Coastal Wetland Amphibian Communities

Indicator #4504

Overall Assessment

Status: **Mixed**

Trend: **Deteriorating**

Rationale: **Species across the Great Lakes basin exhibited both positive and negative population trend tendencies. Four species exhibited significantly negative species population trends while only one species exhibited a significantly positive species population trend.**

Lake-by-Lake Assessment

Lake Superior

Status: Not Assessed

Trend: Undetermined

Lake Michigan

Status: Mixed

Trend: Deteriorating

Rationale: Most species in this lake basin exhibited negative population trend tendencies, three of which were significant. Though two species exhibited positive trends, neither of these was significant.

Lake Huron

Status: Mixed

Trend: Deteriorating

Rationale: Species in this lake basin exhibited both positive and negative population trend tendencies. However, three out of eight species exhibited significantly negative population trends. There were no significantly positive species population trends.

Lake Erie

Status: Mixed

Trend: Unchanging

Rationale: Species in this lake basin exhibited both positive and negative population trend tendencies. Of the two species with significant population trends, one was positive and one was negative.

Lake Ontario

Status: Mixed

Trend: Deteriorating

Rationale: Species in this lake basin exhibited both positive and negative population trend tendencies. Three species exhibited significant negative population trends, and no significant positive trends were observed.

Purpose

- To directly measure species composition and relative occurrence of frogs and toads
- To infer condition of coastal wetland habitat as it relates to factors that influence the biological condition of this ecologically and culturally important component of wetland biotic communities

Ecosystem Objective

The overall objective is to restore and maintain diversity and self-sustaining populations of Great Lakes coastal wetland amphibian communities. Breeding populations of amphibian species across their historical range should be sufficient to ensure population maintenance of each species and overall species diversity. Significant wetland areas in the Great Lakes System that are threatened by urban and agricultural development and waste disposal activities should be identified, preserved and, where necessary, rehabilitated (Annex 13 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).

State of the Ecosystem

Background

Numerous amphibian species occur in the Great Lakes basin and many of these are associated with wetlands during part of their life cycle. Because frogs and toads are relatively sedentary and have semi-permeable skin, they are likely to be more sensitive to, and indicative of, local sources of wetland contamination and degradation than are most other vertebrates. Assessing species composition and relative abundance of calling frogs and toads in Great Lakes wetlands can therefore help to infer wetland habitat quality.

Status of Amphibians

Since 1995, Marsh Monitoring Program (MMP) volunteers have collected amphibian data at 691 discrete routes across the Great Lakes basin. An annual summary of amphibian routes monitored is provided in Table 1.

Thirteen amphibian species were recorded during the 1995 to 2007 period (Table 2). Spring Peeper was the most frequently detected species and was commonly recorded in full chorus (Call Level Code 3) when it was encountered. Green Frog was detected in more than half of the survey stations and was most often recorded at Call Level Code 1 (calling individuals could be discretely counted). Gray Treefrog, American Toad and Northern Leopard Frog were also common, being recorded in approximately one-third or more of all survey stations. Gray Treefrog was recorded with the second highest average calling code (1.8), indicating that MMP observers usually heard several individuals calling simultaneously at each survey station. Chorus Frog, Bullfrog and Wood Frog were detected in approximately one-quarter of survey stations, while the remaining five species were detected in less than 3% of survey stations.

Trends in amphibian occurrence were assessed for eight species commonly detected on MMP routes (Figure 1). For each species, the annual proportion of stations where that species was present within a route was calculated to derive annual indices of occurrence. The overall temporal trend in occurrence for each species was assessed by combining route-level trends in station occurrence. Statistically significant declining trends were detected for American Toad, Chorus Frog, Green Frog and Northern Leopard Frog. No commonly detected species exhibited significant positive trends. While Mink Frog exhibited a significantly increasing trend, its low occurrence frequency across MMP surveys between 1995 and 2007 makes this result less certain.

Anecdotal and research evidence suggests that wide variations in occurrence of many amphibian species at a given site is a natural and ongoing phenomenon. Additional years of data will help distinguish whether the patterns observed (i.e., decline in American Toad, Chorus Frog, Green Frog and Northern Leopard Frog population indices) indicate significant long-term trends or simply natural variation in population sizes inhabiting marsh habitats. It has been observed, for example, that Bullfrog, Green Frog, and Spring Peeper populations reflect changes in lake levels to some degree, which can account for some year-to-year variation (Timmermans 2001). Chorus Frog, on the other

hand, has exhibited a relatively consistent negative population index trend since 1995, suggesting that its decline may be influenced by factors beyond year-to-year variation. However, it would appear that, in general, Great Lakes wetlands are impaired in their ability to successfully sustain amphibian populations, an assessment that can be made with more confidence as further data are gathered. MMP amphibian data are being evaluated to determine how information from their community composition can be used to gain a better understanding of Great Lakes coastal wetland condition in response to various human induced stressors.

A study testing the use of amphibian community-based coastal wetland indices of biotic integrity (IBIs) was conducted using MMP data collected between 1995 and 2003 in the Great Lakes basin south of the Canadian Shield (Ecoregion 8). The geographic range included all of Lake Erie, Lake Ontario, and Lake St. Clair, as well as parts of Lake Michigan and Lake Huron. The study concluded that Hay Bay Marsh, Long Point Wetland 7, Presqu'ile Bay Marsh 4, South Bay Marsh, West Saginaw Bay Wetland, Wilmot Rivermouth Wetland and Button Bay had mean amphibian IBIs of 100 (out of 100, where higher scores indicate amphibian communities in better biotic condition) (Timmermans *et al* 2008). Four other wetlands (Big Island Marsh, Bayfield Bay Wetland, Presqu'ile Bay Marsh 3, and Wye Marsh) scored mean amphibian IBIs of 90 or above (Timmermans *et al* 2008). All of these high-scoring wetlands are located in Ontario, except for West Saginaw Bay Wetland which is in Michigan. The majority of wetlands sampled were in Ontario, but all included states (New York, Pennsylvania, Ohio, Michigan, Illinois, and Wisconsin) had at least one wetland with a mean IBI of 50 or above.

Pressures

Habitat loss and deterioration remain the predominant threat to Great Lakes amphibian populations. Many coastal and inland Great Lakes wetlands are located along watersheds that experience very intensive industrial, agricultural and residential development. Therefore, these wetlands are under continued stress as increased pollution from anthropogenic runoff is washed down watersheds into these sensitive habitats. Combined with other impacts such as water level stabilization, sedimentation, contaminant and nutrient inputs, climate change and invasion of exotic species, Great Lakes wetlands will likely continue to be degraded and as such, should continue to be monitored.

Management Implications

Because of the sensitivity of amphibians to their surrounding environment and the growing international concern about amphibian population status, amphibians in the Great Lakes basin and elsewhere will continue to be monitored. Wherever possible, efforts should be made to maintain high quality wetland habitat as well as associated upland areas adjacent to coastal wetlands. There is also a need to address other impacts that are detrimental to wetland health such as 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 in this area, more work remains for many wetland areas that have yet to receive restoration efforts.

Comments from the author(s)

Effective monitoring of Great Lakes amphibians requires accumulation of many years of data, using a standardized protocol, over a large geographic expanse. As such, efforts should be pursued among the various call-count based anuran monitoring programs operating within the Great Lakes basin to enhance coordination, communication and cooperation, and to standardize protocols where possible, in order to improve anuran population status and trend reporting. A reporting frequency for SOLEC of five years would be appropriate because amphibian populations naturally fluctuate through time, and a five-year timeframe would be sufficient to indicate noteworthy changes in population indices. More rigorous studies will relate trends in species occurrence or relative abundance to environmental factors. Reporting will be improved with establishment of a network of survey routes that accurately

represent the full spectrum of marsh habitat in the Great Lakes basin.

Most MMP amphibian survey routes have been georeferenced to the survey station level. Volunteer recruitment has also improved significantly since the last status reporting period, and with the recent development of an MMP regional coordinator network throughout the Great Lakes basin, improved local and regional delivery of the program is anticipated. Future work will focus to enhance the utility of the SOLEC wetland amphibian indicator by applying the amphibian community-based IBI to evaluate coastal wetland health. Two additional important tasks are in progress: 1) improve the program's capacity to monitor and report on status of wetland-specific Beneficial Use Impairments among Great Lakes Areas of Concern, and; 2) develop and improve the program's capacity to train volunteer participants to identify and survey amphibians following standard MMP protocols. Also, further work is required to determine the relationship between calling codes used to record amphibian occurrence and survey count estimates.

Geographically extensive and long-term monitoring of calling amphibians is possible through the enthusiasm, skill and coordination of volunteer participants trained in the application of standardized monitoring protocols. Information about abundance, distribution and diversity of amphibians provides data for calculating trends in population indices as well as investigating habitat associations, which can contribute to effective long-term conservation strategies.

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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List of Tables

Table 1. Number of routes surveyed for amphibians within the Great Lakes basin, from 1995 to 2007.
Source: Marsh Monitoring Program

Table 2. Frequency of occurrence (Percent Station-Years Present) and average Call Level Code for amphibian species detected at MMP survey stations within the Great Lakes basin, from 1995 through 2007.
Average calling codes are based on the three level call code standard for all MMP amphibian surveys; Code 1 = little overlap among calls, numbers of individuals can be determined, Code 2 = some overlap, numbers can be estimated, Code 3 = much overlap of calls, too numerous to be estimated.

Source: Marsh Monitoring Program

List of Figures

Figure 1. Trends (percent annual change) in station occurrence (population index) of eight amphibian species commonly detected at Marsh Monitoring Program routes, from 1995 to 2007.
Values in parentheses are upper and lower 95% confidence limits, respectively, for trend values given.
Source: Marsh Monitoring Program

Last Updated

State of the Lakes Ecosystem Conference (SOLEC) 2008

Year	Number of Routes
1995	119
1996	181
1997	210
1998	171
1999	166
2000	159
2001	169
2002	197
2003	159
2004	152
2005	181
2006	240
2007	254

Table 1. Number of routes surveyed for amphibians within the Great Lakes basin, from 1995 to 2007.
Source: Marsh Monitoring Program

Species	Percent Station-Years Present [1]	Average Calling Code
Spring Peeper	68.8	2.5
Green Frog	55.6	1.3
Gray Treefrog	38.9	1.8
American Toad	37.2	1.5
Northern Leopard Frog	31.0	1.3
Chorus Frog	26.5	1.7
Bullfrog	25.8	1.3
Wood Frog	18.0	1.6
Pickerel Frog	2.4	1.1
Fowler's Toad	2.2	1.4
Cope's Gray Treefrog	1.2	1.4
Mink Frog	1.2	1.2
Blanchard's Cricket Frog	0.6	1.7

[1] MMP survey stations monitored for multiple years considered as individual samples

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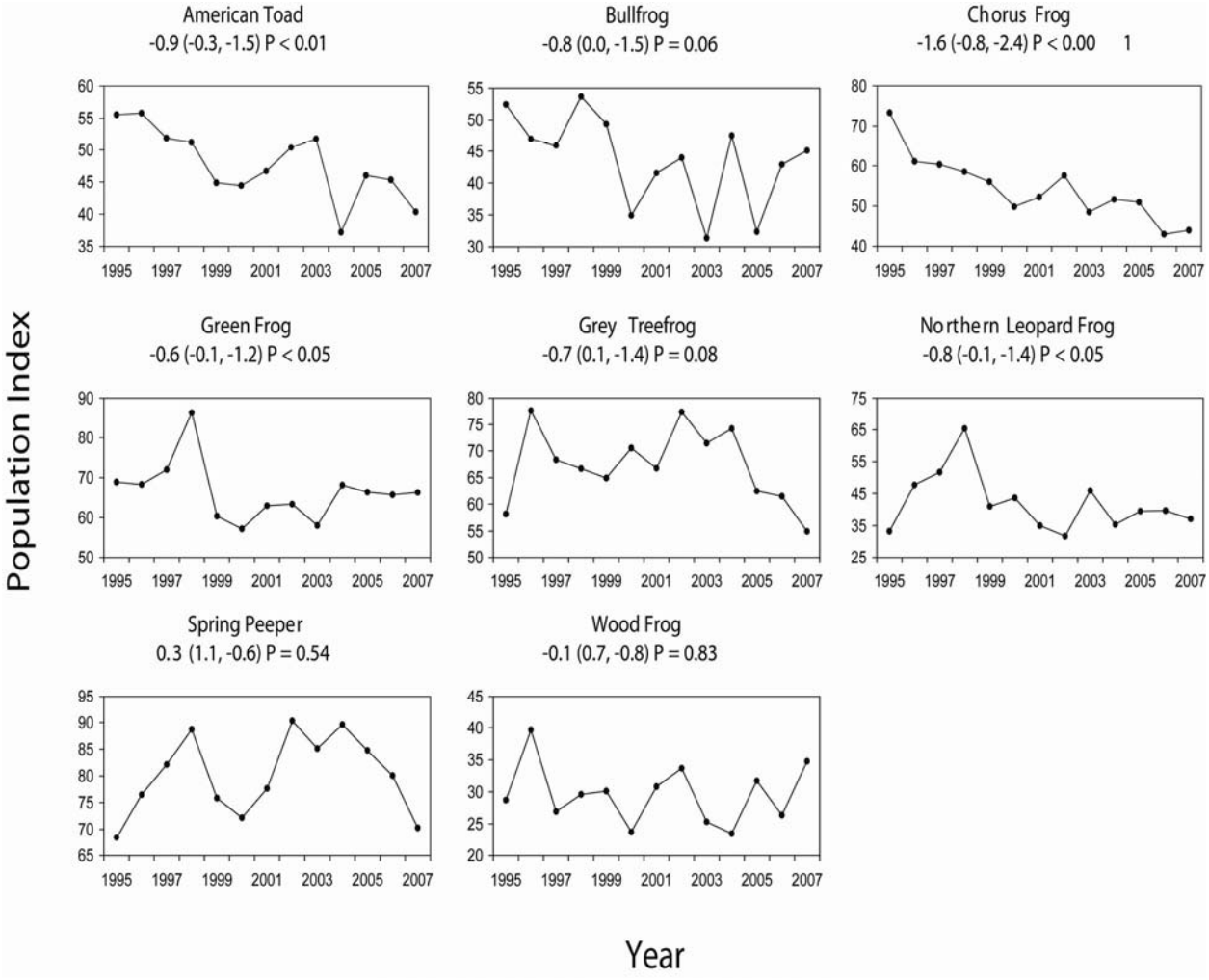

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