Natural Infrastructure for a Climate-Ready Ontario

BUILDING THE CASE FOR LEVERAGING WETLANDS TO REDUCE FLOOD RISK

Natural infrastructure — wetlands, grasslands and forests that support productive landscapes — can play a key role in a climate-ready Ontario. These ecosystems excel at storing rainfall and runoff, reducing the risk of flooding along downstream watercourses and in downstream communities.

Communities are preparing for more frequent extreme weather events. The impacts and costs of flooding have exploded in Ontario, leading to widespread emergency actions and expenditures at the community level. In the spring of 2019, flood emergencies were announced by 23 municipalities and one First Nation.

As the leader in wetland conservation, Ducks Unlimited Canada (DUC) can help integrate Ontario's natural infrastructure into flood-management planning as part of a resilient future. Sound science is the foundation of our business model and drives us to seek evidence that establishing wetland conservation can help communities.

We commissioned research to look at how wetlands are currently integrated into flood management in southern Ontario communities, and asked what is needed to remove barriers that prevent deeper integration of wetland conservation into flood management.

We found that natural flood-management services of wetlands are a cost-effective complement to traditional infrastructure built to protect communities from floods, providing evidence for wetland conservation as a best practice for climate readiness. We also found a growing understanding of the benefits of wetlands—for example, among public sector and water-management experts—but increased awareness has yet to be fully translated into action.

DUC's conservation mission is aligned with a climate-ready Ontario. We have conserved and restored wetlands and adjacent habitats in Ontario for decades. Working with many partners — including thousands of private landowners — we protect and restore wetlands to support the natural infrastructure of landscapes.

This research is another step towards ensuring communities have the tools they need to fully integrate natural infrastructure into their planning practices for a resilient future.





Wetlands can help reduce capital and operating costs and extend the lifecycle of built infrastructure while continuing to provide benefits like improved water quality, recharged groundwater and shelter for hundreds of species of wildlife.



Ducks Unlimited Canada delivers wetland conservation that benefits every Canadian. Our vision is to replenish the landscape with healthy habitat and fill the skies with waterfowl—a conservation mission that embraces the entire continent of North America. All people who care about the future of water, wildlife or wilderness share our conservation mission.



Wetlands for Flood Resiliency

Research commissioned by DUC:

- Assessed the extent to which municipalities are opting to combine wetlands with their built infrastructure to reduce the risk of flooding, and to determine their reasons for doing so;
- Analyzed how municipalities and other agencies assess the costs and benefits of employing wetlands for flood mitigation.

We found that wetlands in combination with traditional infrastructure can be more cost-effective for flood mitigation than using built infrastructure on its own. The cost savings of employing wetlands can be calculated by estimating **1** avoided costs of built infrastructure needed to replace wetland flood-mitigation services or **2** avoided costs of damages if flooding is controlled.

Theme: Increased awareness of wetland flood reduction value not driving more conservation (yet)

Findings from municipal reports and plans suggest there is a growing understanding of the flood mitigation benefits of wetlands. But due to a variety of reasons *(see barriers following)*, increased municipal awareness has yet to be fully translated into actions to mitigate flood risk by leveraging wetlands. However, regulatory requirements for asset management plans to include green infrastructure assets by 2023 will be a key driver for Ontario municipalities and their partners to evaluate, manage and invest in wetlands—potentially making wetland protection and restoration standard municipal practice for flood risk reduction and other benefits such as water quality improvement.

Theme: Cost-benefit analyses of employing wetlands for flood mitigation need to mature

Conducting cost-benefit analyses (i.e., building the business case) for employing wetlands for flood mitigation in combination with traditional/grey infrastructure can be challenging for municipalities and, in some cases, not given any consideration. Our literature review found the lack of a standardized approach for wetland CBAs has caused problems by leaving "each study open to critique of what assumptions and limitations are acceptable to decision makers." To be most useful, municipal or watershed-scale CBAs should consider the cost/benefit components from perspectives of different stakeholders such as farmers, developers and other landowners.

Theme: Potential risk to employing wetlands for flood mitigation

Increased use of existing and restored wetlands for flood mitigation/stormwater management comes with a risk of potential indirect impacts on wetland ecosystem services, for example, increased pollution, increased runoff and higher peak flows. This finding from the literature review aligns with responses from several professionals who indicated that wetlands should not be used for stormwater/flood management because ecosystems would be degraded. The research emphasized that a holistic Low Impact Development (LID) approach, including Better Site Design standards, will reduce both indirect and direct wetland impacts from nearby developments.

Theme: Watershed-based approaches and other innovations are keys to success

Watershed-based approaches to stormwater management are becoming more common as downstream solutions prove insufficient to mitigate floods. Our research found that a sub-watershed and watershed-scale approach to flood mitigation is important to leverage successful wetland-based solutions that may be included in Municipal Class Environmental Assessments including Stormwater Master Plans. Public-sector agencies are studying the benefits of watershed-based approaches in place of municipal-based approaches: for example, Lake Simcoe Region Conservation Authority, Toronto and Region Conservation Authority, and York Region and its partners are working on a "Watershed-scale Model for Stormwater Management and Risk Mitigation" to identify the management actions that provide the greatest cost-benefit for flood control and water quality improvement.

Another innovation being implemented by municipalities, including York Region, is to convert stormwater management ponds to hybrid wetland systems that serve dual functions to attenuate high-flow events and reduce phosphorus loads passing downstream.

Selected barriers to choosing wetlands for flood reduction

We identified barriers that prevent or impede wetland conservation activities aimed at reducing flood risk and recommendations to overcome them.

- Lack of knowledge regarding flood mitigation services of wetlands and the business case for employing wetlands for that specific purpose
- Organizational silos and lack of awareness of common objectives across departments
- The need for more advocacy through public planning processes
- Lack of professional or standardized best practices for municipal plans to consider wetland conservation for the purpose of flood mitigation
- Lack of information/professional resources to support wetland conservation/natural asset management
- The minimum level of service (i.e., extent of flood risk mitigation) required of municipal stormwater management infrastructure is not standardized

Priority recommendations for action

Recommendations arising from the research to overcome these barriers include actions that can be led by DUC and others to be led by municipalities. We selected four recommendations as DUC's first priorities for action:

- Evaluate CBA tools currently used to assess the effectiveness of wetland conservation for flood mitigation in terms of their strengths, weaknesses and applicability to specific types of common wetland conservation opportunities.
- Pacilitate a workshop with multidisciplinary representatives from municipal departments to identify and address barriers or opportunities regarding use of wetland conservation for flood mitigation. Laws, standards, regulations and policies may be unintentionally creating barriers or there may be opportunities for change that would accelerate wetland conservation.
- Partner with a municipality to develop a case study demonstrating how wetland conservation can be integrated into municipal processes to achieve flood management and climate resiliency objectives (e.g., Official Plan, Municipal Asset Management Plans).
- Oevelop resources to support municipalities in their decision-making around wetland conservation, including recommended standard methods for CBAs and compiled supporting literature.



This research was commissioned with support from the Ontario Trillium Foundation. The full report, Municipal Conservation of Wetlands for Flood Resiliency, prepared for DUC by Emmons and Olivier Resources is available on request. Our thanks are due to the many municipal professionals who took the time to share their knowledge and experience with us.



Using science and research as our guide

We take pride in being an excellent partner for conservation delivery, with a proven track record working with industry, governments, landowners and conservation partners — collaborating efficiently to achieve positive outcomes for wetlands and communities. We continually develop our knowledge of the most productive ecosystems in the world: wetlands. We're increasing our understanding of wetlands and their contributions to clean water, and how wetlands help reduce flooding in communities. Other current research projects include:

Research on Natural Infrastructure Role of Wetlands in Water Quality

Warming seasonal temperatures combined with other factors, including the loss of wetlands, have aggravated the problem of excess nutrients in watersheds. We are conducting research in the Lake Erie watershed to quantify the extent to which small, restored wetlands capture nutrients and if such natural infrastructure can effectively mitigate nutrient export in an agricultural landscape. The study will inform conservation decisions with data on how, and how much, restored wetlands improve water quality.

Partners

- DUC's Institute for Wetland and Waterfowl Research
- U.S. Fish & Wildlife Service via the North American Wetlands Conservation Act
- Ontario Ministry of Natural Resources and Forestry
- St. Clair Region Conservation Authority
- 8 private landowners

Aquatic Invertebrates in Wetlands

Wetlands provide valuable services and habitat to many species. The conversion of land in southern Ontario has led to substantial wetland loss and the restoration of wetlands on agricultural properties has the potential to offset these losses. But these wetlands may be affected by surrounding land uses. We are working to better understand to what degree these wetlands are impacted by surrounding land uses and whether these wetlands support wildlife, specifically aquatic invertebrates which are important food sources for waterfowl.

Partners

- University of Waterloo
- DUC's Institute for Wetland and Waterfowl Research
- Mitacs Elevate Postdoctoral Fellowship
- 14 private landowners





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