



GREAT LAKES WETLANDS

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Wetland Notes

May is American Wetlands Month

May has once again been designated American Wetlands Month. American Wetlands Month, in its third year, is coordinated by the Terrene Institute, a not-for-profit educational and research organization. The public information campaign highlights the important uses of wetlands while encouraging the public to enjoy the unique opportunities that wetlands afford, and to take action in their communities to protect, enhance, and restore wetlands.

The Terrene Institute is seeking public, private, and corporate sponsors to promote activities celebrating American Wetlands Month. In addition, Terrene is seeking sponsors to establish a self-supporting institution that will provide wetlands education curricula and supplemental materials, support the wetlands hotline, and develop a central clearinghouse for wetlands expertise and current scientific knowledge. For more information about Wetlands Month activities, contact:

Jodi Sproul
Terrene Institute
1717 K Street, N.W., Ste. 801
Washington, D.C. 20006
Phone: (202) 833-8317
FAX: (202) 296-4071

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Effects of Water Level Regulation on Wetlands of the Great Lakes

by Douglas A. Wilcox, Ph.D.

The International Joint Commission's (IJC) Levels Reference Study Board is concluding a multi-faceted study of means to alleviate the adverse consequences of fluctuating water levels in the Great Lakes-St. Lawrence River Basin. Included were studies of the effects of fluctuations on wetlands of the Great Lakes. A summary of the issues, concerns, and results of Phase I studies was presented by Dr. Douglas Wilcox in Great Lakes Wetlands Vol. 1, No. 2. In this article, Dr. Wilcox explains some of the results and conclusions of Phase II studies.

Dr. Wilcox has been conducting research on wetlands in the Great Lakes region since 1978. He is a wetland ecologist for the U.S. Fish and Wildlife Service at the National Fisheries Research Center-Great Lakes in Ann Arbor, Michigan and has participated in many aspects of the IJC Levels Reference Study. Much of the information summarized here was collected in collaboration with James E. Meeker and Joan Elias at the University of Wisconsin.

Water level fluctuations in the Great Lakes affect property owners, recreational boaters, the shipping and hydropower industries, and natural resources. When water levels are extremely high or low, some of these interests can be adversely affected.

Problems associated with record high lake levels in 1986 prompted the U.S. and Canadian governments to address the question of water level fluctuations through the International Joint Commission (IJC). A two phase study was initiated that reviewed known effects of fluctuations on the various interests and gathered additional information through numerous individual studies.

The effects of natural and regulated water level fluctuations on natural resources are most evident in wetland habitats, where small changes in water levels can cause large areas of submersed land to dewater and vice versa. In addition, wetlands are highly productive habitats for plants, fish, and wildlife. Thus, the IJC task group to which the natural resources issue was assigned selected wetlands as an indicator of the environmental consequences of fluctuating water levels.

Water level fluctuations are vital to wetlands of the Great Lakes. They serve to perpetuate cycling of successional processes and maintain wetland diversity. High lake levels periodically eliminate competitively dominant emergent plants. When levels recede, less competitive species are generally able to grow from seed, complete at least one life cycle, and replenish the seed bank before

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being replaced through competitive interactions. These conclusions were drawn during Phase I of the Levels Reference Study. That study also concluded that each wetland responds differently to a given water level change as a result of differences in basin morphology and positioning of plant communities within a basin. Therefore, when additional studies were initiated in Phase II of the Levels Reference Study, numerous wetlands were assessed to allow basin morphology differences to be addressed and to collect sufficient data to identify the range of fluctuations that must be maintained to protect wetland integrity and habitat diversity.

In Phase II studies, the relationships between elevation, the diversity of plant communities, and specific habitat requirements of individual plant species were examined. Field studies were limited to lakes Ontario and Superior, which are both regulated. Model scenarios that provide the necessary range of water level fluctuations for wetlands were then developed, and the major proposed regulation scenarios were evaluated in terms of predicted wetland response, based on models developed from study data. Water level scenarios for Lakes Michigan and Huron (considered hydrologically united), Erie, and St. Clair were also evaluated. However, these evaluations used information on wetland response to water level change that was obtained in studies of the other lakes.

In both Lakes Ontario and Superior, wetland plant communities differed at different elevations. The plant communities developed as a result of the water level history of each elevation. As part of the study, elevations were selected to define different water level histories based on vegetation samples. In general, plant communities at elevations that had not been flooded for many years were dominated by shrubs, grasses, and old field plants. In areas where flooding was more recent, present were small shrubs that became established after flooding, grasses, sedges, and forbs. The plant communities that had the greatest diversity of wetland vegetation were located at elevations that were flooded periodically at ten to twenty year intervals and dewatered for successive years between floods. These plant communities contained the most wetland



James Meeker

Photo 1: Kakagon Sloughs, Chequamegon Bay, Lake Superior. Water level fluctuations maintain a variety of vegetation types in this wetland complex in the low gradient, drowned mouth of the Kakagon River.

taxa and the most diversity of plant types. Dominants included grasses, forbs, sedges, rushes, emergent plants, and submersed aquatic vegetation. At elevations that were rarely or never dewatered, submersed and floating plants were dominant, with emergent plants also occurring at some sites.

Water levels on Lake Superior have been regulated for much of the 20th century. However, the range of fluctuations and the cyclic nature of high and low lake levels have not been altered substantially. Over 275 taxa were recorded in sampling of 18 wetlands along the U.S. shoreline, and 78% of them were obligate or facultative wetland species (Photo 1).

Water levels on Lake Ontario have been regulated since the St. Lawrence Seaway began operation. Prior to regulation, the range of fluctuations during the 20th century was about 2 m (6.5 ft). Following initiation of regulation, the range was reduced slightly during the period between 1960 and 1976, but low water supply conditions in the mid-1960s and high supplies in the mid-1970s maintained much of the range. Regulation reduced the range to about 0.9 m (2.9 ft) in the years following 1976. The lack of alter-



Douglas Wilcox

Photo 2: Purple loosestrife (*Lythrum salicaria*). Extensive stands of this invasive exotic species are found in wetlands of Lake Ontario, where water level regulation has substantially reduced the range of fluctuations during the past 16 years.

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Conclusion

nating flooded and dewatered conditions at the upper and lower edges of the wetlands resulted in establishment of extensive stands of cattail and domination of other areas by purple loosestrife, reed canary grass, and various shrubs (Photo 2.). Although more than 250 taxa were recorded in sampling of 17 wetlands along the U.S. shoreline, only 58% were obligate or facultative wetland plants.

Lake Ontario's U.S. side contains over 3400 ha (over 8400 acres) of wetlands that are impacted by water level fluctuations. Most of the proposed regulation scenarios for Lake Ontario call for continuing the moderation of fluctuations that have existed since the mid-1970s. As a result, consideration is being given to a revised scenario that would be more environmentally beneficial (i.e., add more variability and amplitude to the fluctuations).

The proposed scenarios for Lake Superior do not have the environmental consequences posed by those for Lake Ontario. However, the extreme low water conditions during the typically high summertime periods are not frequent enough to allow cyclic, regenerative wetland processes to occur over a large enough range of elevations. The result is a restriction of the area occupied by the most diverse plant communities. The range of the peak summertime highs also restricts

development of these plant communities. A scenario that provides an increased range of elevation between the highest and lowest summertime highs would increase the diversity of plant communities and faunal habitats in over 4200 ha (over 10,500 ac) of lake-connected wetlands on the U.S. side alone.

Several scenarios were considered that would add regulation of Lake Erie to that of Lakes Superior and Ontario (3-lake plans), and other scenarios proposed regulation of all lakes (5-lake plans). In general terms, those scenarios would likely create wetland diversity problems on the affected lakes similar to those currently experienced on Lake Ontario. However, benefit/cost deficiencies and environmental consequences resulted in recommendations that the 3- and 5-lake regulation plans be dropped from consideration. (See "Recommendations..." article.)

Studies conducted under the Levels Reference Study demonstrated the necessity of cyclic water level fluctuations in the Great Lakes to periodically stress competitively dominant plants both on the shore and in the water. However, short-term studies that attempt to assess long-term processes cannot provide complete insight into the interactions between water level changes and wetland plant communities. The Levels Reference Study has made clear the necessity for

long-term evaluations of the effects of lake level change on many of the features of the Great Lakes.

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Editor: Wil Cwikiel
Environmental Policy Specialist

Layout and Design: Laura Taylor
Graphic Design Consultant

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We are also interested in any announcements of regional conferences or events related to wetlands, or regional news on wetland science or policy issues.

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Wil Cwikiel, Editor
Great Lakes Wetlands
P.O. Box 300
Conway, Michigan 49722

Name/Title _____
Address _____
City _____
State/Province _____ Mail Code _____
Country _____