



H2O 2021: Extreme Water Levels – Impacts and Strategies
Webinar 1: What’s Happening? What’s New?
Saturday 23 October 2021, 100 am to 12 pm

SYNOPSIS

Key Takeaways:

- 1) Both precipitation and evaporation are projected to increase under various climate-change scenarios, with future lake levels depending on the balance between the rates of increases. The highs are likely to be higher and the lows lower as we move into an increasingly uncertain future.
- 2) The Council of the Great Lakes Region released Action Plan 2030 in June 2019. The Action Plan addresses four major challenges facing the Great Lakes region: climate change, beaches and bacteriological contamination, nutrients and algal blooms, and toxics and harmful pollutants.
- 3) The Council is seeking to leverage federal commitments regarding a strengthened Freshwater Action Plan and the creation of a Canada Water Agency to advance the priorities laid out in Action Plan 2030, including the recommendations it has made to address the four major challenges.
- 4) Climate drivers – including temperature (air and water), wind speed, and precipitation – operate at different scales, including basin-wide and local scales. Future projections predict ‘warmer, wetter, wilder’ conditions. Lake impacts include ice (cover and phenology) and algae growth. Bluegreen algae blooms like it hot, so rising temperatures will favour blooms.
- 5) Additional lake impacts can be seen in wetlands, flora and fauna. Wetlands in Georgian Bay evolved within the long-term water level regime of 6.33 feet of water level fluctuations. There is concern that more rapid transitions between higher highs and lower lows will adversely affect the ability of wetlands to adapt.

- 6) Rising water temperatures, less ice cover and other factors, such as increased sewage overflows and more blue green algae outbreaks, will increasingly tax the ability of our coastal wetlands to keep our water clean. Many plant and animal species will be unable to adapt to the effects of even an intermediate scenario for the future climate, with taxonomic groups depending most on water (e.g., molluscs, fishes, amphibians and lichens) being most vulnerable. The recent event that impacted birds and fish on Wasaga beach (and past, similar incidents) evidenced botulism bacteria being passed through the food chain from algae to invasive round goby to mussels to birds, highlighting the potential vulnerabilities.

Welcome messages

- 1) Rolfe Jones, chair of the board of directors of the Georgian Bay Association, offered a traditional land acknowledgement and welcomed participants on behalf of the two sponsoring organizations – Georgian Bay Forever and the Georgian Bay Association.
- 2) Marilyn Longlade Capreol, an elder from the Shawanaga First Nation, provided opening comments.

Topic A: Climate change impacts – What is coming? Updates on water levels, forecasts and impacts

Two speakers provided an International Joint Commission perspective on Georgian Bay and upper Great Lakes water levels:

- 1) **Pierre Béland, Canadian Section Chair of the International Joint Commission**, who addressed variability in water levels and the drier than average water supplies; and
- 2) **Jane Corwin, U.S. Section Chair of the International Joint Commission**, who addressed regulation of Lake Superior outflows (with Plan 2012 trying to balance water levels in the uppermost Great Lakes, recognizing that net basin supplies are the dominating factor in determining water levels), forecasts, and resiliency.

Pierre Béland provided a thorough review of the Palmer Hydrological Drought Index since January 2017, which clearly demonstrates that wetter than normal conditions persisted throughout the Great Lakes until February 2021, and was then followed by four months of dry conditions. This is why there was an increase in levels on every lake 2017-2020 and a decrease in levels this year.

While not the specific focus of this webinar, Jane Corwin gave examples of how we need to plan for resiliency using approaches such as erosion setbacks, re-location of dwellings, flood elevation and protection requirements, shoreline alteration requirements, real estate disclosure requirements, acquisition of high-risk properties, and hazard insurance.

Two speakers provided an update about water levels:

- 1) **David Sweetnam, Executive Director of Georgian Bay Forever;** and
- 2) **Rupert Kindersley, Executive Director of the Georgian Bay Association.**

They made the following observations:

- 1) both precipitation and evaporation are projected to increase under various climate-change scenarios, with future lake levels depending on the balance between the rates of increases of these two main drivers of water levels;
- 2) the traditional seasonal cycle is evaporation causing water-level declines in fall/winter, and precipitation and snowmelt causing water-level rises in the spring – this is why year to year comparisons are only meaningful when comparing the levels against the same month in each year;
- 3) La Niña occurred in winter 2020-21 and is expected to occur again in winter 2021-22;
- 4) the farther into the future we attempt to ‘model’ water levels, the greater the uncertainty associated with the estimates;
- 5) projections from 13 climate models suggest that the highs are likely to be higher and the lows lower as we move into an increasingly uncertain future;
- 6) much will depend upon global action to address climate change issues, as little/low action will result in much wilder swings between greater extreme highs and lows and;
- 7) an analysis based on past water levels variability may result in a lowering of the low-water datum for Lake Michigan-Huron (M-H) by 9 to 12 inches, which will have important economic and environmental implications for shipping and other industries. Therefore, it is vital that this analysis takes account of the new projections from the yet to be published ECCC study, otherwise it could significantly exacerbate future extreme low water levels on M-H.

Topic B: Great Lakes – St. Lawrence Action Plan 2020-2030 (or Action Plan 2030)

Mark Fisher, President and CEO of the Council of the Great Lakes Region, spoke about Action Plan 2030. He summarized the Council's:

- goals;
- major milestones;
- three major phases of its review;
- collaborative structure;
- four major challenges facing the region:
 1. climate change,
 2. beaches and bacteriological contamination,
 3. nutrients and algal blooms,
 4. toxics and harmful pollutants.
- institutional arrangements for action-plan implementation, and
- next steps

Each of these topics is addressed in more detail below.

The **goals** of the Council of the Great Lakes Regions are:

- 1) an integrated Great Lakes - St. Lawrence vision;
- 2) increase in investments in Great Lakes - St. Lawrence protection (which is a goal inspired by the U.S. Great Lakes Restoration Initiative, a U.S. federal program that has delivered over \$2 billion in investments in the Great Lakes region over the last ten years);
- 3) innovative approaches;
- 4) alignment across governments; and
- 5) engagement with stakeholders, experts, and indigenous groups.

The Council's **major milestones** to date include:

- 1) stakeholder roundtables in Quebec City and Toronto in the fall of 2017;
- 2) Great Lakes - St. Lawrence Day on Parliament Hill, which include a meeting with Environment Minister Catherine McKenna in November 2017;
- 3) a proposal to Environment and Climate Change Canada, which yielded \$400,000 towards the project in September 2018;
- 4) an expert panel recruited, with Gord Miller and Jean Cinq-Mars appointed as Co-chairs, in October 2018; and
- 5) three reports prepared and released:
 - Great Lakes Action Plan 2030 (work undertaken 10/2018-6/2019 and report released 6/2019);
 - Action Plan for the Future of the St. Lawrence 2020-2030 (work undertaken 5/2019-1/2020 with report released 3/2020);
 - Integrated Report (work undertaken 1/2020-4/2020 with report released 5/2020).

The Council includes a steering committee (supported by a secretariat), an expert panel, and four issues tabled, each addressing a different challenge facing the region. Examples of the recommendations made to address these challenges include:

1) ***climate change***

- a. establish a joint Office of Shoreline Climate Change Adaptation and Resilience to develop a regional shoreline adaptation and resiliency strategy, provincial action plans, and coordinate its implementation;
- b. establish and fund Shoreline Resiliency Priority zones and management teams to identify and address significant threats from climate change;

2) ***beaches and bacteriological contamination*** (15-20% of Great Lakes beaches have chronic E. coli contamination problems through the summer season)

- a. introduce a new risk-based categorization system for Great Lakes and St. Lawrence beaches, and require actions of owners of 'impaired' beaches that have chronic bacteriological contamination issues,
- b. create and maintain a publicly accessible, central portal with beach quality information, including information on the status of the beach,
- c. amend the Public Health Ontario's Public Beach Water guidance on test methods for E. coli to allow for alternate testing methods other than membrane filtration as per Ontario Ministry of Environment, Conservation and Parks (MECP) guidance on drinking water testing methods;

3) ***nutrients and algal blooms***

- a. establish a Centre for Water Quality and Nutrient Management supported by a university consortium, indigenous communities and relevant organisations to generate and coordinate information to support precision conservation and best practices and provide extension support to farmers (11 priority zones identified in Quebec),
- b. review and adapt agricultural income support and technical programs to reduce water contamination as well as technical assistance outreach to farmers, especially incorporating green infrastructure, payment for ecosystem services for landowners,
- c. designate a dedicated network of extension workers that receive standardized training and provide consistent technical advice to farmers,
- d. provide financial support for wastewater treatment facility upgrades and the installation of green infrastructure to reduce the number of sewer overflows in priority sectors, remove emerging contaminants, nitrogen, and to mitigate shoreline bacteriological pollution;

4) ***toxics and harmful pollutants***

- a. develop a targeted environmental and human health effects monitoring, human biomonitoring and surveillance program to provide early detection of unexpected effects in the Great Lakes basin that feeds directly into a regulatory and non-regulatory response plan to reduce exposure,
- b. review and strengthen the standards and upgrade the performance of existing wastewater treatment facilities for municipalities, businesses, and institutions,
- c. introduce a strategy to promote substitution of harmful chemicals in products, including a centre for chemical substitution, and a chemical substitution recognition program.

The Council has institutional arrangements for action-plan implementation.

Mark Fisher concluded with two next steps for the Council of the Great Lakes:

- 1) leverage federal commitments regarding a strengthened Freshwater Action Plan and the creation of a Canada Water Agency to advance the priorities laid out in Action Plan 2030; and,
- 2) meet with key ministers, caucuses, shoreline MPs, senators in advance of the Speech from the Throne and Budget 2021 to ensure freshwater and the Great Lakes remains a top priority for the Trudeau government in a minority parliament.

Topic C: Impact on wetlands, flora and fauna – How adaptable are they?

Two speakers – Aisha Chiandet, Scientist, and Julie Cayley, Executive Director, from the Severn Sound Environment Association – joined GBF executive Director David Sweetnam in addressing the impacts of changing climate and water levels on wetlands, flora and fauna, as well as their adaptability.

Aisha Chiandet and Julie Cayley addressed:

- 1) climate drivers, including temperature (air and water), wind speed, and precipitation
- 2) lake impacts, including ice (cover and phenology) and algae growth; and
- 3) need to focus on local/regional trends, projections and implications.

They noted that the climate drivers operate at different scales, including basin-wide and local scales, and that future projections predict “warmer, wetter, wilder conditions.” They also noted that blue-green algae blooms like it “hot,” so extreme warm weather events favour blooms.

Again, while not the specific focus of this webinar, Aisha and Julie offered some suggestions about what we can do:

- 1) invest in resilient shorelines, which includes using bioengineering, soft-engineering, green infrastructure technologies and re-locating infrastructure away from the shoreline where possible;
- 2) reduce nutrient inputs and carbon emissions (with suggestions available at www.severnsound.ca and www.sustainablesevernsound.ca) and calculate your carbon footprint (gbb.ca/carbon-calculator);
- 3) learn how to recognize and report harmful algae; and
- 4) join citizen-science programs near you, such as SSEA programs (e.g., Ice Spotters, Shore Watch, Stream Watch, and Invasive Species Spotters – see <http://bit.ly/sseacit-sci>), Muskoka Watershed Council, Lake Huron Coastal Centre, Nottawasaga Valley Conservation Authority, and Georgian Bay Biosphere.

David Sweetnam, ED of GBF, addressed additional examples of lake impacts, including the adaptability of wetlands, flora and fauna, each of which are addressed below.

Wetlands provide three categories of benefits:

- 1) protect from wave action, with the roots of plants stabilizing soils;
- 2) filter and clean our water; and
- 3) provide habitat for fish and other wildlife including migrating birds.

Wetlands include the forest fringe surrounding them, so occasional dead trees are part of Mother Nature's plan. Decreasing water levels on Georgian Bay from 1987-2013 showed a 7% wetland gain in the North, a 10.8% wetland loss in the south, and an overall net loss of 3.8%. Wetlands in Georgian Bay have evolved within the long-term water level regime of 6.33 feet of water level fluctuations, and these fluctuations keep them healthy. That said, increasing sewage discharge, among other factors, will increasingly tax the ability of our coastal wetlands to keep our water clean, and we need to invest more resources in helping to protect them.

Turning to flora and fauna, David noted that many plant and animal species will be unable to adapt to the effects of even an intermediate scenario for future climate change (RCP 4.5, which includes a global temperature rise between 2 and 3 degrees Celsius and a mean sea-level rise that is 35% higher than that of the better scenario of RCP 2.6). He cited the results of a 2018 report about climate change vulnerability of species in the Ontario Great Lakes basin from the Ontario Ministry of Natural Resources and Forestry. Vulnerability includes both the species' exposure to climate change and its sensitivity/adaptive capacity. The report found that:

- 1) climate change will affect the distribution and abundance of species in the Ontario Great Lakes basin;
- 2) eleven species were found to be extremely vulnerable, 49 were highly vulnerable, and 115 were moderately vulnerable (with the remaining 105 found to be less vulnerable because?!): and;
- 3) of the 10 taxonomic groups assessed, those depending most on water (e.g., molluscs, fishes, amphibians and lichens) were most vulnerable, vascular plants and mammals varied widely in assessed vulnerability, and birds, insects and spiders, and reptiles were the least vulnerable.

David also addressed impacts on fish and birds in more detail. He listed a number of fish stressors:

- 1) overfishing (commercial and recreational);
- 2) development and ensuing habitat loss;
- 3) climate change, which is a long-term stressor for fish as well as an acute stressor for recruitment (e.g., lack of ice cover is associated with lower low viability); and
- 4) invasive species (e.g., phragmites, lamprey, mussels, and goby).

He described the chain of events that led to many dead birds being found along southern Georgian Bay shorelines:

- higher water temperatures cause
- more filamentous algae (Cladophora) that rots, which then produces
- botulinum bacteria, which is taken up by and concentrated in invasive quagga and zebra mussels
- invasive round goby then eat the mussels
- The birds then eat the round goby and die of botulism.

David described additional impacts of climate change on lakes:

- 1) climate change is helping invasive species like phragmites to take hold in coastal wetlands;
- 2) increasing storm intensities are depositing more water in shorter time leading to more flooding, and in turn increasing pollution and nutrient loads; and
- 3) increasing storm intensities are overwhelming septic and stormwater systems, leading to raw sewage releases (e.g., there were 14.5 hours of raw sewage bypasses and 21 hours of partial bypass in Collingwood during heavy rainfall in the week of September 20, 2021).

David noted a number of projects that are underway, or have been completed, including:

- 1) diversion 2.0 project (underway);
- 2) ECCC wetlands study (report anticipated in March 2022);
- 3) GBF detailed bathymetry work (underway); and,
- 4) GBF rock shoal mapping report (report completed in December 2020).

Questions and Answers

Answers to the questions posed in the Q&A session and on registration have been collected into a document that will be posted on the GBA and GBF websites.

Final observations

The webinar led to significant improvements in awareness and knowledge.

On registration:

Question	Responses
Do you understand the future uncertainty predicting a broader range of extreme high and low water levels and the potential impacts on the ecosystems of Georgian Bay?	No, I am looking for help: 12% Somewhat, but I would like more up-to-date information: 85% I don't think extreme water levels changes are an issue for the future: 3%

During the webinar:

Webinar segments	Before presentations	After presentations
Understanding what's ahead for water levels	Yes: 35% I have some questions: 22% No: 40%	Yes: 67% I have some questions: 21% No: 12%
Understanding of Action Plan 2030	Yes: 4% I've heard of it, but know little: 18% No: 78%	Yes: 70% Still have questions: 25% No: 5%
Understanding impacts of climate change and extreme water levels on lake ecosystems	Yes: 52 No: 48	Yes: 97 No: 3

Exit poll:

Question	Responses
Given the information you learned in the webinar about more high-highs and low-lows, will you take action to prepare?	Yes: But I don't know what to do. 73% No. I don't think there is action to take: 6% I don't know: 20%

Basic water levels questions were not the focus of this symposium. Please refer to our websites for the 2020 symposium summary and Q&A where such questions were addressed by the expert panellists.