

## **2002 Progress Report: Vegetative Indicators of Condition, Integrity, and Sustainability of Great Lakes Coastal Wetlands**

**EPA Grant Number:** R828675-02

**Subproject:** *This is subproject number 02, established and managed by the Center Director under grant R828675*

**Center:** [Great Lakes Environmental Indicators Project](#)

**Center Director:** [Gerald J. Niemi](#)

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

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**EPA Project Officer:** Barbara Levinson

**Project Period:** January 10, 2001 to January 9, 2005

**Research Category:** [Estuarine and Great Lakes Program \(EaGLE\)](#)

### **Description:**

**Objective:** Specific objectives of this subproject are to: 1) identify vegetative indicators of condition of Great Lakes coastal wetlands that can be measured at a variety of scales, 2) develop relationships between environmental stressors and those vegetative indicators, and 3) make recommendations about the utility and reliability of vegetative indicators to guide managers toward long-term sustainable development.

**Progress Summary:** During the 2002 field season, the GLEI Wetland Vegetation subproject sampled 45 sites, bringing the total number sampled during the 2001 and 2002 field seasons to 72 sites. The subproject consists of research groups at the Natural Resources Research Institute (NRRI) of the University of Minnesota Duluth, the University of Wisconsin, Madison (UW), and Cornell University. Study sites were distributed among the research groups by location: the Cornell group did sites in lakes Ontario and Erie (14 sites), the UW group did sites in Lake Michigan (17 sites), and the NRRI group did sites in lakes Superior and Huron (14 sites). All collected specimens have been identified, and all data entry has been completed. Data analysis is ongoing.

Prior to commencing field work, the NRRI group did site selection, transect layout, and map preparation for the three subproject groups. GIS-derived measures of human activity within coastal "segment sheds" (ie., the area of land draining to a length of shoreline segment) had been statistically summarized under the aegis of the main center to develop an anthropogenic stress gradient for the segment sheds. Coastal wetlands within the segment sheds were selected to represent this gradient. Wetlands were classified into three geomorphic types: river-influenced, lacustrine (fringing), and protected (barrier beach). To be selected, a study site had to contain emergent wetland vegetation, and sites were rejected if they were too shrubby or too deep to support emergents. Wherever possible, we sought to co-locate sample sites with other groups.

We are sampling wetlands within all of the Quickbird satellite imaging sites to provide quantitative ground truth for remote sensing.

Also in preparation for field work, the subproject held its second annual field camp in Madison, WI, on June 10-11, 2002. The field camp is the only time during the year when *all* subproject personnel assemble in one location. Field exercises are conducted to ensure that all field personnel are consistent in their visual cover estimation. Results of the field exercise are tallied as part of the subproject's QA/QC protocol.

To ensure that all three groups within the subproject were consistent in their plant nomenclature, we chose the Integrated Taxonomic Information System (ITIS) as our taxonomic authority (<http://www.itis.usda.gov/>). The NRRRI group checked data entries from all groups to make sure that they were ITIS compliant. We also converted two U.S. Fish and Wildlife Service databases, "National List of Vascular Plant Species That Occur in Wetlands: 1996 National Summary" and "National List of Vascular Plant Species That Occur in Wetlands: 1996 Synonymy" into formats that could be linked to our field data.

The GLEI Vegetation subgroup participated in several meetings with other GLEI subprojects and other EaGLE Centers:

January 24, 2002	Second GLEI Senior Advisory Board meeting, Duluth MN, subproject report by Terry Brown
October 27-28, 2002	Third GLEI All Hands Meeting, Duluth MN, subproject report by Carol Johnston
December 4-6, 2002	Second All EaGLE Meeting, Edgewater MD, attended by Carol Johnston

In addition, Lynn Vaccaro (Cornell) met with representatives of the New York State Department of Environmental Conservation to discuss the project informally on July 17-18.

All of the river-influenced wetlands selected for the subproject have been sampled, and we began analyzing the data this winter. Slight modification of the original sample design was needed in two instances where segment sheds contained no undiked riverine wetlands; where this was the case we chose river-influenced wetlands anywhere along Lake Erie as replacements. All but four protected wetlands selected for study have been sampled. Most of the study sites remaining to be sampled are in the lacustrine wetlands geomorphic type.

**Future Activities:** The GLEI Wetland Vegetation subproject will hold its third annual field camp on June 6-7, 2003. Field work will continue in the summer of 2003, targeting gaps in coverage of wetland geomorphic types and maximizing overlap with other subprojects. The NRRRI group will focus its efforts on lacustrine wetlands in Saginaw Bay during 2003. The Cornell group will continue to sample protected wetlands along Lake Erie, and the UW group will sample a protected wetland and a lacustrine wetland along the western shore of Lake Michigan.

Carol Johnston and Joy Zedler have organized a special symposium for the Society for Conservation Biology Annual Meeting, to be held in Duluth MN on June 29-July 2, 2003. All five symposium speakers are EaGLE researchers: Mark Brinson (Atlantic Slope Consortium [ASC]), Christin Frieswyk (GLEI), Carol Johnston (GLEI), James Morris (Atlantic Coast Environmental Indicators Consortium [ACE INC]), and Dennis Whigham (ASC). The goals of the symposium, entitled "Coastal Wetland Vegetation as a Harbinger of Environmental Change," are:

1. To examine responses of coastal wetland plants and plant assemblages to environmental stress
2. To present examples of plant indicators of coastal wetland condition at field to landscape scales
3. To explore commonalities and differences between saltwater and freshwater coastal wetlands with respect to vegetation biodiversity and response to environmental stress.

All three of the 2002 field team leaders are pursuing graduate degrees, conducting research related but not identical to the aims of the GLEI Wetland Vegetation subproject. Their tentative plans are described below.

Michael Bourdaghs (NRRI), *An Evaluation of the Floristic Quality Assessment Index For Use in Great Lakes Coastal Wetlands*. The Floristic Quality Assessment Index (FQAI) has been proposed as a tool that can identify natural areas, compare different sites regardless of plant community type, and assess anthropogenic impacts of an area. There has been little critical evaluation of FQAI, even though FQAI has been gaining popularity as an assessment tool. The specific objectives of this research are to: 1) address the theoretical and management implications of non-normal distributions of mean coefficient of conservatism scores, 2) determine the relationship between sampling area, species richness, and FQAI, 3) compare FQAI with other diversity indices, 4) compare quantitative and qualitative sampling methods for use in FQAI, and 5) test FQAI as an indicator of ecological health. Michael will be presenting a portion of his research at the annual meeting of the Society for Conservation Biology as a poster, entitled "The Relationship Between Sampling Area, Species Richness, and the Floristic Quality Assessment Index."

Christin Frieswyk (UW), *Ecosystem Resilience and the Behavior of Typha Species in Lake Michigan Coastal Wetlands*. Christin is addressing the idea of resilience in coastal wetlands. A loss of resilience might be indicative of future changes in wetland composition and structure and could then serve as a red flag for a change in wetland health. Thus, lowered resilience has implications for both management and restoration of coastal wetlands. In naturally resilient coastal wetlands the extent of Typha was historically limited by water level fluctuation, but in Lake Michigan Typha stands appear to be growing despite highly fluctuating water levels. This research will: a) explore the nature of resilience in these wetlands, recent deviations from the historic cycle of vegetation change, and nearby development using aerial photographs, b) describe the nature and extent of Typha dominance in Lake Michigan wetlands, especially among Typha species, and relationships with diversity of native plants, and c) determine the ability of Typha dominated coastal wetlands to regenerate via the seed bank.

Lynn Vaccaro (Cornell), *Road Salt Impacts on Nutrient Availability and Typha Physiology and Growth*. Lynn began her graduate studies in the summer of 2002, so her research is still in the development stage. She is planning to do a combination of greenhouse microcosms and hydrologic and water chemistry monitoring at coastal wetland sites crossed by roads.

**Publications and Presentations:** Total Count: 2

<u>Type</u>	<u>Citation</u>
Journal Article	Johnston, Carol A., and Paul Meysembourg. 2002. Comparison of the Wisconsin and National Wetlands Inventories. <i>Wetlands</i> 22:386-405.
Journal Article	Kercher, Suzanne M., Christin B. Frieswyk, and Joy B. Zedler. Quality Control Approaches Reveal Effects of Sampling Teams and Estimation Methods for Assessing Plant Cover in Temperate Herbaceous Wetlands. Submitted to <i>J. Veg. Science</i> .

**Supplemental Keywords:** *vegetative indicators, coastal wetlands, floristic quality assessment index, ecosystem resilience, aquatic acrophytes, Great Lakes, environmental indicators*

**Relevant Websites:** <http://glei.nrri.umn.edu>