Extreme Water Levels on Lake Huron

Position Statement of the Lake Huron Centre for Coastal Conservation

2013

About the Centre

The Coastal Centre is an independent non-governmental organization dedicated to the conservation and wise stewardship of Lake Huron's coastal ecosystems. It has been in operation as a registered charity since 1998. Our environmental priorities include water quality, coastal processes, biodiversity and climate change. The Centre's work is focused on research, education and community outreach.

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Background

Lake Huron is one of the five Great Lakes positioned in the middle of this interconnected water system. Lake Huron, like the other Great Lakes, is a dynamic system and water level change is part of a normal functioning system. Recorded accounts, since 1918, show the range of levels to vary by about 2 metres. There have been several periods of low lake levels (1930s, 1960s, 2000s), and several periods of high lake levels (1970s, 1980s, 1990s).

Lake Huron is hydro-logically connected to Lake Michigan in such a way that the two lakes are considered one hydrologic unit when discussing lake levels. For this position paper, when Lake Huron water levels are referenced it is assumed that the same relates to Lake Michigan (as referenced on the water level chart shown as **Figure 1**).

It is the Centre's view that natural factors, primarily climatic factors related to precipitation and evaporation, are the key drivers of water levels. The state of balance between precipitation and evaporation will result in higher, lower or static levels. We also acknowledge that:

i. There are changes to our regional climate that have been occurring and are expected to continue to occur in the coming decades;

ii. There are human-related factors influencing lake levels (e.g. water diversions, dredging, water takings), but that those factors have historically altered the lakes in a minor way relative to natural factors; and

iii. Post-glacial isostatic rebound (also called "Glacial Isostatic Adjustment") is slowly tilting the Great Lakes basin, causing water to be gradually displaced from the northeast to the southwest. The effects of this are more acute on the northern portions of the lake and on Georgian Bay. Water levels in Milwaukee, Wisconsin, for example, appear to be rising. At the same time, water levels in the northeastern portion of the basin (e.g., Georgian Bay) appear to be dropping. This rebound accounts for about 30 cm of water level change (rising or dropping) in a person's lifetime (International Upper Great Lakes Study, 2009).

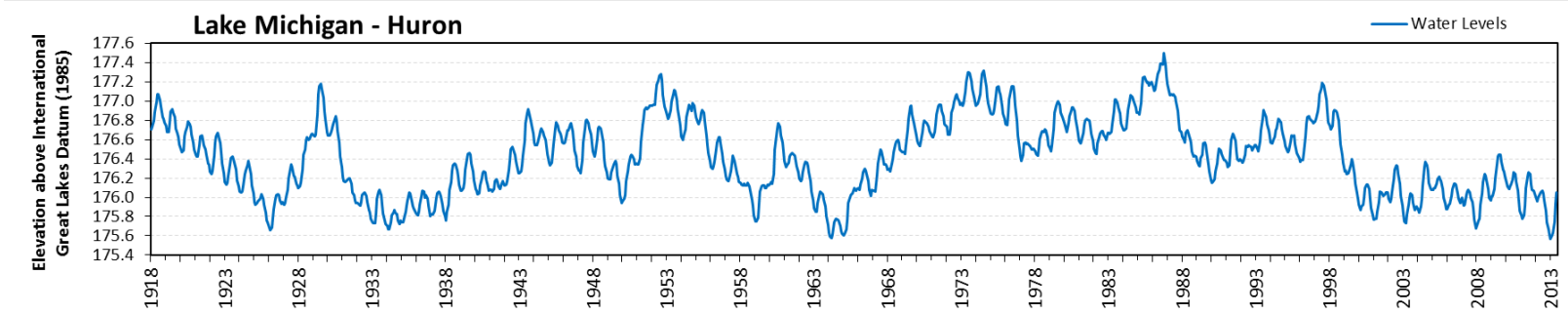

Figure 1: Water levels graph for Lake Huron/Michigan 1918 – 2013

Extreme Lake Levels

Extreme lake levels are not an unusual phenomenon. In the last fifty years Lake Huron has registered three extreme levels scenarios where records have been set. Record lows for Lake Huron were experienced in 1964 and January 2013. Record highs were experienced in 1985-86. Extreme conditions are typically met with public concern and calls for urgent action.

Figure 2: Beach erosion – southern Bruce County, 1986

Figure 3: Dune re-growth as a natural response to low lake levels – southern Bruce County, (same location as Figure 2) 2005

High Levels

Subsequent to the record high levels in 1985-86, the Canadian and United States governments requested the International Joint Commission (IJC) to investigate the extreme levels issue. This resulted in the Levels Reference Study released in 1993. The Study Board recommended against the installation of new structures to further regulate the levels and flows of the Great Lakes and St. Lawrence River because its investigations demonstrated that the costs of such measures would outweigh their economic benefits, and that these measures would produce negative environmental effects.

As a result of shoreline erosion and flooding situations during extreme high levels, extensive structural protection measures were installed along the shoreline that provided temporary relief (at least psychologically). In hindsight, many of the structures interfered with natural coastal processes and simply magnified the problem, or transferred the problem downshore. In one example near Grand Bend, Ontario, one cottage association claimed that their neighbouring cottagers' upshore had installed protection structures that had the effect of altering coastal processes causing erosion to the cottage properties downshore. They successfully launched a lawsuit that required the removal of the structures.

However, some successful adaptive management strategies did unfold as a result of the study. Ontario's Provincial Policy Statement was redesigned to incorporate development setbacks on the Great Lakes. Shoreline mapping under the federal Flood Damage Reduction Program helped define flood and erosion setbacks. Conservation Authorities were tasked to prepare Shoreline Management Plans for local implementation. These measures focused on adapting to extreme high levels, rather than battling against them.

Low Levels

The International Joint Commission (IJC) in April 2013 submitted a series of recommendations to the two federal governments intended to co-manage the lake. These recommendations followed an extensive five-year study by the International Upper Great Lakes Study (IUGLS) team. The IJC recommendations to government were not unanimously supported. The US co-chair (one of 6 commissioners, 3 from the US and 3 from Canada) refused to endorse the report, citing that the recommendations placed insufficient emphasis on climate change and the need for adaptive management. The Commission's recommendations to governments included the following:

1. Opposition to further study of Multi-Lake Regulation. Consistent with previous Commission studies, the Commission found further exploration of multi-lake regulation that includes new large-scale dams and channel enlargements is not warranted.

2. Recommendation was for further investigation to restore Lake Michigan-Huron water levels. This would include:

   (i) exploration of options that would provide relief during low water periods, but not exacerbate future high water levels; and

   (ii) a comprehensive binational benefit-cost analysis and a detailed environmental impact study of potential structural options.

3. Endorsement of the implementation of a comprehensive Adaptive Management approach to the Great Lakes, supported by science and monitoring (IJC, 2013).

There are many competing interests in the upper lakes, preferring various water levels that match their respective interests. Substantial regional public pressure, particularly from Georgian Bay, has called for the construction of engineered structures in the St. Clair River aimed at holding back water in the Lake Huron / Lake Michigan system. The structures being discussed would be aimed at raising levels by about 20 cm. A similar proposal was made in the 1960s during the last extreme low level but was not implemented (History of Dredging and Compensation in the St Clair River, 2009). What followed was three consecutive decades of high lake levels, including the record highs in the mid-1980s. Had the structures been in place during that time, greater flooding and erosion damages would likely have been experienced.

While extreme levels can elicit a strong emotional response amongst some directly affected by either high or low levels, the issue of extreme levels needs to be considered in a careful, objective and measured way.

Position

The Coastal Centre stresses caution on the idea of manipulating water levels through the installation of engineered structures in the St. Clair River. Lake Huron-Michigan is a large complex system. Scientists currently have a limited understanding of the long term effects to Lake Huron's ecosystems and the effects of artificially altered levels. If we use the Lake Ontario regulation experience as an example, we know that its coastal wetlands, for instance, declined dramatically as a result of compressed lake level fluctuations. Previous studies have noted the importance of unrestricted lake fluctuation as critically important to the long term health and function of coastal wetlands. Likewise, little is known about the effects of controlled levels on species and habitat. And finally, our ability to predict future lake levels is so limited that attempts to raise levels to a point that would satisfy some under low conditions could amplify

problems should high lake levels return. We are concerned that controlling 20 cm of lake levels may lead to further expectations to add more structures in the future if these structures fail to meet those expectations and/or if water levels continue to lower.

We support the pursuit of adaptive management as recommended by the IUGLS and IJC. In our view, this would include:

- **Development of 'extreme water levels plans**': These would present strategies to cope with emergencies and practical issues related to access, hazards and ecosystem protection, related to both extreme ends of the water levels spectrum. From past experience, we know that reacting to extreme water levels situations can lead to poorly informed decisions.

- **Planned infrastructure:** Most of our lake infrastructure (e.g. harbours, marinas, water intakes) was engineered for a specific range of lake levels, generally favouring average levels, but well within the historic range. Most plans do not accommodate levels at the extreme ends of the spectrum. Planning for marina and harbour infrastructure repairs and dredging plans that go beyond the recorded range of levels, may help speed up permitting and approvals. For example, lack of planning resulted in delays to the Chi-Cheemaun ferry schedule in early 2013 when confusion over government jurisdictions resulted in the failure to install dock fenders to accommodate lower lake levels that resulted in ferry service delays. Municipalities and private industry were frustrated with the process to investigate, provide approvals, and fund infrastructure works related to the shoreline.

- **Municipal water vs individual water intakes:** The issue of private water intakes becoming exposed during low lake conditions should provoke discussion about municipal drinking water system provision as an adaptive response.

- **Permanent severing of the Chicago sanitary sewer canals:** The canals, built in Chicago in the early 20th century, presently connect the Great Lakes with the Mississippi River system and divert water from Lake Michigan into the river. Several Non-Governmental Organizations and US State governments have proposed a permanent barrier be constructed to prevent future invasive species introductions. Severing the connection between the two water bodies would have the dual effect of increasing levels on Huron-Michigan, and remove the threat of invasive species, such as the Asian Carp, from entering the Great Lakes through the Mississippi River and related canals in Chicago.

- **Invasive plant species control and planning:** Invasive plants, like *Phragmites australis*, infesting beaches has been a response to lower lake levels in recent years. Communities would be best served with early detection and rapid response plans, rather than reacting to the problem once it becomes costly and challenging to address. Invasive species threaten the quality of our coasts, including wildlife habitat and species, as well as people's ability to enjoy them.

- **Protecting/restoring natural resiliency:** As an adaptive response to a changing climate, building coastal resiliency provides multiple benefits including erosion control, enhanced biodiversity, water quality improvement, and better beach quality. Examples include dune conservation, coastal wetland protection and lakeshore naturalization.

- **Rural Stormwater Management planning:** It will be important that we prepare for changing climate conditions within the lake watershed. Extreme weather events in the recent past have often exceeded designed stormwater management structures. The changing climate regime requires a rethinking of current standards for dealing with stormwater management.

- **Adequate funding:** Funds should be made available at the local municipal level to implement adaptive management measures.

> *Ecosystem resilience is the capacity of an ecosystem to tolerate disturbance without collapsing into a qualitatively different state that is controlled by a different set of processes. A resilient ecosystem can withstand shocks and rebuild itself when necessary.*
> *(Resilience Alliance)*

We are entering into a period of a changing climate which will re-define the term "normal". This "new normal" needs to be carefully considered and planned as we adapt to the realization of new and changing management needs. Understanding, planning and adapting to these new conditions will help coastal communities meet the challenges ahead.

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Pamela Scharfe, Chair

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