

2002 Progress Report: Development and Assessment of Environmental Indicators Based on Birds and Amphibians in the Great Lakes Basin

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

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

Title: Development and Assessment of Environmental Indicators Based on Birds and Amphibians in the Great Lakes Basin

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

Description:

Objective: Specific objectives are the following:

1. develop a suite of scientifically robust, cost-effective indices of bird and amphibian assemblages that reflect ecological condition of the Great Lakes;
2. quantify the extent to which these indices are related to environmental pressure indicators such as land use characteristics, water quality, presence of exotic species, and hydrological modifications;
3. derive predictive models based on statistical relationship between pressure indicators and indices of bird/amphibian diversity and abundance;
4. use these models to infer ecological conditions at local and regional scales and to establish or improve the baseline for environmental monitoring programs;
5. develop a quality assurance/quality control infrastructure for future assessments of bird and amphibian communities; and, ultimately,
6. provide scientific recommendations for improving and monitoring the ecological health of the Great Lakes basin.

Progress Summary: Birds and amphibians have been sampled at 149 wetland sites and 110 upland transects in the U.S. portion of the Great Lakes coastal zone, with another 75 wetlands and 70 upland transects scheduled for sampling during 2003. As with other sub-projects in the GLEI project, sites were selected to represent major stressor gradients, including sites that are relatively pristine and sites that are relatively degraded. The field work has involved more than 7000 hrs of planning and field work, plus additional work at the Natural Resources Research Institute, University of Minnesota Duluth for data management. Databases with 899 amphibian, 5875 wetland bird and 28,685 upland bird entries are ready for analysis during 2003-04. In addition to the scheduled field work and indicator species development, this project has been the catalyst for five graduate theses on related topics and will be the subject of two papers presented at international scientific meetings during summer 2003.

Site Selection: Our site selection was based on the cluster analysis of stressors identified by the overall GLEI group. We used results of the cluster analysis that identified 33 clusters in the northern province 212 and 27 clusters in the southern province 222 to guide our site selection. Our original goal was to identify 5 suitable wetlands within each cluster (300 total) and 3 upland segments within each cluster (180 total). Upland and wetland segments were allowed to overlap (we could sample a wetland and upland in one segment). Because we are able to visit many sites, we were not concerned about identifying the wetland type (riverine, protected, or coastal) in our site selection process; all of these categories will be represented in our analysis.

The first step in site selection was to preview maps and air photos to identify all potential wetland and upland sites. Sites identified in this step were visited to determine whether they were accessible for field surveys. Sites were eliminated from the pool of possible sites for reasons determined *a priori* (e.g., accessibility, wetland vegetation, length of road for upland surveys). From 1 to 3 points were sampled in each wetland. The number of points to sample in each wetland was determined from a cost and variability analysis completed during the pilot study.

Sampling. Amphibian sampling began in April 2002 following a protocol that had been refined from the 2001 pilot study. Each wetland was surveyed three times for amphibians in the evening (sunset to midnight) and once for breeding birds in the early morning (sunrise to 9AM). The initial amphibian surveys were complicated by the unusual spring weather, particularly in the southern portion of the Great Lakes. We were able to complete some surveys during a very warm in mid-April, but subsequent snow and cold weather eliminated the early sampling period at some sites.

Summary of Wetland Samples

Bird/Amphibian Group 2002

Province	Wetlands Sampled 2002	Will sample 2003	Rejected
212	97	19	35
222	52	56	21
<i>Total</i>	<i>149</i>	<i>75</i>	<i>56</i>

Our original goal was to sample at least 300 wetland sites, but this target has been adjusted to about 225, based mainly on limitations of site availability and suitability. This sample, nevertheless, will fulfill our primary objective of representing a gradient of conditions from degraded to nearly pristine wetlands.

Upland bird surveys were conducted on roads located within approximately 1 km of the Great Lakes shoreline. Each survey consisted of 15 subsamples (unlimited radius point counts) at least 500 m apart along a transect centered in the selected segment-shed. All counts were completed

in early morning (before ~8:30 a.m.) during June or early July. A single survey was conducted at each of the selected segment-sheds.

Summary of Upland Bird Samples

Bird/Amphibian Group 2002

Province	Uplands Sampled 2002	Will sample 2003	Rejected
Northern (212)	81	18	5
Southern (222)	29	52	26
Total	110	70	31

Based on significant progress during 2002, we expect to easily reach the original goal of 180 upland bird samples.

Future Activities: The major focus of our activities during 2003 will be to complete field site surveys on approximately 75 wetlands and 70 upland sites that have not previously been sampled. In order to gauge inter-annual variation, we plan to resample 25 wetlands for amphibians and wetland birds and 20 upland bird survey transects. Results will provide at least a short-term analysis of variability between years. Like all groups within the GLEI project, we have taken special efforts to maximize the overlap of sample sites to facilitate the comparison of results among the different interdisciplinary sub-projects.

After data have been entered in late summer, we will begin statistical analyses of these data with models that have been developed at NRRI, University of Minnesota Duluth as well as those being developed by Don Steven's group at Oregon State University. Results of our work will be presented at three national/international meetings this coming summer and four theses will be completed based on this investigation. Work will begin on peer-reviewed publications from these projects as well as from the overall bird/amphibian component of the GLEI project.

Completed or Ongoing Theses

Effects of anthropogenic development on breeding bird abundance and communities. Christina Marie Miller. University of Minnesota Duluth. Finished February 2003.

Landscape factors affecting productivity of breeding birds in Great Lakes coastal wetlands. David Grandmaison. University of Minnesota Duluth. In preparation.

Anuran-habitat associations in coastal wetlands of the western Great Lakes. Steven Price. University of Wisconsin-Green Bay. In preparation.

Local habitat and landscape effects on the avifauna of coastal wetlands of the western Great

Lakes region. David Marks. University of Wisconsin-Green Bay. In preparation.

Evaluation of the Ohio rapid assessment methods on wetlands of the Great Lakes basin: a comparative analysis of bird assemblages and wetland quality. Anna Peterson. University of Minnesota Duluth. In preparation.

Supplemental Keywords: *environmental indicators, birds, amphibians, Great Lakes coastal zone, Great Lakes, coastal wetlands*

Relevant Websites: <http://glei.nrrri.umn.edu>