



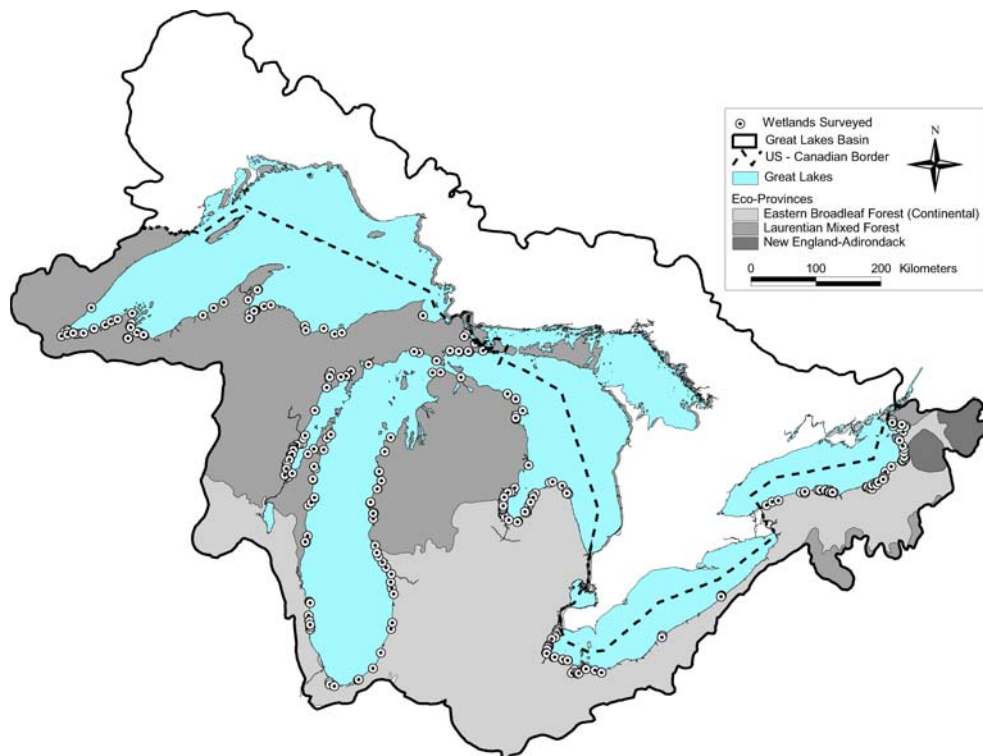
# Great Lakes Environmental Indicators

EPASTAR EaGLe

## Breeding Birds as Indicators of Great Lakes Coastal Condition

Birds have a long and successful history of being indicators of environmental health in many ecosystems throughout the world. We used standardized North American marsh bird surveys and a modified breeding bird survey route to sample wetland and upland breeding birds in over 200 coastal wetlands and 180 coastal upland segments across the Great Lakes. Our objective was to develop a suite of indicators from these data that could be used to document and assess the condition of coastal wetlands and uplands of the Great Lakes. Wetlands and uplands were randomly selected and then sampled along a pre-determined disturbance gradient that was defined by physical, chemical and biological stressor data from the study area. We defined the relative condition of the basin by developing breeding bird indicators at a variety of spatial scales that were based on either hydrologic models or local land-use surrounding the wetlands and/or uplands at several scales.

We were successful in identifying several upland and wetland breeding bird species and or groups of species (guilds) that will be useful indicators of the amount of human disturbance in the basin. We conclude that the condition of coastal wetlands can be ascertained and annual change can be monitored with national monitoring standards. The link between breeding birds and condition of coastal areas is significant because it will allow us to more closely track changes in the status of these coastal areas. For example, a sample of breeding birds can easily be collected annually, whereas it takes several years and thousands of dollars to up-date and summarize land-use, population census, or chemical use data for this region. We also found that one morning survey is more efficient in terms of capturing breeding bird composition of wetlands than two evening surveys.



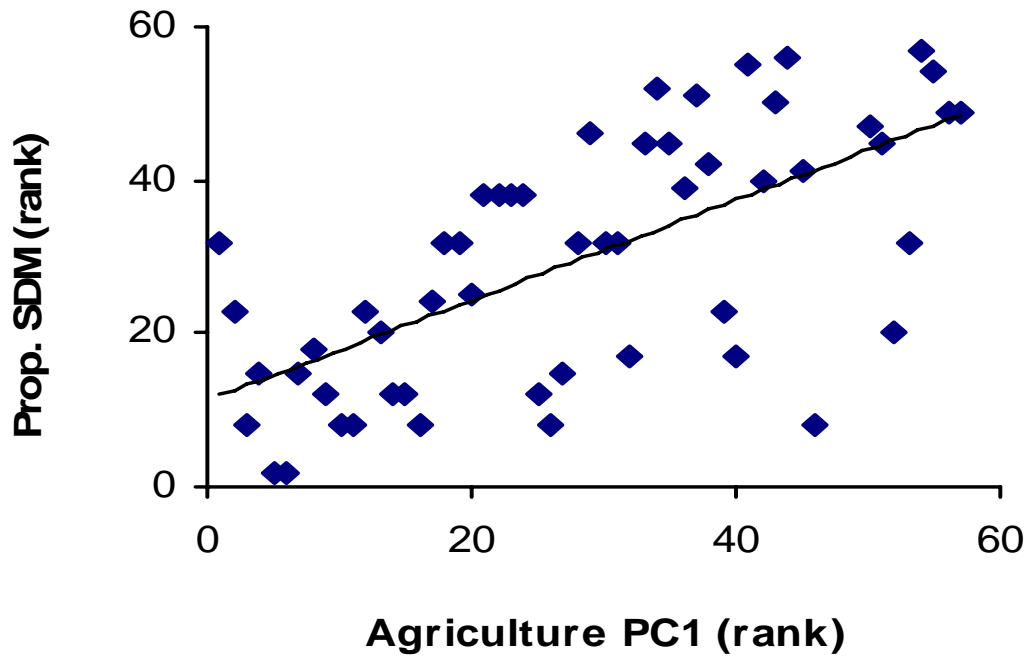
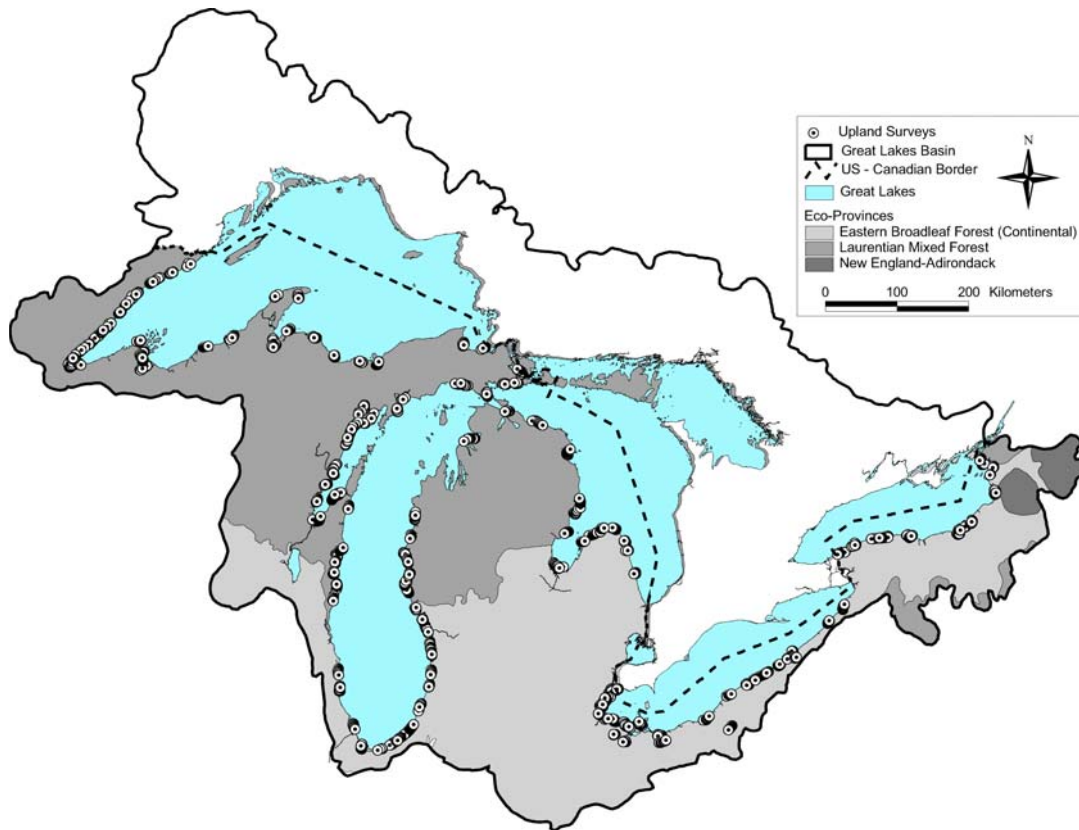


Figure 2. The relationship ( $R^2 = 0.68$ ) between the proportion of short distance migrant (SDM) bird individuals observed in Great Lakes coastal wetlands and an anthropogenic disturbance gradient from agriculture in watersheds of those wetlands in the Eastern Broadleaf Forest Province. Higher PC1 scores are in watersheds that have more disturbance from agriculture. SDM birds are species that breed in northern regions of the continent and that winter in southern portions of the United States. The predominant species include blackbirds, sparrows, and gulls.



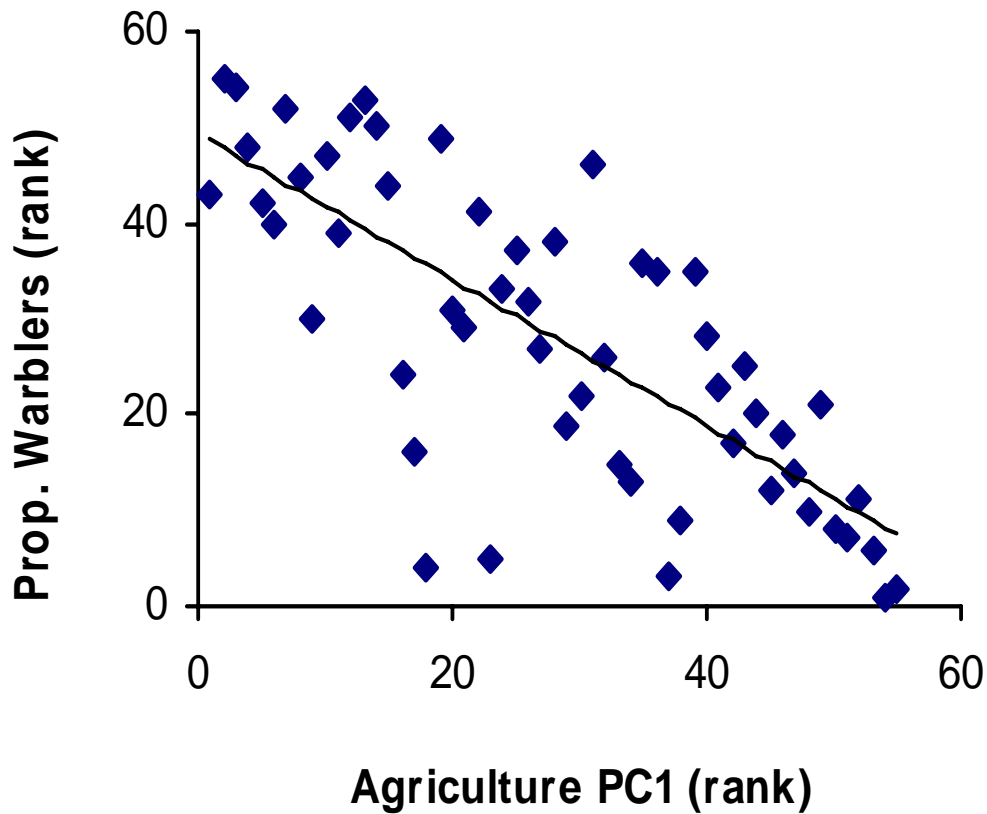


Figure 4. The relationship ( $R^2 = -0.70$ ) between the proportion of long distance migrant (LDM) bird individuals observed in Great Lakes coastal upland samples and an anthropogenic disturbance gradient from agriculture in watersheds of those uplands in the Eastern Broadleaf Forest Province. Higher PC1 scores are in watersheds that have more disturbance from agriculture. LDM birds are species that breed in northern regions of the continent and that winter in Central and South America. The predominant species include warblers, flycatchers and vireos.

## Investigators

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