

# A New Approach to Lake Basin Planning: Lake Ontario & Green Bay

*David Klein, Senior Field Representative, New York Chapter*  
*Scott Thompson, Director of Freshwater Conservation, Wisconsin Chapter*

## Introduction

The Great Lakes are so vast that it's tempting to think of them as indestructible.

But through the work of The Nature Conservancy and others, we understand that the native biodiversity of the Great Lakes is threatened by invasive species that alter food webs and endanger native species; incompatible development that fragments forests and coastal habitats; agricultural practices that increase runoff of sediments and nutrients into near shore waters and tributaries; dams and barriers on tributaries and connecting channels that alter hydrologic patterns and deny migratory fish access to spawning areas; and climate change, which will potentially lower lake levels and reduce the viability of critical habitats.

In the face of these major threats, how do we plan effectively for the conservation and restoration of the Great Lakes? We know that effective conservation within the Great Lakes basin will depend on an understanding of the important species, systems and processes that contribute to the biological diversity of the basin and their interrelationships. We also know that the Conservancy can't do it alone. We need to build coalitions with public agencies, other nonprofit organizations, universities and research centers, and influence public policy at local, state and national levels. And finally, we will need to develop strategies that integrate and balance human needs and uses with the needs of nature.

## New Approach to Planning

The Conservancy has developed a planning process that allows us to engage the expertise and experience of local and lake-wide partners to develop and implement conservation strategies.

We have utilized the Conservancy's Conservation Action Planning (CAP) process as a framework to integrate data and expert knowledge in a common agenda for conservation. In this way, we seek to extend what the Conservancy can accomplish by enlisting our partners in the effort to define a common vision and to pool resources to achieve it.

Through this planning process, we are tapping into the extensive knowledge of our partners to build our understanding of large freshwater lake systems, where we have had little experience. Together we are developing strategies that integrate terrestrial and aquatic systems, while recognizing the need to integrate economic and social realities to ensure that these ecological systems are sustainable.

Each of the Great Lakes systems for which we are currently planning or for which we will plan in the future is unique in size, landscape context and threats to biodiversity. But there is a suite of objectives common to each planning process:

- We will take a holistic approach to lake conservation and management that considers the entire system rather than focusing on one species or ecological community;
- We will engage the human communities that depend on these lake systems for clean water, recreation and other benefits in their conservation;
- We will integrate biodiversity health into the thinking about what constitutes a healthy freshwater system;
- We will cross political and cultural boundaries that stand in the way of an integrated conservation approach; and
- We will turn planning into conservation action by testing conservation strategies and then sharing those strategies with other large freshwater lake systems worldwide.

## Planning for Lake Ontario and the Green Bay Watershed

Conservancy staff are currently engaged in planning for Lake Ontario and the Green Bay watershed.

These projects aim to apply the Conservancy's landscape approach to the conservation and restoration of healthy ecological systems in the open waters of two Great Lakes.

**Lake Ontario:** Lake Ontario's unique biological diversity reflects its freshwater and oceanic origins. In relatively recent times, the lake was a bay of the Atlantic, and its populations of Atlantic salmon (now extinct in the lake) and American eel (critically endangered) reflect this saltwater history. The lake's glacial heritage is visible today in the beaches, dunes and sheltered lagoons of its coastal zone; the coastal wetlands, including wet meadows, emergent marshes, coastal fens and aquatic beds; and the native fish like American eel, northern pike, muskellunge and lake sturgeon that depend on these wetlands and tributaries.

The challenge of developing a conservation agenda for Lake Ontario required the Nature Conservancy of Canada and The Nature Conservancy to find a binational framework to bring together the public agencies and non-governmental organizations (NGOs) that focus on the lake. Fortunately, such a binational structure already existed in the Lake-wide Management Plan (LaMP), a joint effort of the Environmental Protection Agency, New York's Department of Environmental Conservation, Environment Canada and the Ontario Ministry of Natural Resources.

Working under the auspices of the LaMP, we have assembled a project team representing 27 agencies, universities and NGOs in Ontario and New York. More than 100 experts and practitioners have participated in four workshops to identify focal conservation targets, clarify threats to the viability of these targets, frame strategies to abate these threats and prioritize tributaries and coastal reaches for implementation of these strategies.

The project team decided to focus on these key components of the lake's ecosystem:

1. The pelagic (open water) ecosystem;
2. The benthos -- the lake's bottom in permanently cold waters;
3. Native migratory fish such as lake sturgeon, lake trout, American eel and northern pike, and including target species for restoration such as Atlantic salmon;
4. Naturally-formed and artificially-formed islands that serve as nesting habitat for species such as common terns;
5. The near-shore waters that support numerous submerged aquatic plants and the expansive communities that depend on them such as softshell turtles, dabbling ducks and yellow perch;
6. Coastal wetlands of the lake and the upper St. Lawrence River, including wetlands altered by regulation of levels and flows;
7. Coastal terrestrial ecosystems such as dunes and beaches;

8. Rivers, estuaries and connecting channels, including all major inlet and outlet rivers of the lake and the Bay of Quinte in Ontario.

After three hundred years of intensive human use and alteration, an array of threats now undermines the viability of these conservation targets:

1. **Invasive species** have altered the food web and the nutrient cycling of the lake and river, leading to the decline of many native species. Halting the establishment of new aquatic invasive species and reducing impacts of existing species will require international, multi-agency cooperation.
2. **Incompatible development** fragments forests and key terrestrial habitats and alters the hydrology of aquatic systems through increased runoff from impervious surfaces. There are important opportunities to protect key areas in the watershed to maintain the health of the lake.
3. **Dams and barriers** restrict access of river-spawning fishes to upstream habitats and alter hydrologic patterns. Regulation of levels and flows of Lake Ontario and the St. Lawrence River, with ecosystem-wide impacts to coastal habitats, is the most extreme example of this hydrologic alteration. Dams and barriers also can alter water quality by warming streams. Deposition of sediments at river-mouth wetlands and in the near-shore zone can be disrupted when sediments are trapped behind dams.
4. **Climate change** may alter hydrologic regimes and floodplains, restrict access to fish spawning habitat and increase the frequency of severe storm events along the coast. Unlike marine environments, water levels in the Great Lakes are forecast to decline by significant amounts as a result of higher temperatures, reduced winter ice cover and dramatic increases in evaporation. Lake levels and their fluctuations determine the distribution and function of coastal wetlands and habitats.
5. **Nutrient and sediment runoff** leads to algal blooms in near-shore waters that alter water chemistry and impair native species. Elevated nutrient runoff may combine with actions of invasive mussels to alter chemical and species composition of near-shore waters. This is an issue of particular importance in the urban settings of the western basin and during the workshops we attempted to develop strategies specific to urban and rural settings. The proposed binational objective for phosphorus in near-shore waters is 15 mg/L.

The project team identified 18 strategies to pursue in abating these threats, and the Conservancy will focus on the following subset of actions in support of this common agenda:

- With partners, identify priority watersheds and coastal reaches for application of the strategies identified in the lake-wide CAP process facilitated by the Conservancy and the Nature Conservancy of Canada. (2008 – near completion)
- With partners, select and apply criteria to guide land protection in priority watersheds and coastal reaches. (2008)
- Collaborate with scientists and agency practitioners to identify and field-test techniques of integrated pest management for control of aquatic invasive animals. (2008-2010)
- Cooperate with state and federal agencies, NGOs, and private landowners to implement a regulation plan for Lake Ontario-St. Lawrence River that restores natural periodicity of water levels and flows. (2008-2010)
- Act as the catalyst for an effort to “step down” global models of climate change to predict impacts of lower lake levels on coastal wetlands and species of Lake Ontario. (2008-2012)
- Clarify how the Conservancy can contribute to restoration of native fisheries and implement the appropriate actions. (2008-2015)
- Participate in a basin-wide effort to identify and conserve stopover sites for migrating birds and integrate protection of these sites with other actions in priority watersheds. (2009-2012)

**Green Bay Watershed:** Green Bay is the world’s largest freshwater estuary and among the top three embayments in terms of productivity in the Great Lakes system. The Green Bay Project includes the Greater Green Bay Watershed both in Michigan, (including the Stonington and Garden peninsulas), and Wisconsin, (including the Door Peninsula), as well as all major watersheds and tributaries within the Green Bay basin. The geographic scope also includes the near-shore and open waters of the bay and the islands imbedded within the bay, including the Grand Traverse Island system.

Coastal wetlands in the basin provide critical nesting, feeding and resting habitat for a wide variety of migratory songbirds, waterfowl and shorebirds. Large rivers like the Menominee, Peshtigo, Oconto and Escanaba, flowing from vast northern forests to Green Bay, play a critical role in maintaining the bay’s fishery. Northern pike continue to run up the tributaries as they have since the glaciers retreated,

and lake sturgeon are returning to their historic spawning rivers.

Many public agencies and private organizations had established conservation projects in the watershed, but a basin-wide assessment of biodiversity and conservation needs from the open waters of the bay to the tributaries upstream had never been completed.

This type of assessment would guide the Conservancy’s efforts to support ongoing conservation work in the basin, develop new partnerships to advance conservation of significant sites and species, and help to integrate the conservation efforts of all stakeholders in the basin.

With a grant from the Wisconsin Coastal Management Program and the participation of 17 agencies and organizations with expertise in the use and ecology of the watershed, the Conservancy launched a planning process to take a big picture look at the watershed, including the sources of stress on the ecosystem’s health, and develop a blueprint for conservation and restoration of Green Bay. The plan was completed in 2007.

The planning team identified several habitats and species of ecological significance within the watershed that would need to be conserved in order to ensure the long-term health of the system:

- Coastal wetland complex (includes deltas, open and sand-spit embayments, ridge and swale complex, barred estuary and open lake plain marsh);
- Littoral zone (area from the marsh edge into open water that can support submerged aquatic vegetation);
- Benthic community (oxygenated area of bottom sediments within and beyond the littoral zone);
- Northern pike, the top predator of the Green Bay system. Pike use coastal wetlands, the near shore zone and the deep water zones throughout their life stages;
- Lake sturgeon. Living most of their life in the deep waters of the bay, sturgeon migrate into many of the major tributaries of the bay during the spawning stage of their life;
- Migratory diving ducks, (includes redheads, buffleheads and golden eyes). Diving ducks utilize the near shore zone and deep water zones of the bay as a food source and a migration corridor during their life stages;
- Island-dependent colonial nesting birds (includes red-breasted mergansers, common and Caspian terns and white pelicans). These birds use the unique islands in this system and count on the waters of the bay to house their food source.

Conditions contributing to the decline in health of these habitats and species were also identified and include invasive species such as carp and zebra and quagga mussels, residential development, agricultural runoff, dams and dikes and climate change.

Actions that could be taken to maintain or improve the health of individual habitats and species as well as the overall health of the system were also identified and include:

***Create a self-sustaining partnership to develop, implement and monitor strategic activities that will achieve the objectives of the conservation plan. (2008)***

The partners recognized that a system this large would take coordinated, large-scale conservation efforts. To realize sustainable conservation, we would need to recognize, and account for, the social and economic values of the local communities. Creating this partnership would be a first step towards integrating those efforts.

Partners agreed that this effort should be developed around one of the conservation strategies so that conservation success would result in an engaged community.

***Protect all current coastal wetlands and those lands that will become coastal wetlands due to declining water levels of the bay, and restore the wetland communities and hydrological connections to all high priority coastal wetlands. (2020)***

Green Bay has the largest system of coastal wetlands in the Great Lakes system. Even with regulations, we continue to lose wetlands at an alarming rate. Serving as a natural source of filtration and flood control, as well as spawning, life stage and nesting habitat to an incredible number of species, wetlands are a critical part of the ecological system of Green Bay.

Efforts are underway to build an information system that will help prioritize the protection and restoration of the more than 230,000 acres of wetlands that remain unprotected or in need of restoration.

***Protect the open water systems of Green Bay that provide the highest habitat values. (2030)***

This strategy continues to identify information gaps and challenges for each of the partners as we work to identify those processes and systems that support native species habitats and the threats that continue to challenge those habitats.

We concur with our partners that, although this is a lofty goal, it is one that needs to remain a focus for each of us if we are to conserve Green Bay in a sustainable framework.

***Increase or maintain a naturally sustaining population of northern pike and lake sturgeon from all tributaries of Green Bay (by 2060 for lake sturgeon); and double the populations of island-dependent colonial nesting birds that are of conservation concern. (2040)***

These umbrella species, when protected, will also protect a host of ecological processes, systems and species that are all interconnected. They are also very visible species that can both engage our communities and serve as measures of conservation success.

**Conclusion**

Protecting and restoring functional systems at the scale of the Great Lakes will continue to offer large scale challenges and opportunities.

Many of the same conservation questions reach across large freshwater systems around the globe. Using our work in Green Bay and Lake Ontario, we have the potential to show that we can reach across ecological systems and political boundaries to offer effective conservation at scale. These projects can also serve as templates for similar approaches to conservation in other Great Lakes and in large lake ecosystems elsewhere around the globe.