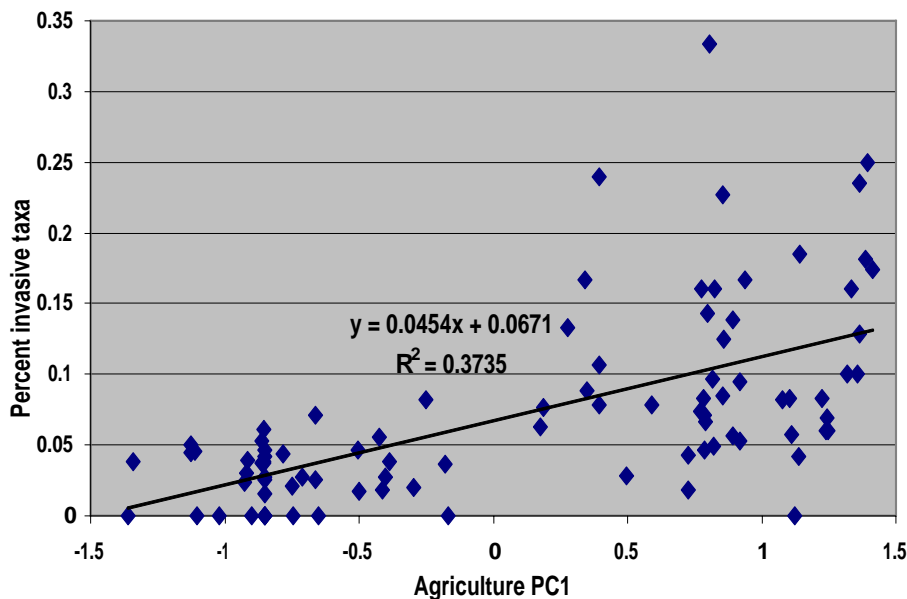


Figure 4. Percentage of invasive taxa significantly increases with increasing agricultural chemicals in the Great Lakes basin.

Further Information

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References

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Bourdaghs, M. 2004. Properties and Performance of the Floristic Quality Index In Great Lakes Coastal Wetlands. M.S. thesis, Department of Biology, University of Minnesota Duluth