



Wetland Birds

Formerly Indicator # 4507

Overall Assessment

Status: Poor

Trend: Deteriorating

Rationale: The abundance of half the species that regularly or always nest in wetlands declined significantly between 1995 and 2010 (10 of 19 [52%]). By contrast, the abundance of only three such species significantly increased (16%). Similar patterns occur in previous reports.

Lake-by-Lake Assessment

Lake Superior

Status: Undetermined

Trend: Undetermined

Lake Michigan

Status: Poor

Trend: Deteriorating

Rationale: The abundance of nearly half the species that regularly or always nest in wetlands declined significantly between 1995 and 2010 (7 of 15 [47%]). By contrast, the abundance of no such species significantly increased. Similar patterns occur in previous reports.

Lake Huron

Status: Poor

Trend: Deteriorating

Rationale: The abundance of nearly half the species that regularly or always nest in wetlands declined significantly between 1995 and 2010 (7 of 16 [44%]). By contrast, the abundance of only two such species significantly increased (12%). Similar patterns occur in previous reports.

Lake Erie

Status: Poor

Trend: Deteriorating

Rationale: The abundance of over half the species that regularly or always nest in wetlands declined significantly between 1995 and 2010 (12 of 18 [67%]). By contrast, the abundance of only three such species significantly increased (17%). Similar patterns occur in previous reports.

Lake Ontario

Status: Poor

Trend: Deteriorating

Rationale: The abundance of almost half the species that regularly or always nest in wetlands declined significantly between 1995 and 2010 (7 of 17 [41%]). By contrast, the abundance of only three such species significantly increased (18%). Similar patterns occur in previous reports.

Purpose

- To assess changes in the relative abundance of wetland-dependent breeding bird species
- To infer condition of wetland habitat as it relates to factors that influence this ecologically and culturally important resource
- The Wetland Birds indicator is used in the Great Lakes indicators suite as a State indicator in the Aquatic Dependent Life top level reporting category.

Ecosystem Objective

To restore and maintain self-sustaining populations of Great Lakes wetland-dependent breeding bird species across their historic ranges. Numerous wetlands in the Great Lakes basin are threatened by urban and agricultural development and other incompatible land uses and these wetlands should be identified, preserved, and where

necessary rehabilitated (GLWQA Annex 13). Monitoring and assessment activities provide information on the location, severity, aerial or volume extent, and frequency of Great Lakes wetlands (Annex 11 GLWQA). This indicator supports the restoration and maintenance of the chemical, physical and biological integrity of the Great Lakes basin and beneficial uses dependent on healthy wetlands (Annex 2 GLWQA).

Ecological Condition

Measure

Changes in relative abundance of wetland-dependent breeding birds are based on data from morning or evening surveys using Bird Studies Canada's Great Lakes Marsh Monitoring Program (MMP) bird point count protocol or a modification of it (Marsh Monitoring Program 2009). MMP data from coastal and inland wetlands throughout the Great Lakes basin or throughout each individual lake basin (e.g., Lake Erie; Fig. 1) are used to calculate annual indices of relative abundance for a suite of wetland bird species. Wetlands dominated by non-woody emergent plants such as cattails (*Typha* spp.) and sedges (e.g., *Carex* spp.) are targeted by the program. Species-specific population trends over time are calculated using repeated measures Poisson regression in a Bayesian mode of inference with uninformative priors (Kéry 2010).

Endpoint

Populations of most wetland-dependent breeding bird species have declined since data collection began for this indicator in 1995. Therefore, one endpoint is population indices for nearly all wetland-dependent breeding bird species that are as high as or higher than population indices reported by the MMP in the late 1990s, when the program began. A potentially better endpoint, however, might be based on MMP abundance indices from pristine or near-pristine wetlands throughout the Great Lakes basin (i.e., least disturbed based on indices of anthropogenic disturbance within and surrounding the wetland)—guided by a literature search of other current and historical data and expert opinion. Population indices from this approach are likely to be higher than those reported by the MMP in the late 1990s, given that many wetlands throughout the Great Lakes basin were degraded by that time. Presumably the two approaches estimate the extremes of a range of abundance that is likely to contain the carrying capacity that the landscape is currently capable of supporting and, therefore, somewhere near the middle of the range is the most suitable endpoint. This is the endpoint used in this report.

Background

Wetland-dependent breeding birds are influenced by the physical, chemical, and biological components of the wetlands and surrounding landscapes in which they breed. The abundance and/or reproductive success of multiple species in the Great Lakes basin, for example, declines as (1) wetland size decreases; (2) wetland habitat and natural cover in the surrounding landscape decreases; (3) pesticide, herbicide, and runoff from other sources of pollution into wetlands from the surrounding landscape increases; and (4) generalist predators (e.g., raccoons [*Procyon lotor*]) associated with anthropogenic habitats in the surrounding landscape increase (Brazner et al. 2007a,b; Crosbie and Chow-Fraser 1999; Howe et al. 2007; Grandmaison and Niemi 2007; Naugle et al. 2000; Smith and Chow-Fraser 2010 a,b; Tozer et al. 2010). Thus, the abundance of wetland-dependent breeding birds is a valuable indicator of the health of wetlands and the surrounding landscape.

Status of Wetland Birds

A grand total of 56 bird species that use marshes (e.g., for feeding, loafing, nesting) were recorded across all surveys and years throughout the Great Lakes basin between 1995 and 2010. Of these, 19 species regularly or always nest in emergent wetlands. Members of this latter group of species were used to assess the health of wetlands and their surrounding landscapes in this report because they rely completely or nearly completely on resources within or relatively close to their nesting wetlands (i.e., within a few kilometres). Only a subset of these 19 species, however, was observed in each individual Great Lakes basin (Table 1).

Great Lakes Basin

The abundance of half the species that regularly or always nest in wetlands declined significantly between 1995 and 2010 (10 of 19 [52%]; Fig. 2). By contrast, the abundance of only three species that regularly or always nest in wetlands significantly increased between 1995 and 2010 (16%; Fig. 2). The Trumpeter Swan (*Cygnus buccinator*; see Table 1 for a list of scientific names for all subsequent common names) increased primarily due to relatively recent reintroductions after the species was nearly extirpated about a century ago (Mitchell and Eichholz 2010) and the Sandhill Crane continues to increase following continental population lows in the early 1900s (Tacha et al.

1992), both of which may have little to do with the health of wetlands in the Great Lakes basin between 1995 and 2010; these two species are also responsible for most of the significant population increases identified within individual Great Lakes basins in the following sections. The abundance of the remaining six species that regularly or always nest in wetlands was stable between 1995 and 2010 (32%). Similar patterns occur across the Great Lakes basin for this indicator in previous reports. Given that populations of half the species that regularly or always nest in wetlands continue to decline below each of the suggested endpoints, the overall status is poor and the trend is deteriorating.

Lake Michigan

The abundance of nearly half the species that regularly or always nest in wetlands declined significantly between 1995 and 2010 (7 of 15 [47%]). By contrast, the abundance of no such species significantly increased. The abundance of the remaining eight species that regularly or always nest in wetlands was stable between 1995 and 2010 (53%). Similar patterns occur in the Lake Michigan basin for this indicator in previous reports. Given that populations of nearly half the species that regularly or always nest in wetlands continue to decline below each of the suggested endpoints, the overall status is poor and the trend is deteriorating (Table 1).

Lake Huron

The abundance of nearly half the species that regularly or always nest in wetlands declined significantly between 1995 and 2010 (7 of 16 [44%]). By contrast, the abundance of only two such species significantly increased (12%). The abundance of the remaining seven species that regularly or always nest in wetlands was stable between 1995 and 2010 (44%). Similar patterns occur in the Lake Huron basin for this indicator in previous reports. Given that populations of nearly half the species that regularly or always nest in wetlands continue to decline below each of the suggested endpoints, the overall status is poor and the trend is deteriorating (Table 1).

Lake Erie

The abundance of over half the species that regularly or always nest in wetlands declined significantly between 1995 and 2010 (12 of 18 [67%]). By contrast, the abundance of only three such species significantly increased (17%). The abundance of the remaining three species that regularly or always nest in wetlands was stable between 1995 and 2010 (17%). Similar patterns occur in the Lake Erie basin for this indicator in previous reports. Given that populations of over half the species that regularly or always nest in wetlands continue to decline below each of the suggested endpoints, the overall status is poor and the trend is deteriorating (Table 1).

Lake Ontario

The abundance of almost half the species that regularly or always nest in wetlands declined significantly between 1995 and 2010 (7 of 17 [41%]). By contrast, the abundance of only three such species significantly increased (18%). The abundance of the remaining seven species that regularly or always nest in wetlands was stable between 1995 and 2010 (17%). Similar patterns occur in the Lake Ontario basin for this indicator in previous reports. Given that populations of almost half the species that regularly or always nest in wetlands continue to decline below each of the suggested endpoints, the overall status is poor and the trend is deteriorating (Table 1).

Linkages

Wetland-dependent breeding birds are influenced by numerous characteristics of the wetlands and surrounding landscapes in which they breed, many of which are monitored as SOLEC indicators. For instance, populations of some of the 19 wetland-dependent breeding bird species used to assess Great Lakes wetland health in this report are known to co-vary with changing water levels at local and individual Great Lakes basin scales (Timmermans et al. 2008, Jobin et al. 2009). Thus, the wetland bird indicator will co-vary with #4861: Effect of Alteration of Natural Water Level Fluctuations. The wetland bird indicator can also be expected to co-vary with indicators that track wetland breeding bird habitat (e.g., #4863: Coastal Wetland Plant Community; #4863: Land Cover Adjacent to Coastal Wetlands) and prey (#4501 Coastal Wetland Invertebrate Community Health; #4502: Coastal Wetland Fish Community Health) and factors that indirectly influence them, such as invasive plant species that encroach upon preferred native vegetation and pollution runoff from surrounding uplands that reduce prey abundance and/or availability.

Management Challenges/Opportunities

Maintain or improve the quality of wetlands and adjacent uplands for breeding wetland birds by mitigating or eliminating influences that are detrimental to wetland health such as water level fluctuations, invasive species, and

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inputs of toxic chemicals, nutrients and sediments. Restoration programs are underway for many degraded wetland areas through the work of local citizens, organizations and governments. Although significant progress has been made, considerably more conservation and restoration work is needed to ensure maintenance of healthy and functional wetlands throughout the Great Lakes basin.

Comments from the author(s)

The utility of the Wetland Birds indicator is dependent on the continuation of the MMP across the Great Lakes basin. Therefore, recruitment and retention of volunteer surveyors has been, and will continue to be, high priority. Despite this, there are areas where coverage is too sparse for analysis and could be improved (e.g., Lake Superior). As a result, a power analysis was conducted to quantify the MMP's ability to detect changes in population sizes of wetland-dependent breeding bird species at the scales explored in this report. The analysis suggests that the MMP has 80% power to detect percent annual changes in occurrence indices as small as 1.5% in the Great Lakes basin; 3% in the Lake Huron, Erie, and Ontario basins; and 4% in the Lake Michigan basin for most species (Fig. 3). These numbers should be considered preliminary and exploratory, however, until the effects of spatial and temporal dependence amongst surveys and detection probability can be fully assessed, which is an ongoing and evolving area of study (Seavy and Reynolds 2007, Patuxent Wildlife Research Center 2003).

Assessing Data Quality

Insert "x" under the statement that best corresponds with each data characteristic

Data Characteristics	Strongly Agree	Agree	Neutral or Unknown	Disagree	Strongly Disagree	Not Applicable
1. Data are documented, validated, or quality-assured by a recognized agency or organization	x					
2. Data are traceable to original sources	x					
3. The source of the data is a known, reliable and respected generator of data	x					
4. Geographic coverage and scale of data are appropriate to the Great Lakes basin	x					
5. Data obtained from sources within the U.S. are comparable to those from Canada	x					
6. Uncertainty and variability in the data are documented and within acceptable limits for this indicator report	x					
Clarifying Notes:						

Acknowledgments

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Contributors:

Hundreds of volunteers who generously donate their time, equipment, and skills to ensure long-term, broad-scale monitoring of the health of Great Lakes wetlands.

Robert W. Rankin, Data Analyst, Bird Studies Canada, P.O. Box 160, 115 Front Street, Port Rowan, ON N0E 1M0. Rob provided statistical assistance.

Information Sources

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List of Tables

Table 1. Population trends of wetland-nesting bird species used to assess the health of wetlands and their surrounding landscapes in the Lake Michigan, Huron, Erie, and Ontario basin, based on abundance indices derived from Marsh Monitoring Program point count surveys between 1995 and 2010. Statistically significant trends are indicated by * (i.e., Bayesian credible intervals do not overlap zero). Source: Great Lakes Marsh Monitoring Program.

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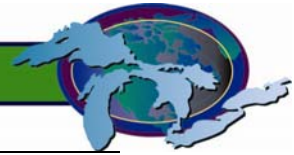
Figure 1. Mean (\pm SD) number of Marsh Monitoring Program routes surveyed for birds per year in the Great Lakes basin (All) and in each individual Great Lakes basin (e.g., Superior) between 1995 and 2010. A route consists of multiple, spatially-clustered point count survey locations, typically located in the same wetland, all of which can be surveyed by the same person in a single morning or evening. Source: Great Lakes Marsh Monitoring Program.

Figure 2. Percent annual change of population indices for some wetland-nesting bird species from 1995 to 2010 in the Great Lakes basin. Indices estimated with a Bayesian mixed-model framework, assuming a Poisson distribution. Statistically significant positive trends are green, significant negative trends are red, and stable (non-significant) trends are white. Source: Great Lakes Marsh Monitoring Program.

Figure 3. Box-and-whisker plots showing minimum detectable annual change (%) of population indices of some wetland-nesting bird species in the Great Lakes basin (All) and in individual Great Lakes basins (e.g., Superior), derived from Great Lakes Marsh Monitoring Program data. The figure summarizes the 19 species used to assess wetland health in this report, with the exception of Trumpeter Swan, which was considered an outlier and removed for ease of interpretation; for this species, minimum detectable annual change was 7% in the Great Lakes basin and 10 and 25% in the Lake Ontario and Erie basins, respectively. Source: Great Lakes Marsh Monitoring Program.

Last Updated

State of the Lakes Ecosystem Conference (SOLEC) 2011



Common Name	Scientific Name	Michigan	Huron	Erie	Ontario
American Bittern	<i>Botaurus lentiginosus</i>	–	*-0.5	*-2.8	-1.1
American Coot	<i>Fulica americana</i>	*-14.1	*-11.2	*-15.5	*-5.4
Black Tern	<i>Chlidonias niger</i>	*-18.3	*-12.2	*-4.6	*-13.3
Canada Goose	<i>Branta canadensis</i>	-2.0	+1.94	*-5.7	+0.61
Common Grackle	<i>Quiscalus quiscula</i>	+0.07	*-3.4	*-2.7	-0.3
Common Moorhen	<i>Gallinula chloropus</i>	*-16.9	*-11.8	*-13.7	*-6.8
Common Yellowthroat	<i>Geothlypis trichas</i>	+0.63	*+2.21	*+1.66	*+1.34
Forster's Tern	<i>Sterna forsteri</i>	–	–	*-13.7	–
Least Bittern	<i>Ixobrychus exilis</i>	*-6.1	*-4.2	*-7.0	*-2.9
Marsh Wren	<i>Cistothorus palustris</i>	-1.5	+1.43	*-2.5	-0.9
Mute Swan	<i>Cygnus olor</i>	-5.2	–	-3.3	+2.74
Pied-billed Grebe	<i>Podilymbus podiceps</i>	*-7.7	*-5.6	-2.7	*-8.1
Red-winged Blackbird	<i>Agelaius phoeniceus</i>	+0.04	-0.7	*-1.1	*-0.7
Sandhill Crane	<i>Grus canadensis</i>	+6.16	*+14.51	*+13.89	–
Sora	<i>Porzana carolina</i>	*-4.0	+0.04	*-4.1	-2.1
Swamp Sparrow	<i>Melospiza georgiana</i>	-0.6	-1.2	*-0.9	*+1.2
Trumpeter Swan	<i>Cygnus buccinator</i>	–	–	*+77.68	*+32.38
Virginia Rail	<i>Rallus limicola</i>	*-8.6	*-2.5	*-4.9	*-3.4
Wilson's Snipe	<i>Gallinago delicata</i>	–	-1.3	–	+9.85
TOTAL	19	15	16	18	17

Table 1. Population trends of wetland-nesting bird species used to assess the health of wetlands and their surrounding landscapes in the Lake Michigan, Huron, Erie, and Ontario basin, based on abundance indices derived from Marsh Monitoring Program point count surveys between 1995 and 2010. Statistically significant trends are indicated by * (i.e., Bayesian credible intervals do not overlap zero).

Source: Great Lakes Marsh Monitoring Program

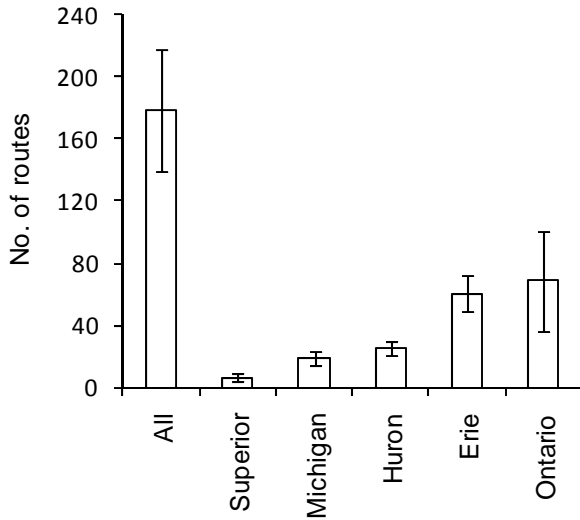


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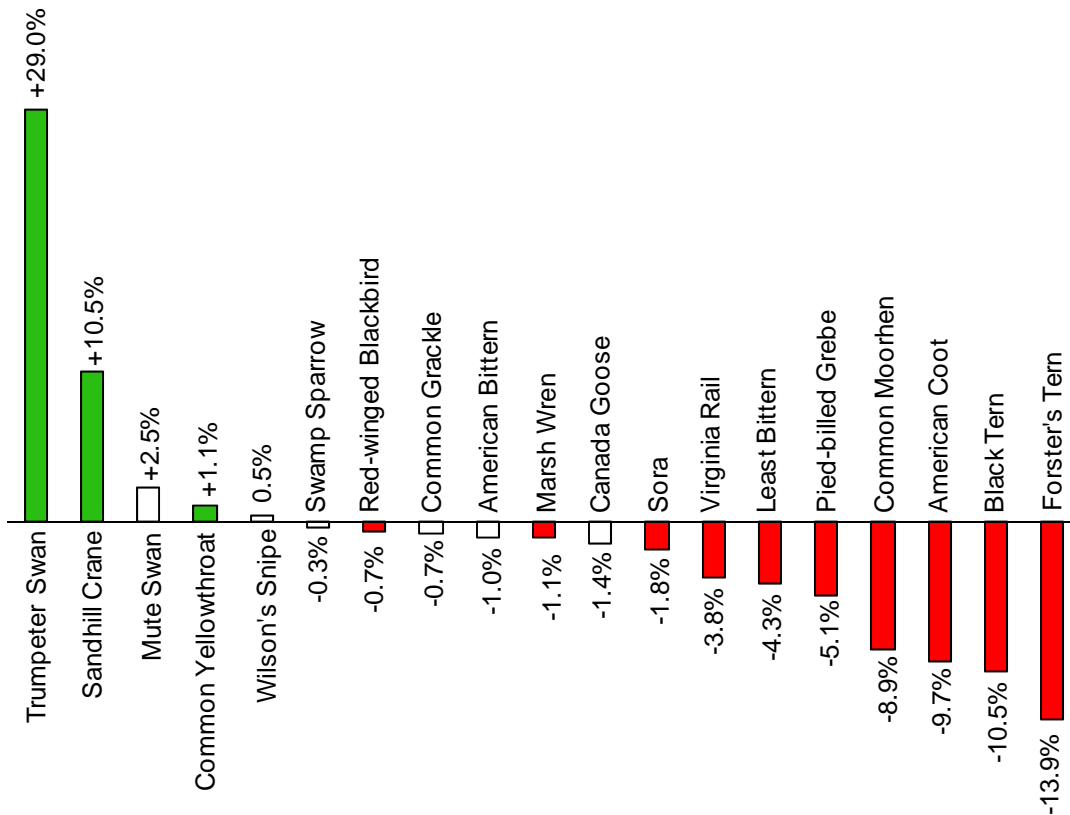


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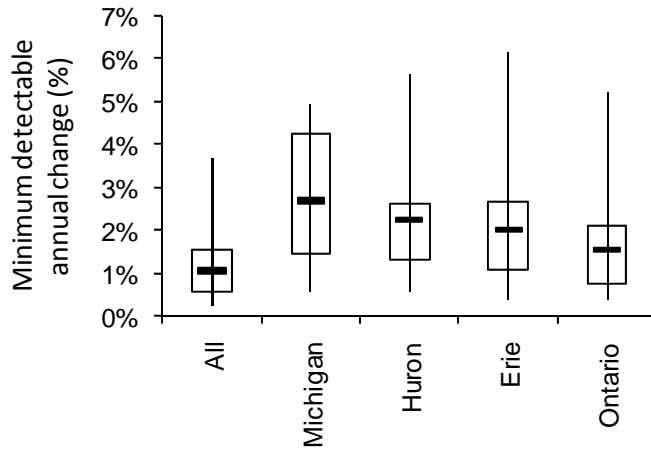


Figure 3. Box-and-whisker plots showing minimum detectable annual change (%) of population indices of some wetland-nesting bird species in the Great Lakes basin (All) and in individual Great Lakes basins (e.g., Superior), derived from Great Lakes Marsh Monitoring Program data. The figure summarizes the 19 species used to assess wetland health in this report, with the exception of Trumpeter Swan, which was considered an outlier and removed for ease of interpretation; for this species, minimum detectable annual change was 7% in the Great Lakes basin and 10 and 25% in the Lake Ontario and Erie basins, respectively.

Source: Great Lakes Marsh Monitoring Program