2017 Lake Huron-Georgian Bay

Summit Summary

Working Together for a Healthy Lake Huron-Georgian Bay

Sharing Community-Based Monitoring Experiences

Cranberry Golf Resort, Collingwood Ontario, October 25-26, 2017

Lake Huron - Georgian Bay Watershed

A Canadian Initiative for Community Action

Sixty-nine people representing 24 government and non-government agencies attended the 2017 Lake Huron-Georgian Bay Summit to share their experiences and discuss ways to work together to improve the health of their watershed.

We opened with a Water and Earth Blessing provided by the Chippewa of Nawash Unceded First Nation and a welcome from the Historic Saugeen Metis.

We learned about the State of Lake Huron fish populations and about the condition of the nearshore areas.

We learned how to connect with the Lake Huron Lakewide Action and Management Plan (LAMP), about community based projects led by local agencies, about the successes and challenges to community based monitoring, and how the Aamjiwnaang First Nation (near Sarnia) developed a Traditional Land Use Study to address social and environmental concerns.

We brainstormed and discussed ways to address 5 key threats to the watershed by sharing information on successful actions to address these threats, and methods to track achievements.

We identified our key needs to address these threats.

The Summit was a place where like-minded individuals and colleagues came together, to gain support and learn from the experiences of others.

The Summit was closed with a traveling prayer and song and we all headed home energized and ready for new action.

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The 2017 Lake Huron-Georgian Bay Summit Committee:

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Ted Briggs
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Ausable Bayfield Conservation Authority

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Summit Summary prepared by French Planning Services Inc.

A. About the Summit

The Lake Huron-Georgian Bay Watershed Canadian Initiative for Community Action (called the Initiative for Canadian Action) is a people oriented approach to promote community action and respond to environmental issues across the watershed. The Initiative for Canadian Action is based on the belief that every individual, community and organization in the watershed operates independently, yet are united by the common cause of improving environmental health. The Initiative for Canadian Action is a watershed wide approach intended to connect the actions of government and non-government organizations, raise awareness about common environmental issues and actions, and build upon existing strengths and opportunities.

The theme for the 2017 Lake Huron-Georgian Bay Summit was Working Together for a Healthy Lake Huron-Georgian Bay and sharing community monitoring experiences. The Summit provided an opportunity to broaden the Lake Huron-Georgian Bay network, share experiences, and identify tools and approaches to assist everyone in advancing restoration and protection initiatives around the watershed. Specifically, the Summit:

1. *Shared information on water quality conditions, management needs, and links with community-based efforts.*
2. *Built on the results and guidance from our 2014 Summit and understand new opportunities to take action, engage and network with watershed citizens, groups and agencies.*
3. *Discussed the needs and challenges related to tracking progress, measuring results and use of indicators at different scales (e.g. tributary to nearshore to open lake).*
4. *Provided opportunities to meet with people, groups and agency representatives and share experiences on actions and activities around Lake Huron-Georgian Bay.*

Through plenary and small group discussions, local knowledge and experience was shared with Summit participants. A self-guided hike to local demonstration sites also provided the opportunity to discuss how community interest was turned into environmental action while demonstrating approaches for shoreline naturalization, water quality, benthic monitoring, fish habitat, and flood plain protection.

The following governments, agencies and non-government agencies attended the Summit. A list of the participants names is provided in Appendix 1.

Government and Non-Government Agencies at the Summit

Aamjiwnaang First Nation	Lake Superior Watershed Conservancy
Ausable Bayfield Conservation Authority	Maitland Valley Conservation Authority
Beaver River Watershed Initiative	Manitoulin Streams Improvement Association
Blue Mountain Watershed Trust	Muskoka Watershed Council
Bruce Peninsula Biosphere Association	Nature Conservancy of Canada
Canadian Freshwater Alliance	Nottawasaga Valley Conservation Authority
Central Algoma Freshwater Coalition	Nottawasaga Watershed Improvement Program
Chippewa of Nawash Unceded First Nation	Ontario Ministry of Environment and Climate Change
Eastern Georgian Bay Stewardship Council	Ontario Ministry of Natural Resources and Forestry
Environment and Climate Change Canada	Ontario Ministry of Agriculture, Food and Rural Affairs
French Planning Services Inc.	Pine River Watershed Initiative Network
Freshwater Future Canada	Saugeen Valley Conservation Authority
Georgian Bay Association	Severn Sound Environmental Association
Georgian Bay Biosphere Reserve	South Simcoe Streams Network
Georgian Bay Forever	St Marys River Remedial Action Plan
Great Lakes Commission	St. Clair Region Conservation Authority
Grey Sauble Conservation Authority	The Gordon Foundation
Historic Saugeen Metis	USDA-Natural Resources Conservation Service
Lake Huron Centre for Coastal Conservation	

B. State of Lake Huron - Presentations on Current Condition, Trends and Projects

The following is a summary of the presentations provided at the Summit. Every presentation is available in the resources section at www.lakehuroncommunityaction.ca.

The State of Fish Communities in Lake Huron

Arunas Liskauskas - Ministry of Natural Resources and Forestry

Arunas highlighted the state of fish communities in Lake Huron using selected data summaries from a variety of sources.

Lake Huron is the third largest lake in the world by surface area. The Lake Huron basin is comprised of three sub-basins, the main basin, North Channel and Georgian Bay. The deepest offshore waters are in the northern part of the main basin and the western half of Georgian Bay. The nearshore, or littoral zone of Lake Huron is technically comprised of those waters 30 metres in depth or less. This zone occupies about 25% of the surface area of Lake Huron and is most prominent in eastern Georgian Bay, the north shore of the North Channel, the St. Marys River, the Les Cheneaux Islands and Saginaw Bay.

Lake Huron is likely one of the most diverse lakes in the world supporting a variety of habitat types.

The First Wave of Invasive Species - The historic offshore food web of Lake Huron was comprised of Lake trout and a deepwater cisco species. This efficient food web was permanently altered with the first wave of exotic species. The Sea Lamprey, a parasite of large bodied fish, decimated predator populations in the lake, resulting in the near extirpation of lake trout.

The introduction of non-native prey fish such as Alewife and Rainbow Smelt, displaced native prey fish. Together with intensifying commercial fisheries and habitat degradation, the fish community in Lake Huron was changed profoundly.

The second wave of exotic species affecting fish communities are proving to be just as destructive as the first wave, if not more. The Zebra Mussel and its close relative the Quagga Mussel, established in the mid 1990s on Lake Huron, are removing nutrients from the water column and locking them up near the lake bottom. This is in contrast to the historical lower food web where organisms were moving vertically in the offshore waters.

The Spiny Water Flea is a voracious predator on smaller zooplankton species that are important prey for juvenile fish. The water flea, with its spiny tail, is not very appetizing for most fish species. The Round Goby, is a destructive predator on fish eggs and is expanding its range in Lake Huron. It is ccupying nearshore areas and historically important offshore Lake Trout and Whitefish spawning reefs. Cormorant populations in the Great Lakes and especially Lake Huron underwent a period of exponential increase in the 1990s and early 2000s. In response to reduced DDT levels and abundant prey fish, their numbers increased to the point where there voracious feeding habits were affecting prey fish abundance. They continue to be a significant factor governing prey fish and other fish species dynamics even though their numbers have been declining in recent years.

Cladophora was a problem in the lower Great Lakes in the 1960s, but abated due to nutrient controls. The recent resurgence of this algae has caused many problems, including beach fouling, interference with fishing nets, and problems with water intakes. The recent resurgence of this algae is likely related to the invasion of Dreissenid Mussels, which have cleared the water column due to their filtering, provided a hard substrate for

Cladophora attachment, and provided soluble phosphorus to the algae beds. Whether this will get worse remains to be seen.

Dramatic and sustained recent low lake levels on Lake Huron have had profound consequences to aquatic ecosystems. Productive wetlands were reduced in size and function by low water levels and fish spawning and nursery habitats were compromised as a result. Habitats that affect fish production have been altered. As well, dams have reduced access to historically important spawning areas.

Key Observations Related to Fish Communities

- Prey fish populations have declined over time in Lake Huron. After peaks in the 1980s and 1990s, there was a precipitous decline of over 90%. Until recent years, prey fish populations were dominated by non-native species such as Alewives and Rainbow Smelt. The only substantial native prey species in offshore pelagic waters was the deepwater cisco species known as the Bloater Chub.
- Rainbow Smelt are not evenly distributed in the lake, with the North Channel currently supporting the highest densities.
- Bloater Chub are more evenly distributed among the three basins.
- Diporeia density has decreased. The spread of Quagga Mussels have been implicated in the dramatic decline of the native benthic amphipod, Diporeia, over the last decade. This organism was historically found in great abundance on the lake bottom and was a very important food item for a variety of fish. It had the capacity for vertical migration, was high in lipid content and was critical in connecting the flow of energy from deep areas of the lake to the offshore fish community.
- Quagga Mussel density is increasing. Quagga mussels have recently replaced Zebra Mussels in much of Lake Huron and are increasing the rate of nutrient removal because they occupy greater depths and more substrate types than Zebra Mussels.
- Lake Whitefish has historically been one of the most important commercially sought-after fish species. It currently represents over 80% of total commercial harvest of fish in Lake Huron. Sea Lamprey had a major impact on its dramatic decline in the 1940s. With Sea Lamprey control, Lake Whitefish populations reached historic highs by the 1990s, but are now in rapid decline primarily due to declining productivity in the lower food web. Lake Whitefish have shifted their diet from highly nutritious Diaporhia to less nutritious Dreissenid Mussels. They are now also consuming large numbers of young-of-the-year Round Goby.
- Lake Trout is recognized as the keystone predator in Lake Huron with the capacity to structure fish communities due to their foraging preferences. Lake Trout were historically very important in the commercial fishery until their collapse in the 1940s due to the parasitic Sea Lamprey. This collapse was one of the most dramatic events in the ecology of the Great Lakes. Efforts to rehabilitate Lake Trout have been ongoing for over 50 years with limited success up until the recent decade.
- Adult Sea Lamprey are declining and Lake Trout now reproducing more successfully. The abundance of adult Sea Lamprey has recently reached a 30 year low on Lake Huron.
- Lake Trout have been reproducing successfully for the past 15 years as a result of greater adult survival of stocked fish due to Sea Lamprey control and the collapse of Alewife in 2004 altering diets and improving reproductive success for Lake Trout.
- Graded mesh gillnets are used in overnight sets to determine the relative abundance, composition and distribution of the offshore fish community. The results of this assessment include:
    - The general trend in relative abundance of most prey fish is in decline for Alewife, Chub, Cisco and Rainbow Smelt.
    - The relative abundance of Lake Trout, Lake Whitefish, Suckers, Round Whitefish, Yellow Perch and Walleye is also in decline.

- The effect of the collapse of Alewives has been dramatic especially for fish predators like Chinook Salmon. Their almost total reliance on Alewives for prey translated into emaciated adults and high mortality rates.

Key Observations Related to Tributaries

- Historically, Lake Huron was connected to a diverse array of stream and inland lake habitats and tributaries which were important sources of cool, high quality water, as well as spawning and nursery habitats.
- Tributary habitats throughout the Great Lakes are important areas of fish production and diversity.
- The principal spawning and nursery habitats for 1/3 of the fishes in the Great Lakes are located in tributaries.

Key Observations Related to Walleye

- Historically, the basin supported a diversity of Walleye populations due to the many different watersheds draining into the basin. Some populations likely mixed at certain times of the year forming mixed stock aggregations that were exploited by a combination of recreational, commercial and subsistence fisheries.
- Canadian Shield populations have low productivity and low resilience, but at one time supported a relatively large Walleye biomass of accumulated stocks. In contrast, Saginaw Bay and the southern main basin are more productive waters. They have extensive littoral zones and emigrants from a variety of sources including western Lake Erie.
- There are some walleye populations that occur across the lake. Many of these populations are believed to be reproductively isolated and perhaps distinct stocks. On the other hand, there is considerable main basin mixing taking place (probably mostly in the open water months) and some fisheries are a mix of sources.
- Saginaw Bay has experienced a resurgence in its Walleye population after the collapse of Alewives. Alewives are known to predate on young-of-the-year Walleye. Walleye are now naturally reproducing, and stocking has been phased out. Current adult population levels of Walleye are in the millions.
- Walleye populations in most locations in eastern Georgian Bay and the North Channel are currently less abundant. In some locations, like the Moon River, spawning habitat in the form of boulder and rubble placement has been added as an adaptive measure to improve availability of spawning habitat during variable lake level episodes.
- Other species like Lake Sturgeon have also been documented as using these constructed habitat features as spawning substrates.

Key Observations Related to Coastal Wetlands

- Coastal wetlands are an intermediate zone linking the open waters of the Great Lakes with their watersheds and are separated into different systems based on their dominant hydrologic source and connectivity to the lake. Coastal wetlands support much of the biological productivity and diversity and play a crucial role in storing and cycling nutrients and organic material from the land into the aquatic food web. Many types of coastal wetlands exist along the Great Lakes shoreline
- Nearshore areas in Lake Huron support a diversity of fish species ranging from larval stages of Minnows, adult Minnows, all the life stages of Yellow Perch, Pumpkinseed and Bass, as well as providing nursery habitat for a variety of predators including Muskellunge
- Muskellunge is an example of a wetland obligate species, a species that requires intact coastal wetlands to spawn successfully and provide rearing habitat for juveniles. Many other species of fish also require these wetlands to complete their life cycles. The loss of coastal wetlands translates into a loss of fish production and diversity as well as the benefits of a healthy fish community.
- Considering a long-term perspective in Severn Sound, Northern Pike have declined substantially from levels seen in the early 1980s and 1990s. The high levels of abundance at that time corresponded quite closely to

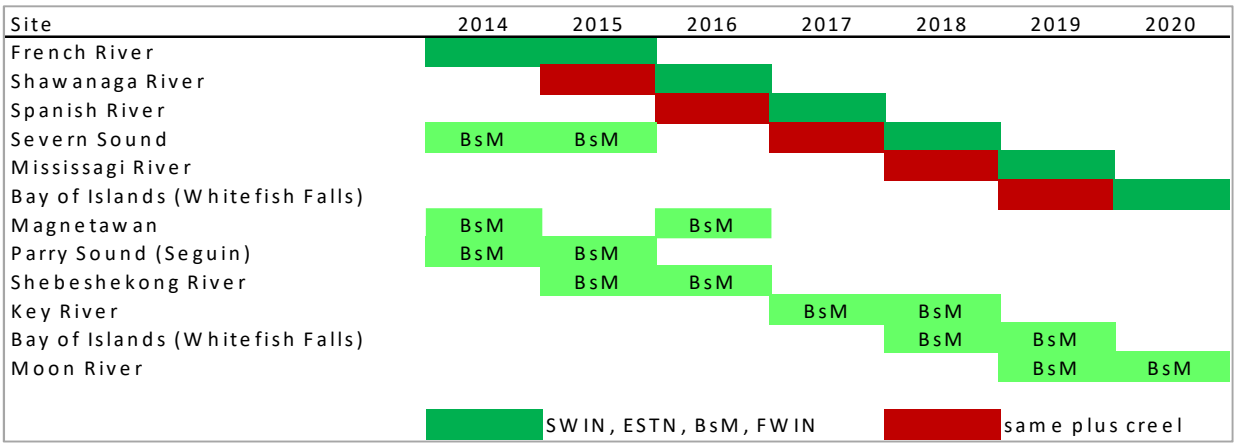
high water years and suggest that northern pike recruitment is closely linked to water levels in the Lake Huron basin.

Key Observations Related to Shorelines

- The coastal areas of Lake Huron are likely the most diverse among all the Great Lakes.
- The native Smallmouth Bass, that spends most of its life in close proximity to nearshore habitats, has been increasing in abundance in many parts of the lake. In recent years, year class production has been consistently strong, and Bass are benefiting from a longer growing season due to warming climate trends and ample prey including a growing abundance of Round Goby. When looking at a longer time series of information from Severn Sound, Bass have maintained consistently high levels of abundance in Severn Sound in recent years. Bass have likely benefited by the recent warming trend that have resulted in optimal conditions for recruitment and early growth that come with warmer temperatures.
- Another way of looking at the dynamics of nearshore fish communities is to group them according to feeding habits. Three generalized fish groupings can provide insights into long term changes. Predators, especially Bass are increasing in Severn Sound while Walleye remain stable and Northern Pike declining. Benthic species, and in particular, Bullhead, have increased substantially compared to historic levels. Panfish appear to have changed the most, with Black Crappie and Yellow Perch reduced to very low levels and overall abundance of panfish decreasing as well
- Fish communities along the eastern Georgian Bay and North Channel coastline are variable making it difficult to make a blanket statement of how these communities are faring.

Next Six Years

Since 2015, an effort has been made to be more systematic and comprehensive in assessing the dynamics of nearshore fish communities in Ontario waters. Priority sampling areas have been selected and a variety of sampling methodologies are being used to characterize nearshore fish community composition and dynamics. The results of this approach should be summarized by 2020.



A specific example of how species diversity is being monitored in the lake incudes the small fish survey conducted since 2005. The purpose of this survey is to monitor the composition and distribution of small bodied fish and track the spread of invasive species like the Round Goby. Generally, small fish composition in nearshore waters is very diverse across the three basins of the lake. Certain groups or species are more prominent in some locations then in others.

Summary of Key Observations

- Offshore pelagic and benthic productivity has declined.
- Relative abundance of the offshore community is currently at the lowest level in the time series.
- Non-native prey fish have declined (Alewife, Rainbow Smelt).
- There are some signs of native species recovery (Bloater, Walleye, Lake Trout).
- Nearshore fish communities are dynamic and diverse both spatially and temporally.
- Round Goby distribution and abundance is uncertain.
- Coordinated and systematic nearshore surveys have been developed.
- More work is required!

Linking the Landscapes of Lake Huron and Georgian Bay to Nearshore Water Quality

E.T. Howell, Environmental Monitoring and Reporting Branch
Ontario Ministry of Environment and Climate Change

Todd Howell provided an overview of some of the key features that help to explain the conditions of the nearshore water in two areas: the southeast shores of Lake Huron and eastern Georgian Bay. His presentation explained how the nearshore water is affected by the changing offshore water quality, how shoreline water quality varies widely around the lake basin, and how nearshore water quality is linked to the surrounding geography, watershed development, geology, and shoreline morphology.

Changing Lake Offshore Affects Nearshore Water Quality

The water quality in the offshore of Lake Huron is ultra-oligotrophic. Total phosphorus is falling, and the lake is going through a significant downturn in productivity. The productivity of Lake Huron has dropped so much that it is now as un-productive as Lake Superior. It is at a level that can be described as 'breathtakingly low' in terms of phosphorus, which is the nutrient that limits productivity.

The Great Lakes Water Quality Agreement suggests that a heathy concentration of total phosphorus in the offshore should be 5.0 μg/L, yet at open water nearshore reference stations total phosphorus concentrations in Lake Huron are around a median of about 2 μg/L, and have continued to decrease from 2003 to 2016. Chlorophyll *a* concentrations have also decreased over this period. At the level of productivity envisaged by the Great Lakes Water Quality Agreement phosphorus target, the concentration of Chlorophyll *a* should be about 1.3 μg/L, yet the open water Chlorophyll *a* concentrations in Lake Huron are often below 1.0 ug/L.

Another change is a trend towards higher water clarity in the offshore allowing sunlight to penetrate further into the water column and phytoplankton to grow deeper. Lake Huron is now as clear as Lake Superior. This high water clarity was illustrated with results from 2010 studies in the Inverhuron area of Lake Huron where photic depth, the depth to which there is enough sunlight to grow phytoplankton, reached 50 m at some locations.

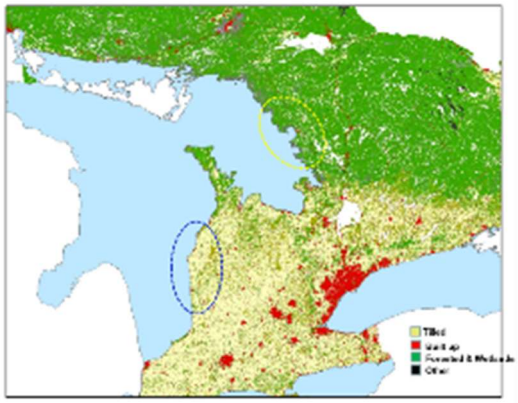
The changing offshore of Lake Huron has relevance to nearshore water quality. First, since there is less phosphorous, the shoreline biota is more responsive to nutrient inputs from land. As well there are sharp gradients in nutrient and water quality from the land to lake. Since the water is becoming clearer, there is more sunlight reaching the lake bottom, and resulting in potential for greater algae growth on the lakebed. An example of this changing ecology was illustrated using a study results for the Point Clark and Eighteen Mile River

areas in eastern Lake Huron. There has been an increased buildup of turf algae (periphyton) on deep areas of the lake bottom. The periphyton is composed of diatoms which is a healthy part of the lakebed biota that appears to be benefiting from changes in the lake.

Understanding Water Quality Linkages to Geography

There are fundamental differences between the characteristics of the nearshore water quality in Lake Huron and eastern Georgian Bay which are due to the contrasting physical features of the landscape and differences in land use of the adjacent shoreline and watersheds. For example, along southeast Lake Huron, the water is hard and alkaline, with low colour (dissolved organic carbon), and high in nitrates. In contrast, we find that the water along eastern Georgian Bay is generally low in alkalinity, with more coloured water, and low in nitrates.

The lands along southeastern Lake Huron are mostly developed with large areas in agricultural production. Rich calcareous soil cover of lands and erodible cliffs along an exposed linear coastline characterise much of the coastline. Eastern Georgian Bay has less development and the shoreline is fed by rivers that drain the forested Canadian Shield delivering organically-stained water low in alkalinity water into networks of embayments and reefs along the coastline.



However, when we look at phosphorous, the difference between southeastern Lake Huron and eastern Georgian Bay is not as obvious. The variation in phosphorus appears to correlate more to shoreline types, rather than geographical area. Phosphorus is higher at river mouths and higher in harbours and embayments. While the mean values of phosphorus among long-term monitoring stations in the nearshore are low and in the ultra-oligotrophic to oligotrophic range, they tend to be generally higher along eastern Georgian Bay than other areas in Georgian Bay and Lake Huron as groupings of stations.

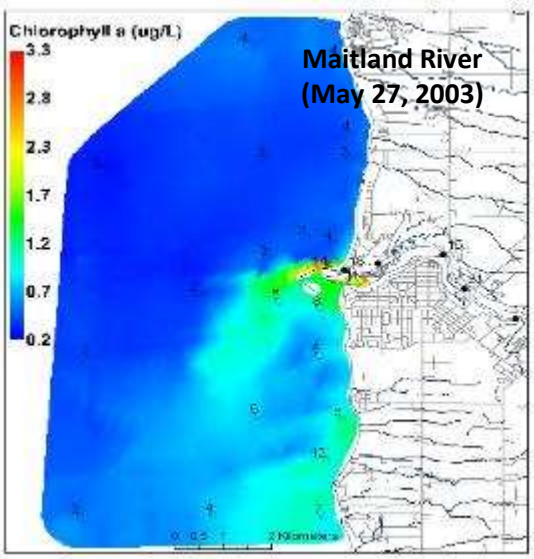
An obvious difference between these two areas is the way the land is being used. Along the southeast shores of Lake Huron, the lands are mostly rural and have been heavily modified for agricultural production and with small communities. Along eastern Georgian Bay we find largely undeveloped lands on the Canadian shield. This area is mostly forested land and has only a few small communities.

Both areas have a big difference in the way that water circulates along the coastline, and the way water moves around is key to understanding water chemistry.

Southeastern Shores of Lake Huron - The linear and exposed shoreline of southeastern Lake Huron results in strong currents often moving parallel with the shoreline (called alongshore currents). When wave action erodes sediment from the shoreline into the lake, it moves this material along the shoreline in one direction for a few days and the other direction for a few days, depending on wind conditions. When the sediment frequently moves back and forth along the coastline, the resulting bands of turbidity can often shape the perception or indication that there is poor water quality.

Southeastern Lake Huron has few large rivers and many small tributaries, and water is discharged to the shoreline from these many tributaries in vastly difference amounts. Water quality in the small tributaries is more easily impacted by runoff. At times this results in high nutrient, solids, and fecal indicator concentrations, but generally, because of the small size of these tributaries, there are limited loads to the lake and the areas impacted in the lake are usually limited to a nearby shoreline. Despite the limited zone of influence of these discharges, their effects on shoreline water quality should not be underestimated.

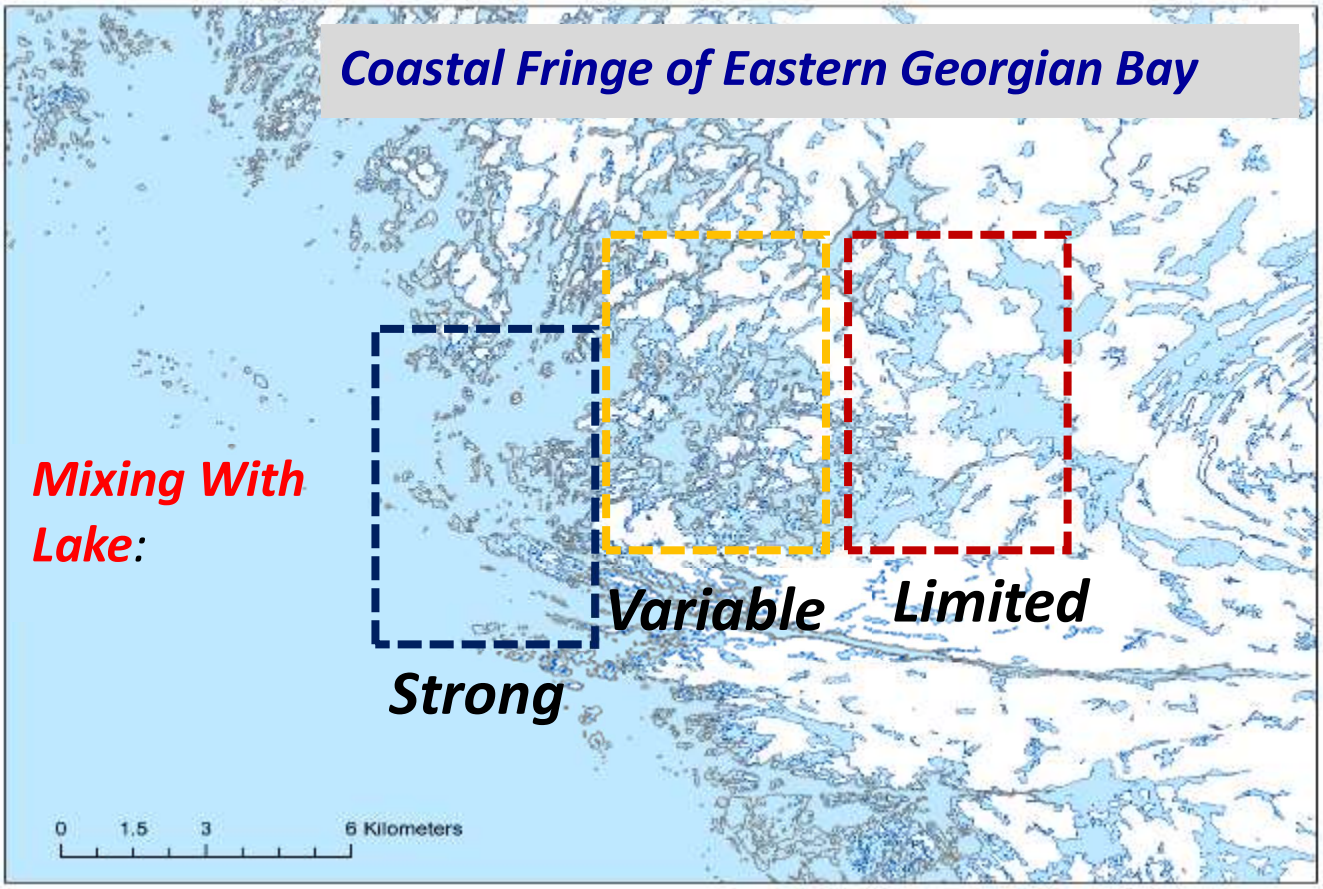
There are only a few large rivers along the southeastern shores of Lake Huron where you would expect to have larger loads and a bigger footprint on the lake. Generally, this loading does not appear to be causing corresponding large problems along this shoreline which is thought to be because of the strong dilution by lake water and fast lake currents. This idea is illustrated by a study result showing the concentrations of phosphorus that were found along the shoreline around a large river mouth, the Maitland River. The map of chlorophyll *a* levels identifies the mixing of the river discharge southward in the lake. There are higher Chlorophyll *a* and total phosphorus concentrations (the number values) in the lake plume, yet, levels are in an oligotrophic range and not specifically impacting the shoreline water quality.



Loading from Large Tributaries Not Causing Problem at Shoreline

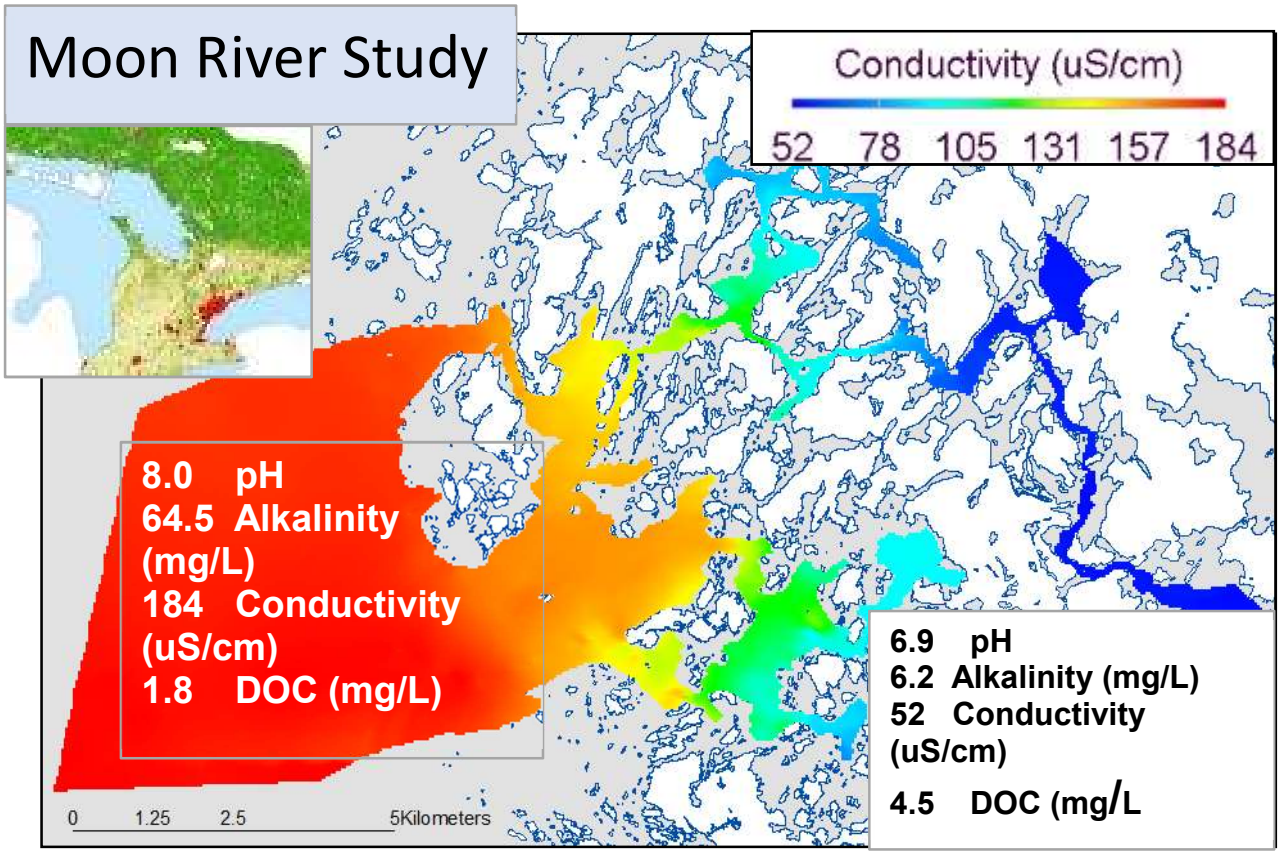
However, there is a contrast, when areas that have numerous smaller tributaries are considered. Although they may discharge small volumes of water, these inputs to the lake result in elevated concentrations of phosphorus directly along the shore, which directly impacts shoreline water quality. At the mouths of creeks and drains, there are often localized growth of algae on the lakebed, mostly the green algae Cladophora, that can be linked to shore fouling problems.

Eastern Georgian Bay - Eastern Georgian Bay is a very different situation in terms of water quality problems and the way the linkage between the land and the lake works. In Georgian Bay, the gradient of interest is from onshore to offshore across what is referred to as the coastal fringe. Within this area, the more exposed and



outer portion of the coastal fringe has a strong potential to mix with the lake, whereas when you move further inshore into the open embayments and into the closed bays, the potential for mixing with the lake becomes more variable and then limited. Water quality is basically shaped by the amount of open lake water that mixes with the water running off the Canadian Shield and discharged by tributaries to the coastline.

This is illustrated with an example from studies in the Moon River Study Area in 2015 showing several features of water quality linked to the contrasting chemistry of Georgian Bay and runoff from rivers on the Canadian Shield. Specific conductivity, an indicator of the ionic richness of water (e.g. mostly calcium and bicarbonate ions) is much higher in Georgian Bay than in the rivers and can be used to infer degree of mixing of Bay and Shield water. Low conductivity water in the inner fringe generally has a lower pH and is organically stained (higher dissolved inorganic carbon) compared with the high conductivity water of the outer fringe which is uncoloured and alkaline.



This gradient across the coastal fringe has ecological implications. One interesting point to illustrate in this regard is the distribution of Dreissenids (Zebra and Quagga mussels) in eastern Georgian Bay. The gradient across the coastal fringe has implications for their distribution, because the loading of low alkalinity water (low calcium and pH) along the inner coastline from the Canadian Shield limits growth of Zebra and Quagga mussels. The reason for this is that the runoff from the Shield does not have enough calcium to support mussel development. However, in the outer portions of the coastal fringe, calcium levels in Georgian Bay support mussels and therefore, more mussels can be found.

There is a natural productivity gradient that runs from higher in the inner fringe on the Shield-fed waters to low in the open lake. To illustrate the gradient a series of Chlorophyll *a* and Total Phosphorus maps complied from ongoing studies were shown for four areas in eastern Georgian Bay: Cognashene, Go Home Lake, Shawanaga and Moon River. In these areas, highest productivity levels, as inferred from chlorophyll *a,* were found near rivers mouth and at locations in the inner coastal fringe (i.e., the very near shore areas), which was interpreted

as due to the limited flushing with the very low productivity waters of the open lake. In the areas with intermediate mixing with the lake, there was more variable and moderate productivity. In the outer fringe and open lake there was very low productivity.

There are also location-specific modifiers that affect water quality in Georgian Bay. The first modifier is that bathymetry and basin morphology plays a large role in water quality. Enclosed embayments do not mix well with the open lake and when they are deep enough for the water column to stratify over the summer they are susceptible to increased algae blooms because there may be a nutrient release from the lakebed if oxygen in bottom water becomes depleted. An example is Sturgeon Bay, an area with chronic algae blooms. In this area during studies in 2006 and 2007, there were very high concentrations of Total Phosphorus in the water just above the lakebed compared with much lower concentrations in mixed surface waters. This resulted from low dissolved oxygen concentration along the lake bed mobilizing phosphorus from sediments which later mixed with the upper water column later in the summer when the water column mixed fueling algae blooms. The second modifier is the amount of development and anthropogenic sources of phosphorus from the seasonal and year-round development.

On-Going Research

Over the next few years, there will be ongoing work to examine physical mixing to predict water quality. One of the purposes of these ongoing projects is to set reference points in the lake from which trends and observations can be drawn about the changes in water quality over the dynamic and variable coastal fringe. One of the projects is led by Dr. Wells and Dr. Girihagama of the University of Toronto. They will be conducting hydrodynamic modeling that uses a computer model to simulate complex nearshore circulation. From this work they will be determining how circulation drives nutrient gradients. Another project is the collection of physical data and analysis of physical limnology that will use seasonal deployments of instruments across the coastal fringe to examine lake circulation and water column structure.

This is new and exciting work that has not been previously done on Georgian Bay and it is hoped that it will improve our understanding of how water mixes and water chemistry is shaped along the coastline. To detect change, water quality needs to be linked with lake circulation. The temporal-spatial variability in nutrients is tied to mixing across the coastal fringe and reference conditions need to be established in order to assess change. This requires location specific information in order to have a better understanding of the mixing conditions.

Summary

In summary, nearshore water quality varies by region.

Along the southeastern Lake Huron, the nearshore water quality is very similar to the offshore of the lake. The winds and shoreline erosion can, at times, cause elevated turbidity. Along the shoreline, there are patches of areas that are 10s to 100s of meters long with elevated nutrients, solids and fecal pollution indicators. However, these conditions vary widely with the weather.

Along eastern Georgian Bay, the water quality varies with the degree of flushing from the open lake. In areas that are well flushed the water quality is similar to Lake Huron water. In areas that are poorly flushed, the water is generally low in alkalinity, more phosphorus rich and productive and therefore coloured, with low water clarity. As well, there are a limited number of embayed areas with signs of nutrient enrichment resulting in depleted oxygen and algae blooms.

Ongoing water concerns along the southeastern shores of Lake Huron are related to tributary discharges of fecal pollution that may impact recreational water quality, and discharges of nutrients and solids from the small tributaries. These conditions affect shoreline water quality and cause shoreline algae fouling.

Ongoing water quality concerns along the eastern Georgian Bay coastline are related to the potential impacts of shoreline residential development, the potential loss or deterioration of a high quality natural environment and area-specific water quality problems in embayments.

Other lakewide concerns include the further oligotrophication of Lake Huron and any unknowns such as climate change, new invasive species, or development.

Connections with the Lake Huron Lakewide Action and Management Plan (LAMP)

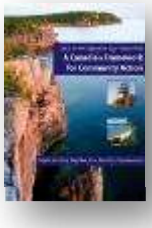
Collaborative Governance at Work

Greg Mayne, Environment and Climate Change Canada
Ted Briggs, Ontario Ministry of Environment and Climate Change

Greg Mayne and Ted Briggs highlighted key aspects of the newly released Lake Huron Lakewide Action and Management Plan (LAMP), identified linkages between the LAMP and local community-based actions and provided information on provincial and federal agency work that addresses some key environmental issues and management challenges over the foreseeable future.

Among the many challenges in addressing the threats to the Lake Huron ecosystem, the following are key: the vast geographic scope and complexity of the resource; the divergent watershed land uses and stressors; and management needs that exceed the reach of any one jurisdiction. Addressing these issues requires innovative governance arrangements so that action can happen over several scales simultaneously ranging from local, regional, national, and binational and through both formal and informal methods. The answer to this challenge is collaborative governance; something that we have been practicing on a binational level on the Great Lakes since the Boundary Waters Treaty of 1909 and through the Great Lakes Water Quality Agreement (GLWQA) since 1972.

What is unique about Lake Huron is that the Canadian collaborative governance arrangement involves the participation of government agencies, non-government agencies (NGOs), and watershed and community groups from Sarnia to the St. Marys River. All these groups are working together under the umbrella of the Lake Huron-Georgian Bay Watershed – Canadian Initiative for Community Action.



Since the mid-2000's, groups across the watershed have been getting together to share information and ideas, and working to align efforts to address the following four principles of the Lake Huron-Georgian Bay Initiative:

1. Increase awareness and appreciation of Lake Huron and Georgian Bay and build local capacity.
2. Get people and communities actively involved.
3. Participate in restoration and protection actions.
4. Track projects and measure success to demonstrate that we are collectively making a difference on Lake Huron. Adapt accordingly to new information and priorities.

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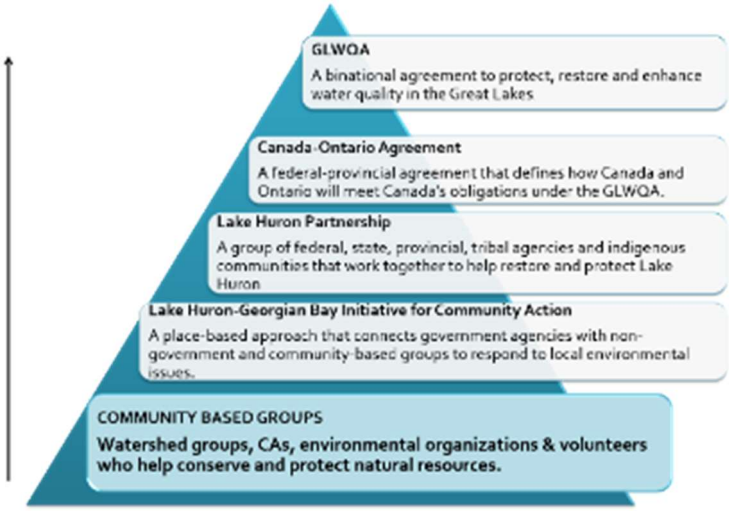
Who is at Work on Lake Huron



Community-based action is the foundation of addressing environmental threats on Lake Huron and Georgian Bay. People at the community-level are the most effective champions to achieve environmental sustainability in their own backyards. The people attending this Summit are the ambassadors for local efforts in areas throughout the watershed or lake, and each person provides a positive multiplier effect through outreach in their local communities.

The Initiative for Community Action, provides an informal means to network, learn from each other, and to collaborate on education, behaviour change, priority setting, project implementation and measuring success of actions. The Initiative for Canadian Action supports efforts around resolving priority domestic and binational management challenges.

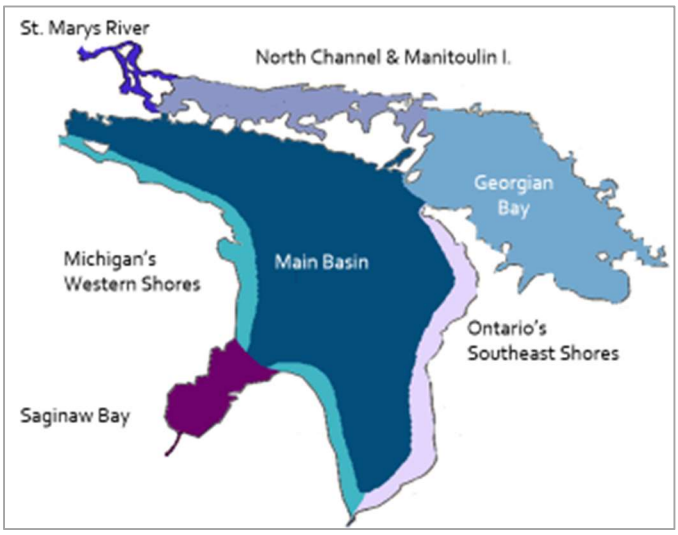
Binational priorities are defined by the Lake Huron Partnership, which is a collective body of over 20 resource management agencies in Canada and the U.S. and includes input from stakeholders and the public.

At the top of the pyramid is the Canada-Ontario Agreement (COA). The COA is a federal-provincial agreement that supports Canadian domestic restoration, protection and monitoring actions required to meet the commitments set out in the GLWQA.

Lake Huron LAMP (2017-2021)

Work at a binational level involves the development of the Lake Huron LAMP which includes the assembly, assessment and synthesis of information on the current condition of Lake Huron, the identification of environmental threats to the lake and the corresponding remedial actions by the partnership agencies and watershed groups.

The 2017-2021 Lake Huron LAMP provides a shared understanding of Lake Huron and areas for improvement. The LAMP adds relevance and linkages to needed management actions when submitting proposals for funding. The LAMP was available for review beginning in July of 2017 at binational.net. Comments on the draft report were received from public, NGOs, and government agencies, together with input via meetings with the Metis Nation of Ontario and a webinar with First Nation communities.



The LAMP makes a strong connection between a healthy watershed and the waters of Lake Huron, Georgian Bay, the North Channel and the St. Marys River.

Given that threats to water quality can result from localized land use and regional biogeography, the LAMP identifies threats within six major regions that include the Main basin, St. Marys River, North Channel and Manitoulin Island, Michigan Western Shores, Saginaw Bay, Ontario South East Shores and Georgian Bay.

Lake Huron Strategies and Actions

The Lake Huron LAMP provides information on spatial and temporal conditions of Lake Huron and identifies five major threats, namely: chemical contaminants, nutrients and bacterial contamination, invasive species, loss of habitat and native species, and climate change impacts. The LAMP provides five strategies to address each of these threats and over 40 actions involving more than 20 participating agencies, that will be undertaken over the next five years.

The LAMP is a public document that will guide the efforts of resource management agencies and provides a shared understanding of Lake Huron. The LAMP encourages members of the public to move from the role of observer to active participant and provides direction to groups across the watershed to take action in the conservation, protection and restoration of Lake Huron. The LAMP will also help community groups by providing rationale and information that will strengthen funding applications.

Lake Huron Condition

Information on the current condition of Lake Huron is organized by nine general objectives adopted by the GLWQA. A full description of the objectives is provided in the LAMP document. At a very high level, Lake Huron is in 'fair' condition.

Although the only objective with a status of 'poor condition' was invasive species, Lake Huron is generally seen to be outside of the range of a perfectly healthy and functioning ecosystem, and more Conservation, Protection and Restoration (CPR) is required.

Summary of Condition by GLWQA General Objective	*Status*
• Drinking Water • Swimming and Recreational Use • Groundwater	*Good*
• Chemical Contaminants	*Good/Fair*
• Fish and Wildlife Consumption • Habitats and Native Species • Nutrients (and algae) • Other Substances/Materials	*Fair*
• Invasive Species	*Poor*

Projects and Efforts Benefiting Lake Huron

There are many key actions currently underway that will benefit Lake Huron:

- Lake Huron Georgian Bay Canadian Initiative for Community Action
- Southern Georgian Bay Shoreline Initiative
- Healthy Lake Huron: Clean Water Clean Beaches Initiative
- Ontario's Great Lakes Strategy
- Great Lakes Protection Act
- Student Conferences (Grand Bend 2015, Goderich 2017)
- Great Lakes Guardian Community Fund ($1.5M of grants per year, up to $25,000 per project.

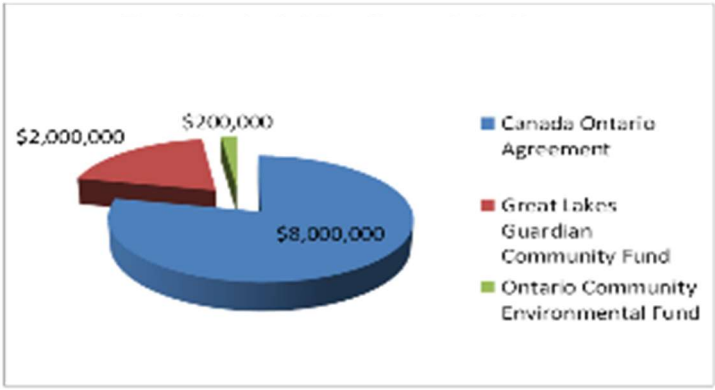
Total Federal and Provincial Funding to Lake Huron/Georgian Bay (2013-17)

Together, the province and federal governments are working to enable community-based action and to improve water quality and ecosystem health in the Lake Huron watershed.

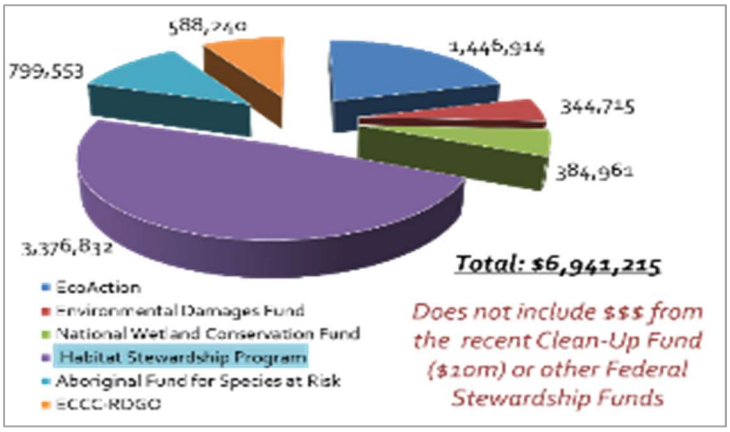
Since 2013, the total provincial funding to Lake Huron-Georgian Bay has exceeded $10 million dollars. About $8 million dollars has come from the Canada-Ontario Agreement, $2 million dollars from the Great Lakes Guardian Community Fund and the remaining $200,000 from the Ontario Community Environmental Fund.

Federal funding to Lake Huron has exceeded $20 million allocated over the past five years. The pie chart shows only the funds allocated to groups in the Lake Huron watershed from Environment and Climate Change Canada's (ECCC) Community Funding Program such as EcoAction, Environmental Damages Fund, Natural Wetland Conservation Fund, Habitat Stewardship Program, Aboriginal Fund for Species at Risk and ECCC – Regional Director General Office. Over $10 million was also invested through the Lake Simcoe and Southern Georgian Bay Clean-up Fund.

Provincial Funding (2013-2017)



Federal Funding (2013-2017)



Canadian Federal Initiatives Supporting Lakewide Management

ECCC has several existing and new initiatives underway over the next five years. Three examples with strong links to community-based action include:

<u>The Great Lakes Nearshore Framework</u> - The Great Lakes Nearshore Framework is an approach to assess nearshore waters that will have an important link with local communities and stewardship groups. The Nearshore Framework consists of 3 components:

1. Characterizing and assessing the nearshore to obtain baseline measurements of water quality, physical data, and biological information and sharing findings with stakeholders and to establish priorities.
2. Taking action by setting priorities with local community-based groups through information sharing sessions; helping to identify local restoration and protection needs; and providing information and tools to improve understanding and approaches.
3. Repeating the assessment of nearshore waters every five years, tracking changes and adapting as necessary.

The assessment methodology has been developed and work is underway on Lake Erie. The assessment is done in three phases with the first phase seeing the nearshore classified into aquatic habitat units by modeling physical properties such as wave energy, bathymetry, substrate type and littoral zones. In phase 2, water quality and aquatic habitat indicator data are assembled and overlaid and compared to established thresholds to evaluate current condition and trends. During Phase 3, results are confirmed by looking at

biological data and habitat function endpoints. Preliminary results have been shared with local conservation authorities and ECCC staff have engaged environmental groups starting in the eastern basin of Lake Erie. A recent milestone is an arrangement between ECCC and the Canadian Hydrographic Service (CHS) to acquire and share LiDAR data. This will help resolve nearshore bathymetry and substrate data gaps that have been challenging for many years.

Community-Based Science & Monitoring - Community-based science and monitoring is a fairly new term, but a very old practice with formalized approaches developed in the early 20th century through initiatives like the Christmas Bird Count established to count birds rather than hunt them. By the mid-20th century, science became the domain of universities and government research labs. However, over the last decade, there has been a surge in community-based monitoring interests across Canada. Excellent examples include the Lake Partner Program, Bird Studies Canada, and the Canadian Aquatic Biomonitoring Network (CABIN). ECCC is currently examining ways to advance community-based science and monitoring by considering if and how data collected by citizens could help fill data gaps to meet certain objectives of the GLWQA, encourage active participation of people and generally bring people closer to the Great Lakes.

Climate Change Impacts - ECCC has an ongoing emphasis on climate science and assessing climate change impacts on the Great Lakes. To advance ECCC's mandate for the Great Lakes, the initial planning is being undertaken in defining science needs and a science-based approach to assess sensitivity, vulnerability, and resilience of habitats and species to the impacts of climate change. Currently, the focus is on developing a methodology for modelling, mapping, priority setting and ultimately best management practices for adaptation to increase resilience of nearshore habitats. Outreach and engagement with stakeholders will be a key aspect of this work.

Cooperative Science and Monitoring

Every five years, the results of science and monitoring activities are shared with agencies and the public around Lake Huron to better understand the condition and trends of the waters of Lake Huron and to jointly identify community science and monitoring initiative priorities. Following a year of planning, a year-long intensive study ensues to fill data gaps and answer key management questions. The 2017 intensive study on Lake Huron is just wrapping up after a collaborative study by several agencies that:

1. Describes spatial (nearshore to offshore, across main basin, North Channel, Georgian Bay, Saginaw Bay) and monthly differences in primary and secondary production.
2. Determines whether variation in lower trophic level production is related to density and growth rates of fish larvae (Lake Whitefish, Rainbow Smelt, Bloater) or energetic condition of native mysids and key juvenile and adult prey fishes (e.g., Rainbow Smelt, Round Goby, Bloater) that support important recreational fisheries.
3. Develops and refines additional indicators for Lake Huron assessment and monitoring.

Avenues for Public Involvement

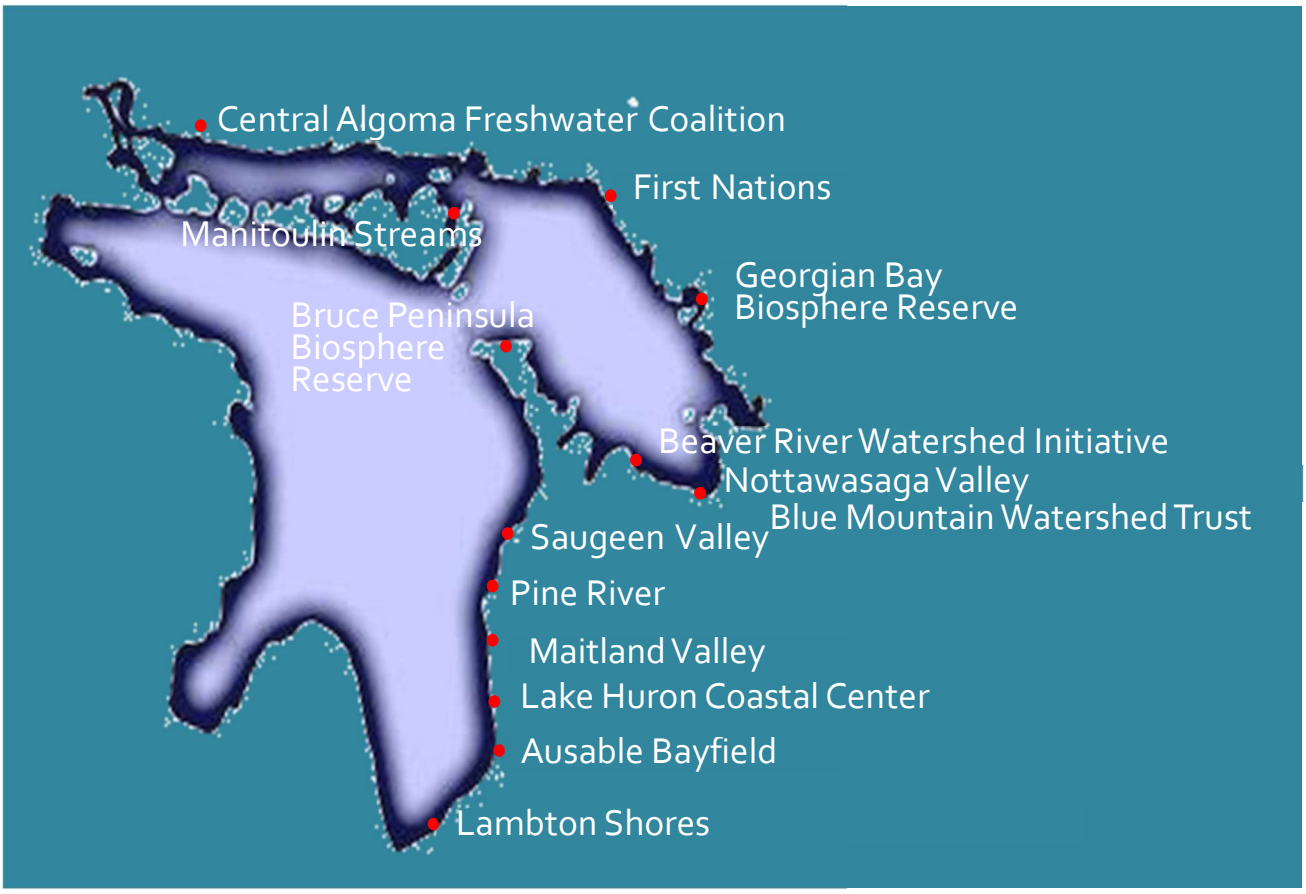
There are several ways the general public can get involved in conservation, protection and restoration (CPR) activities around the Lake Huron basin. Under Annex 2 of the GLWQ Agreement, the Lake Huron Partnership's adaptive management approach works over a 5-year cycle with periodic opportunities to learn, share concerns and information, provide input on priorities, be actively involved in the implementation and tracking of projects. An Outreach and Engagement Team is currently looking at ways to further increase binational public engagement on Lakewide Management.

Around Lake Huron and Georgian Bay

An Introduction to Community Initiatives to Improve Lake Huron and Georgian Bay - Together we achieve more than by individual efforts alone

Greg Mason, General Manager of the Georgian Bay Biosphere Reserve
Mari Veliz, Healthy Watersheds Supervisor at Ausable Bayfield Conservation Authority

Around Lake Huron and Georgian Bay there are many community based projects that are addressing the threats identified in the Lake Huron Lake Wide Action and Management Plan (LAMP). Community organizations are working to address threats such as nutrients and bacterial pollution, invasive species, contaminants, loss of habitat and climate change. Groups are also taking action to deal with water quantity, micro-plastics, new chemicals, wildlife diseases, species at risk, and human development pressure. Aligning community action with the objectives of the LAMP can increase the collective impact for the benefit of Lake Huron-Georgian Bay. These groups are following an adaptive management framework to educate, provide community support, take action and evaluate as suggested by the Initiative for Community Action.



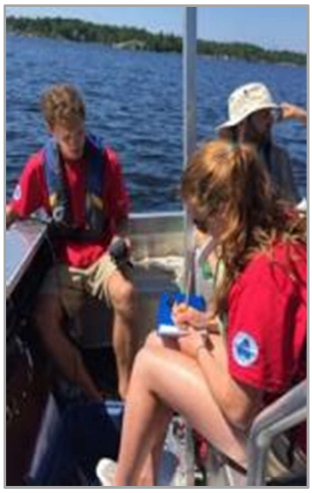
There is a wide range of watershed impacts from the southern part of the lake to the north. The south faces the highest development pressures and generally focusses on enhancement and restoration while in the north, action is more focussed on protection. However, stressors are present in every region of the lake and some concerns are common across the basin.

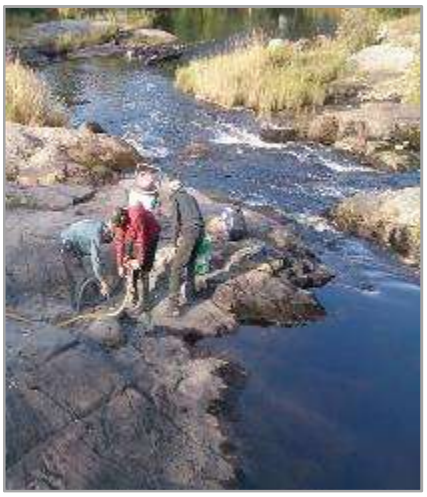
Community based initiatives being undertaken throughout Lake Huron-Georgian Bay include the following:

North Channel and Manitoulin

In the north, groups such as the Central Algoma Freshwater Coalition (represented at the Summit by Chuck Miller), Kensington Conservancy, and Manitoulin Streams (represented by Seija Deschenes and Jesse Beaudin) are focusing on stream restoration projects. There is also some interest in remediating habitat loss from shoreline development. Nutrient monitoring is being undertaken by Central Algoma while Kensington Conservancy is working with a variety of audiences, government, volunteers and school groups to complete stream bank restoration. Manitoulin Streams have undertaken many stream restoration and agricultural best management practice projects, and completed benthic monitoring. Manitoulin Streams have also collaborated with academia on monitoring projects.

Eastern Georgian Bay





On eastern Georgian Bay, many different groups are active and collaborating to address threats to the lake. Eastern Georgian Bay Stewardship Council (represented by Julia Sutton and Katrina Krievens) is taking action on mapping fish habitat and strategically improving habitat while making it resilient to climate induced water level fluctuations.

Georgian Bay Forever (represented by David Sweetnam) has been on the road and water assessing and mitigating invasive Phragmites through mapping and removal projects along with many other important water quality research and monitoring efforts.

The State of the Bay report facilitated by the Georgian Bay Biosphere Reserve (represented by Greg Mason and David Bywater) provides a summary of coastal health condition and also provides an avenue for better clarity around roles and collaboration in other environmental projects such as coordinated water quality monitoring.

The Georgian Bay Land Trust benefits Lake Huron-Georgian Bay through land protection that targets hot spots for biodiversity and the Georgian Bay Association undertakes important advocacy and lobbying activities. Many municipalities, while not always having specific expertise in environment, are keen to partner and are often willing to become involved. The Severn Sound Environmental Association (represented by Julie Cayley and Aisha Chiandet) also provides support and expertise to improve conditions in eastern Georgian Bay. Muskoka Watershed Council (represented by Rebecca Willison) is preparing a watershed report card and undertaking monitoring in watersheds that flow into the southern portions of eastern Georgian Bay.

Magnetewan First Nations is following up on the process of creating their land code and have sought to better understand the water quality in their area. They are finding ways to share that information and partner with the surrounding communities in order to build awareness of the impacts to water. Their objective is to ensure that water quality is good for fish spawning in their traditional territory.

Each group has sought expertise and support from government agencies to undertake their project and in turn has assisted agency scientists or program leaders in their work.

Southern and Western Georgian Bay

In southern and western Georgian Bay, geology changes significantly from shield landscape to limestone and the intensity of impact related to development increases. Much of the community based action involves enhancement and restoration.

The Severn Sound Environmental Association (SSEA) has quite successfully transformed from an Area of Concern focused on completing a Remedial Action Plan into an organization that has broadened its scope, expanded its partners and continued a long-standing collaboration with its constituent municipalities. Recently, SSEA has created a broad-based citizen science program that is accessible to diverse groups and has supported that effort with additional monitoring and expertise. SSEA has also undertaken fish habitat mapping with support from the Provincial and Federal governments.

Nottawasaga Valley Conservation Authority's Watershed Improvement Program (represented by Fred Dobbs and Sarah Campbell) and Beaver River Watershed Initiative (represented by Andy McKee) have both provided a considerable amount of effort and expertise to restoring streams, including in-stream work and stream bank restoration with the objective of ensuring quality habitat. These programs have involved and engaged a diversity of stakeholders and provided scientifically sound approaches or are testing new approaches to stream management. Getting people into the watershed to experience nature and community action in the Nottawasaga Watershed has been a helpful strategy to address habitat loss and soil and water conservation projects. The Beaver Valley Watershed also promotes public awareness of the threats to the lake.

The Blue Mountain Watershed Trust (represented by George Powell, Duncan Bristow, Blanka Guyatt, Stella Juhasz, Don Kerr and Wendy Smeh) has been promoting enhanced land use policy and regulations and working to minimize the impacts from golf courses.

The Bruce Peninsula

Since 2012, Bruce Peninsula Biosphere Association (represented by Katherine McLeod, Jeremy and Elizabeth Thorn and Neils Munk) has provided over 12 km of fencing and 66 cattle watering systems that keep almost 5000 cattle from accessing the streams. They have also worked locally to promote the inspection and improvement of failing household septic systems.

The three participants from the Bruce Peninsula Biosphere Association represent a 23 person committee guiding stream enhancement efforts. That is the kind of multiplying effect that happens when a local community is engaged. Each person at the Summit represents from five to 20 people in their community and this demonstrates how providing a small amount of resources to the community can significantly increase participation and impact.

The groups in the Bruce Peninsula are working to reduce nutrients, improve habitat and combat Phragmites.

South East Shores

Organizations currently involved in activities throughout the South East Shores area include Lake Huron Centre for Coastal Conservation, Pine River Watershed Initiative Network, and the Maitland, Ausable Bayfield, St. Clair Region, Saugeen Valley and Grey Sauble Conservation Authorities. These organizations collaborate with other local groups and provincial and federal agencies to address nutrient enrichment and beach posting issues. They have taken a watershed and adaptive management systems approach, with a focus on land use and evaluating and implementing best management practices. They have identified and evaluated practices from a field level to the lake scale.

Lake Huron Centre for Coastal Conservation (represented by Hannah Cann), provides education about coastal processes. They have hosted many State of the Lake biennial conferences that provide an opportunity to share knowledge. They are currently developing a plan that is evaluating the conditions and documenting nearshore beaches and bluffs, coastal wetlands and islands for the south east shore of Lake Huron.

There are also local groups at work in the Lambton Shores area taking action to fight Phragmites.

What has Worked

This review of community action around Lake Huron and Georgian Bay has shown that the seed funding provided by the Province (OMOECC, OMAFRA and OMNRF) and Environment and Climate Change Canada (ECCC) for a wide range of organizations has been essential to growing and sustaining projects around the basin. In addition, it is clear that collaboration has allowed groups to come together to better understand each organization's role, share in opportunities, share approaches, increase efficiencies, and pool funding. Opportunities for groups to meet and discuss approaches, such as this Summit, benefit future programs and projects.

In addition, improved program coordination has resulted in more focused projects to address the management needs of Lake Huron. A multi-scale and multi-stakeholder approach can address both local concerns and the broader scale threats identified in the LAMP. The insights provided by federal and provincial agencies help to guide community work. Adaptive management experiences through the Initiative for Community Action indicate that there are multiple avenues to resolve problems. Outcomes are evaluated, and the knowledge applied to improve programs.

What Needs More Work

This review of community action around Lake Huron-Georgian Bay also revealed aspects of community action that are challenging and require more attention. There is a need to better communicate the benefits of basin-wide coordinated community action, to track success and share information about the challenges. It can be challenging to determine what to report in terms of environmental condition and socio-economic conditions due to the complexity of landscape, spatial and temporal changes, politics, or funding. The issues in the basin are multi-faceted and there is a need to also address socio-economic considerations since environmental problems are often related to socio-economic decisions.

In some cases, the problems that community groups are attempting to address doesn't provide tangible projects at a local level. The source of a problem can also be beyond the scope of a local organization. For example, the invasion of phragmites is being addressed at the local level, but there is also a need for government to take action along transportation corridors.

Multi-disciplinary approaches will be essential in the future. It is critical to involve the leadership from various organizations so that issues are considered by more than just traditional stakeholders. For example, it has been critically important to have the Ontario Ministry of Agriculture, Food and Rural Affairs (OMAFRA) co-lead the Healthy Lake Huron program along the southeastern shoreline. The socio-economic insights provided by OMAFRA have improved communications, enhanced the understanding of issues, and increased the uptake of best management practices in the region.

Future Action

In the future, groups throughout the watershed are capable of initiating more community action and enhancing their impact. It can be helpful to think of a range of environmental actions that include: SAVE (policies), STEWARD (best management practice), and SEED (ecosystem creation or enhancement, tree planting or wetland projects) at different scales (Scale 1 regional – lake basin, Scale 2 -tertiary and smaller 10 to 30 km^2 watersheds, and Scale 3 -individual properties).

SAVE actions are focused on protecting existing natural features and could include development of legislation and policies. For instance, it is important to recognize and protect some components of the landscape have significance such as a provincially significant wetland. Policies to protect provincially significant wetlands and larger wetland areas have been implemented. However, it is less clear how to protect the smaller wetlands that also provide for ecosystem resilience. In 2017, a University of Waterloo study found that small wetlands have a more significant role to play than larger ones in preventing excess nutrients like nitrogen and phosphorus from reaching the Great Lakes. Small wetlands could be protected through local policies, but the significance of these small, individual wetlands can be questioned in community discussions. At the property scale, important natural features are often considered 'the heart' of the property and are already considered as having significant value to the landowner. These wetlands might be better protected with better community recognition of landowners' efforts.

SEED actions are those related to restoration such as planting trees, or restoring wetlands and other natural heritage features. At a regional scale, it may be important to identify locations where naturalization is needed or where existing features could be enhanced. At the property scale, private landowners could be encouraged to consider if there are places on their property that could be restored.

STEWARD actions are the environmental best management practices (BMPs). BMPs exist for many sectors including forestry, mining, agriculture, and urban landscapes. There is a hierarchy of best management practices. The most important BMPs are practices that hold water in the ground where it falls and avoid moving water into ephemeral channels. Control of water at the lot or field scale and trapping and treating water at the micro-watershed scale are also important stewardship actions.

In the future, there is important work do at the local level. There is a need to continue to work with untraditional partners and to also allow these partners to lead conservation efforts. Since these partners bring socio-economic considerations to environmental work, their leadership will help conservation efforts become more sustainable.

Communication of the approaches used throughout the basin is important. Please tell your story and read other stories at the Canadian Initiative for Community Action website: https://www.lakehuroncommunityaction.ca/

A Community-Based Approach to Monitoring Examples from Georgian Bay Biosphere Reserve

Greg Mason and David Bywater, Georgian Bay Biosphere Reserve

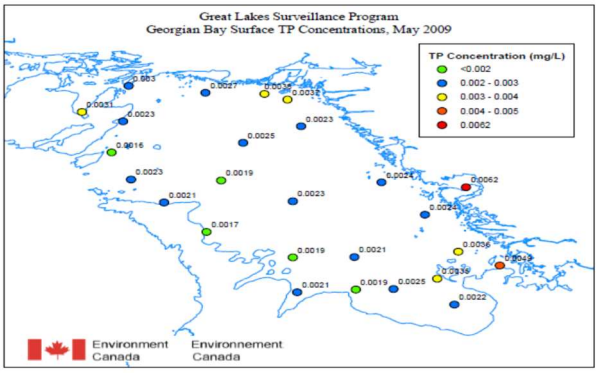
Greg Mason (General Manager) and David Bywater (State of the Bay Program Coordinator) of the Georgian Bay Biosphere Reserve (GBBR) talked about the evolution, successes and challenges to creating a community-based approach to enhance a nutrient monitoring partnership along eastern Georgian Bay.

Eastern Georgian Bay, known as the 30,000 Islands, is an ecologically and globally unique ecosystem that was designated as a UNESCO World Biosphere Reserve in 2004. It is an area with diverse, abundant and healthy wetlands, rock barren landscapes, a mosaic of habitats that creates habitat for diversity and abundance, a complex bathymetric landscape of shallow waters and incoming streams and rivers providing fish spawning and nursery habitat. A landscape that for now, is in relatively good condition, but requires ongoing efforts to ensure it remains healthy and provides an array of ecological services.

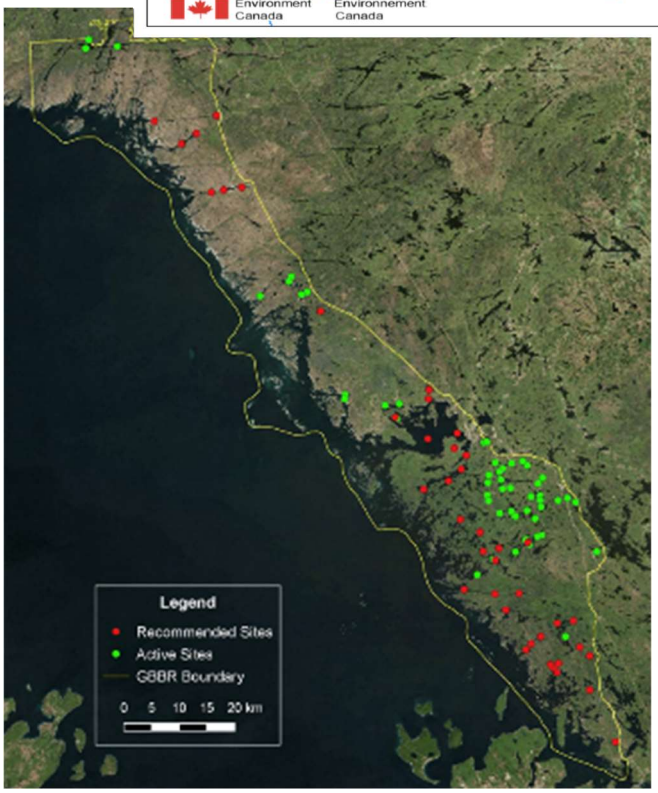
Eastern Georgian Bay does not have a Conservation Authority or any singular environmental body or municipal government with jurisdiction over the entire area, and this causes problems in consistency when it comes to environmental planning, research and monitoring. As well, there are many landowner and stakeholder organizations that undertake research and monitoring projects, and some work in isolation from others.

In 2014, the GBBR undertook an assessment of water quality and nutrient monitoring programs along eastern Georgian Bay as the first step to establishing a collaborative nutrient monitoring program. The report examined existing nutrient monitoring programs and their outcomes in detail and identified gaps, opportunities, redundancies and approaches to harmonize the tiered nutrient monitoring programs. The Water Quality Monitoring Summary Report identified over 15 water quality monitoring projects along eastern Georgian Bay that were conducted by a range of government and non-government agencies. The report found that there were many different methodologies used and that there was a need for coordination and regional characterization.

The report also identified that the variability within the system, in terms of the nearshore to offshore gradient, presents challenges in terms of monitoring, reporting and communication. As well, accessibility to areas along the coast presented a challenge. Some federal and provincial boats could not access certain areas, and this helped to emphasize the need, value and benefit for community based monitoring, simply because community groups were out on the landscape and willing to monitor.



A Total Phosphorus Monitoring Guideline was released in 2016 which recommended spring sampling protocols and 41 nutrient monitoring locations for enclosed bays. In 2016 outreach and communication activities across the biosphere resulted in 23 new monitoring locations being identified. Most of them were on in-land lakes, with a smaller number on the coastline or enclosed bays. In 2017, a more focused communication effort involved a mix of activities, including, articles in GBBR and partner newsletters, social media, tailored communication to each ratepayer association, and attendance at annual general meetings and workshops. The result of the extra effort is that most of the recommended monitoring locations have been filled.



The ongoing success of this effort will depend on coordination so that data from all individual monitoring programs are included to help assess spatial or temporal variation in datasets. Regional characterization could be developed by combining the data from multiple tier agencies and assessing the spatial variation of water quality over wider areas.

The project built effective partnerships and collaborations between local groups to aid in creating regionally necessary programs. It enabled regional groups to be more effective partners with agencies and receive support (usually expertise) from agency scientists.

The GBBR will continue to seek support to establish a consistent monitoring and reporting strategy for eastern Georgian Bay. However, coordination takes a lot of effort and time. Success is dependent on strong relationships and partner support. The wide diversity of groups involved in nutrient monitoring is an asset, because it enables the sharing of resources and nurtures excellent staff expertise. Key activities required for success include solid, ongoing communication, and a clarity of purpose and role(s).

Traditional Land Use Study – What it is and how it helped a Community

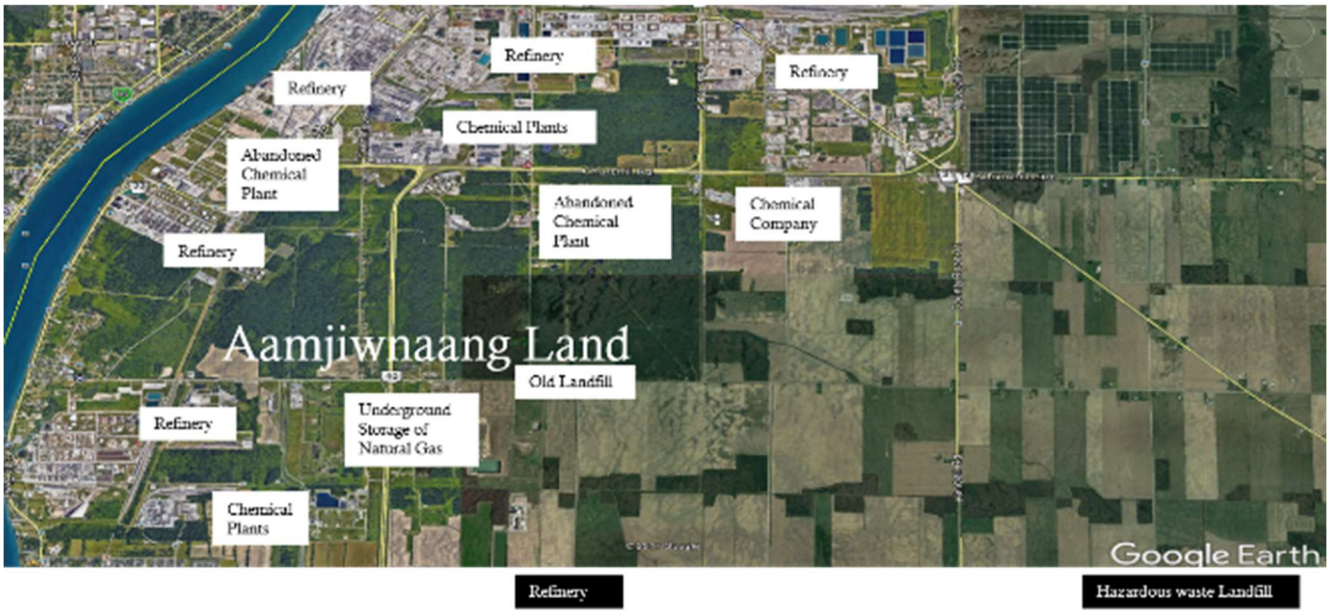
Sharilyn Johnston Aamjiwnaang First Nation

Sharilyn Johnston is the Environment Coordinator for the Aamjiwnaang First Nation (AFN) which is located on the St. Clair River, three miles south of the southern tip of Lake Huron within Sarnia city limits. There are approximately 2,300 band members and approximately 950 live on Aamjiwnaang Territory.

AFN are descendants of a part of the Anishinabek Nation and their ancestors occupied southwestern Ontario and the Great Lakes long before contact with the Europeans occurred. AFN people have been asserting Aboriginal rights over their traditional territory since time immemorial.

Traditional Land Use Study

For many years, the AFN community has been concerned about the cumulative environmental impacts related to pipeline ruptures, air releases of toxic chemicals and spills of hazardous materials in the St. Clair River. The community fears that not all spills are being reported and believe that more analysis is required to inform policy and to be included as part of the modelling requirements for industry. Science can be a tool that confuses the people and there needs to be more transparency with the community. The community needs to be warned about releases to air and the river.



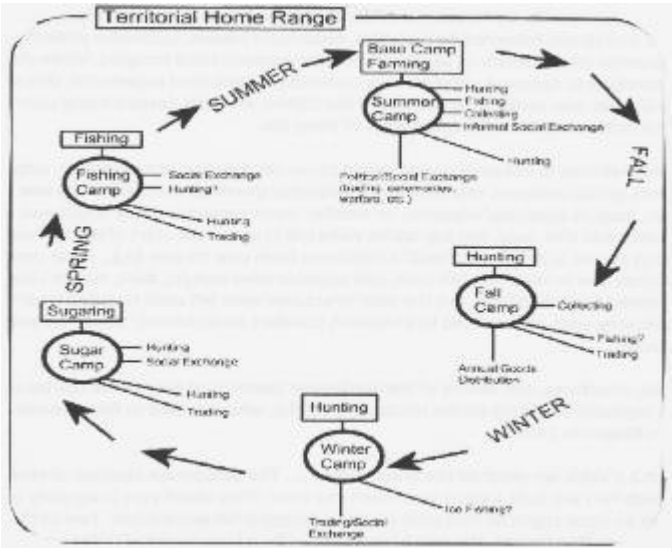
In a recent decision regarding the expansion of Line 9, a pipeline that ships bitumen between Sarnia and Montreal, the National Energy Board (NEB) approved the project and determined that, “any potential project

impacts on the rights and interests of Aboriginal groups are likely to be minimal and will be appropriately mitigated". The NEB further indicated that in their view, AFN did not provide specific information respecting traditional activities that it practices in the project area, which is AFN territory. The decision also stated that AFN only made broad assertions about potential impacts of the project and did not identify ways in which any potential effects of the project on our interests could be avoided or mitigated. The community believes that the decision incorrectly focused on the significance of impacts rather than the potential for the project to cause them.

As Anishinabe peoples, AFN are subject to Anishinabe law and have a duty under our law to be stewards of our land. Our people have a long relationship with our land, including the harvesting of resources, which remains important to our people. Fishing, hunting and the gathering of medicines is of special importance to our people, both historically and today. Canadian Courts have recognized and affirmed the protection of existing Aboriginal and treaty rights, which are constitutionally protected. Our traditional territory is also important to us for its ceremonial and sacred sites. It is also one of our most important laws that the places where our ancestors are buried should not be disturbed.

Upon review of the NEB's decision and comments about our traditional practices, Chief and Council felt it would be beneficial to AFN in future negotiations with government and industry proponents to have a Traditional Land Use study completed. As a result, the Environment Committee recommended a preliminary Traditional Land Use Study be undertaken to address the perception that AFN does not practice traditional activities in its territory. The study would document and describe the traditional practices that are currently carried out by the AFN community in proximity to the Line 9 right-of-way.

Preliminary research and elder interviews indicate that AFN's ancestors used, occupied, and controlled lands extending from the St. Clair River eastward between Lake Huron and Lake Erie. The research also indicates that AFN's ancestors used lands and resources in a cycle typical of hunter-gatherer societies sometimes referred to as 'annual rounds'. They used the rivers and the lakes for fishing, and low-lying lands and wetlands for trapping muskrats and other furbearing animals. They gathered various berries and medicines and nuts and used trees for their wood and bark. They also hunted deer over a relatively large area extending well up the peninsula of southwestern Ontario.



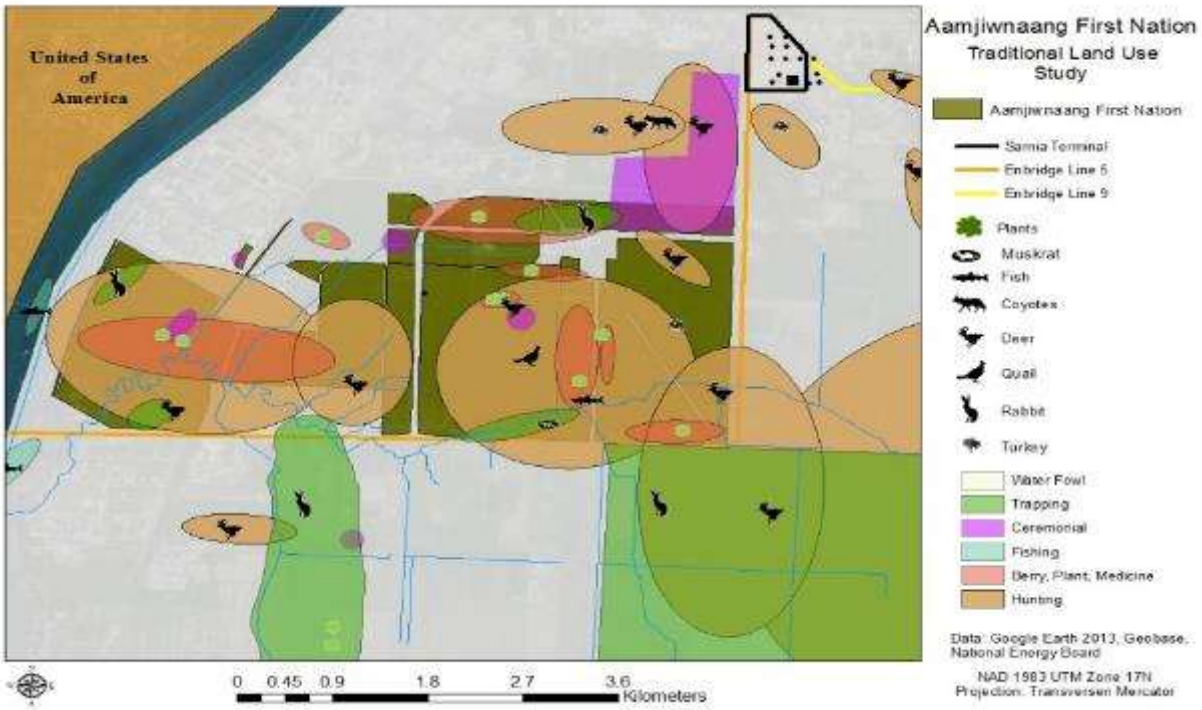
Seasonal Rounds Dr. Ferris diagram (May 20, 2009)

The preliminary Traditional Land Use Study was limited in scope and extent. Only the amount of background research necessary to achieve a historical context was carried out and no in-depth historical, archeological, anthropological and/or ethnographic research was performed.

Fewer land and resource users were interviewed during the study than would typically be interviewed in a full traditional land use study. Fourteen (14) Elders and other AFN land and resource users were interviewed over the course of four days in July of 2013. These interviews were recorded on video and audio tapes. The locations of land and resource use identified by the interviewees were overlaid on a map of the area. Questions were

asked about traditional life such as fishing, medicinal plants, family values, habitats and species, important areas, previous land uses, stories.

From the results of the Traditional Land Use Study, it was established that AFN members continue to teach and carry out an annual round of seasonal land and resource use similar in kind to that followed by their ancestors. As well, specific sites and hunting grounds where identified within AFN's traditional territory where they continue to harvest a variety of species of fish, birds, and mammals and gather medicine, maple sap, and other



flora, including at sites that are directly adjacent to the Line 9 right-of-way. In addition to providing sustenance, these practices and the land and water bodies they are carried out on, have deep spiritual significance to the interviewees. AFN members made significant use of lands and resources in their traditional territory, including their close proximity to where Line 9 leaves the Sarnia Terminal and heads eastward. AFN members hunt, trap, and harvest plants over relatively large areas east of the Sarnia Terminal on both sides of the Line 9 right-of-way. Important and intensive land and resource use is also occurring on AFN's reserve. The locations of current land and resource use, and the users themselves, have been clearly impacted by the large-scale industrial development that encircles all four corners of AFN's reserve.

From the findings of this study, it is AFN's opinion that a release of crude oil from Line 9 in this area would directly impact the lands and waters historically used by AFN. Therefore, it would carry with it a serious risk of severely impairing the current exercise of rights and traditional practices associated with those lands and waters. AFN's membership is severely impacted by on-going industrial and refining operations located around the perimeter of our First Nation. These sites continue to affect our quality of life and health. It is the community's opinion that development of additional pipelines and facilities will contribute to the already significant negative cumulative impact on our reserve and traditional lands and waters, and will further impair our ability to carry out traditional practices.

The next phase is to conduct a full Traditional Land Use Study, which is to be completed by April of 2018. We are partnering with Enbridge, Shared Value Solutions and the Toronto Zoo for cultural mapping and AFN is

developing the methodology, interview guide, and protocol for the study respecting the gathering and archival information, historical mapping and land use occupancy.

Antler River Deshkaan Ziibi Guardians From 4 Directions

A new youth group, called the "Antler River Deshkaan Ziibi Guardians From 4 Directions", has also been created. This group involves four First Nation communities (Walpole Island First Nation (Bkejwanong Territory), Chippewa of the Thames First Nation, Aamjiwnaang First Nation, Caldwell First Nation) and they are working with the Thames River Clear Water Revival Steering Committee, Tides Canada, Ontario Ministry of Environment and Climate Change, Ontario Ministry of Natural Resources and Forestry, Upper Thames River Conservation Authority and Lower Thames Valley Conservation Authority.

This youth group has accomplished many activities including: working at the Ska Nah Doht Longwoods Conservation Area, learning about traditional medicinal uses for many different plants, and gathering environmental information by canoe. Knowledge of singing and drumming is also being passed on to the youth in this group. Other activities have included: wetland restoration, birch bark canoe building, Turtle Island Zoo Species at Risk, water ceremony and teachings and making a treaty canoe.

Tracking Success - The Opportunity and Challenges of Standardized Indicators

Mari Veliz, Ausable Bayfield Conservation Authority

Mari Veliz is the Healthy Watersheds Supervisor for the Ausable Bayfield Conservation Authority (ABCA), located in Exeter Ontario.

Mari provided information about approaches to program evaluation and the potential benefits and challenges in using standardized indicators. The presentation was intended to begin a very important conversation about standardizing the way the health of ecosystems is evaluated.

Monitoring is one of the four key principles in the Initiative for Community Action. While community involvement can start at any point in this process, groups often begin by monitoring to better understand an environmental change that is emerging.

Importance of Program Evaluation

Monitoring and data analysis is undertaken to:

1. Identify a problem.
2. Determine if the action being taken is making a difference and the approach is correct.
3. Motivate conservation actions.
4. Explain environmental conditions.

Monitoring and reporting is important to ensure that environmental organizations are accountable. Measurement encourages attention to an issue and inspires action.

People, Project and Planet Indicators

The People, Project and Planet Indicators concept summarized in the following table illustrates how a range of indicators can be applied to evaluate a program.

People, Projects, Planet Indicators

Level of Indicator	Specific Indicator	Methodology
People	People attending a workshop	Phone Records
Project	BMPs installed	Tracking Database
Planet (Ecosystem)	Turbidity, flow, Total Suspended Solids	Water Quality Measurements

Adapted from US EPA Watershed Plan Handbook 2005

People

As an example of how people can be used as indicators of success, the ABCA and community partners released 40 turtle hatchlings and 550 people attended the event. This kind of response would not likely have happened 10 years ago, but there seems to be more community interest now in the environment. Counting people attending events is an important indicator of the community's readiness to engage in environmental action. Environmental groups are considering how to take advantage of this interest in the environment and how to convert it into conservation action. The approaches for action can include Save (policies for protection), Steward (best management practices) and Seed (action to regenerate areas).

Project

Considering the number and impact of projects offers another level of evaluation. The Project Output table for a watershed restoration program demonstrates the number and types of projects and their impact for a watershed restoration program. These types of indicators measure what action was undertaken and the area of impact. However, this level of evaluation may not include the identification of the policies that are being implemented or whether past projects have been maintained.

Project Output for Watershed Restoration Program

Type of Best Management Practice	Number of Projects	Area Affected (if applicable)
Streamside Restoration	1	50 m
Riparian Tree Planting	1	300 m
Water and Sediment Control Basins (WASCoBs) – includes upgrades	31	
Wetland	1	0.46 ac
Grassed Waterway	2	167 m
Fragile Land Retirement	4	4.1 ac
Fragile Land Retirement – Windbreaks	2	460 m
Fragile Land Retirement – Vegetative Cover	1	5.4 ac
Manure Storage Upgrade	2	
Manure Amendments	4	241 ac
No Till Implemented	5	908 ac
Conservation Tillage Implemented	3	130 ac
Cover Crops Implemented	11	351 ac
Precision Agriculture Implemented	11	670.5 ac
Nutrient Management Implemented	5	89 ac
Residue Management	1	141 ac
Total BMPs	85	

Planet

Measuring at the planet or ecosystem level is more complicated than measuring people or projects. This level of evaluation is more difficult to implement, but it provides an in-depth assessment of impact. Community members and funders want to know whether the action implemented is making a difference. Measuring at the planet level involves assessing a larger area and is more complex. At a local level, the measurement may involve just one issue, but at the planet or ecosystem scale, multiple issues must be considered. At the planet level, the questions to be answered are more challenging.

A watershed report card is one of the best approaches to monitoring at the planet level. A watershed report card can use a wide range of indicators across a large area.

Another approach is to look at 'sentinel' watersheds (such as those shown on the map). An adaptive management framework (i.e., build awareness, support community involvement, take action, and measure success) can be applied in these smaller priority sub-watersheds where success is easier to measure.

When monitoring at the planet level, it is important to ensure multi-stakeholder collaboration especially when gathering data and preparing a study. When the community participates, they are more likely to become involved and take the action recommended.

Time and Space Complications

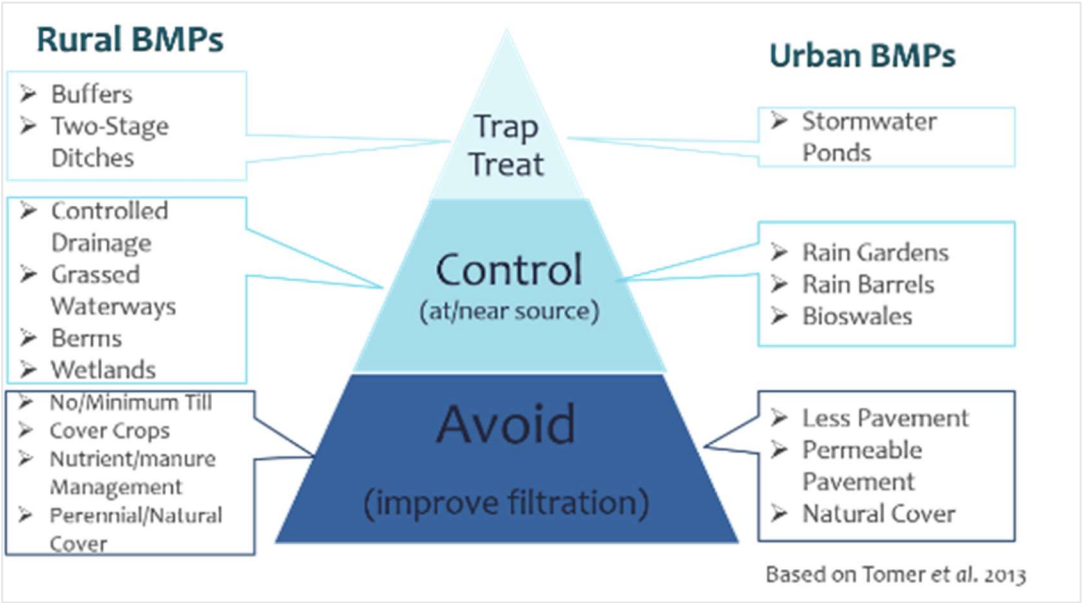
Land use and its effects on water quality vary spatially (area) and temporally (in time). Spatial considerations include the fact that nutrient and bacterial indicators manifest in downstream water bodies and result in impacts such as beach postings and algal blooms. Communities will often focus on the lake or the zone of impact to assess its health and measure trends. However, there is also a need to look upstream in the watershed and consider the zone of influence. This allows for the measurement of small and incremental impacts such as that from an ephemeral channel that may produce cumulative impacts downstream. The zone of influence is much larger and more complicated to evaluate than the zone of impact.

Time is also a factor in monitoring and evaluation. Watershed studies have demonstrated that when measuring the effects of land-based BMPs such as those listed in the Project Output table, there is a need measure at the time precipitation and storm events are occurring and water is moving across the landscape. However, is not feasible to measure water quality on a constant basis throughout the year and it is difficult to monitor an unexpected storm event.

Watershed Perspective

In the past, community action and evaluation has focused on local areas closer to the lake, but there is a need to take a broader landscape approach to the issues. For example, action can be taken on the land to prevent those ephemeral channels from running across the land and impacting the lake. An Avoid, Control, Trap and Treat Nutrients and Sediment approach has recently been suggested and this is similar to a treatment train

approach used in storm water management in urban areas. Issues in the lake can be avoided by improving infiltration and improving the health of the soil on the landscape. A 1 % increase in soil organic matter can improve the capacity of the soil to hold an additional 27,000 gallons of water per acre. Cover soil, reduction of tillage, and crop rotation should be encouraged. Water can be controlled, held and treated on the landscape to reduce the impact on the lake.



Standardized Ecosystem Evaluation

There are many organizations across the lake that have similar objectives and face common issues, but may use different monitoring protocols. Without standardized planet or ecosystem indicators, it is difficult to compare environmental data. Common issues would benefit from common approaches, and monitoring indicators. The first step would be to develop shared goals and then developing standardized indicators should be considered. With common monitoring indicators, community organizations could demonstrate more accountability and have a more complete and understandable story to tell.

Some of the challenges to standardizing our indicators include the following:

Challenge 1 – Different Goals - There are 10 to 15 groups that frequently contribute to the Initiative for Community Action. Each group has its own focus and goals. Some groups provide in stream habitat protection or land management to provide downstream habitat enhancement, while others focus on outreach or water quality monitoring. Some groups are practicing adaptive management (i.e., build awareness, support the community, take action and monitor). The goals and programs undertaken are affected by each group's organizational capacity.

Challenge 2 – Scale - Some groups are monitoring the zone of influence (watershed) while others are monitoring in the zone of impact (lake). Focusing solely on the zone of impact and documenting that problem may not connect it to potential solutions.

Challenge 3 – The Problem is Very Complex – ABCA has evaluated stream health in a small demonstration watershed based on concentration data and stream discharge which were then converted to pollutant loads. The stage (water level) data was taken every 15 minutes and resulted in

over 100,000 data points. Concentration data was taken approximately 50 times. The data was then converted to loads.

Stream Measurements Needed to Calculate Pollutant Load

Pollutant Load		Stream Discharge		Pollutant Concentration
Mass of pollutant per time	=	Volume of water per time	X	Mass of pollutant per volume of water

This allowed for a comparison with other watercourses or the same watercourse over time. It also provided for a better understanding of concentrations over time and showed how the watercourse behaved over time. Observing the data over time showed ABCA that concentrations are declining in the study watershed. Good monitoring data can be used to identify a trend such as whether a situation is improving, degrading or remaining the same, but it will not explain what is causing that trend. Without ecosystem modelling, the ABCA would be unable to clearly connect the water quality improvement to the enhanced uptake in BMPs (e.g., creation of berms or the more difficult to measure land management activities such as cover crops).

Data management and processing tasks for this investigation required a substantial time investment. These tasks included:

- Collection, quality assurance and quality control of stage data
- Development of rating curves
- water quality, precipitation and land management datasets
- Conversion of stage data to flow
- Maintenance of the data in formats compatible with a database
- Calculation of runoff coefficients
- Estimation of loads.

A variety of statistical techniques and models were used to analyze these data. The ABCA provided the data to the University of Guelph who then modeled the impact of various land management options to determine their effectiveness and impact.

Undertaking a demonstration project and this level of evaluation can show the impact of action taken on the ground and guide future projects. The results can be used to show landowners the impact that BMPs have had in reducing overland flow. In addition, results of the demonstration project can also be used more widely and applied to other similar areas. A demonstration project can contribute to a more effective use of scarce resources so that funds can be allocated to both monitoring and outreach. Monitoring and outreach (the SEED, SAVE and STEWARD actions) are both important components of an environmental program.

Summary

Evaluation is important to demonstrate environmental impact, encourage action and show accountability to the community. Assessment at the people and project levels are common because standardized approaches have been developed and these approaches require fewer resources. The planet or ecosystem level of evaluation is more complex, difficult and costly. Multi-faceted problems take time and resources to define the problem and design a program. This level of evaluation usually involves multiple stakeholders and various disciplines. Before taking action, it is important to consider how that action will be evaluated and what will level of evaluation will resonate with the community.

C. The Lake Huron-Georgian Bay Café

Addressing the Threats to Lake Huron-Georgian Bay

Communities and agencies across the watershed are addressing five key threats to Lake Huron-Georgian Bay:

1. *Chemical Contaminants*
2. *Nutrients and Bacterial Pollution*
3. *Loss of Habitat and Native Species*
4. *Invasive Species*
5. *Climate Change Impacts*

In this session people had the option to meet in 2 of the 5 groups to discuss these threats and to share information and experiences by answering the following questions:

1) What is the most successful thing you're doing (or have seen) to address this threat?
2) What is the best thing you are doing to track achievements to address this threat?
3) What (apart from money) do you need to further address this threat?
4) What opportunities exist to better address this threat?

The following are the results of the discussions:

1. Chemical Contaminants

a. Successful Efforts to Address Chemical Contaminants

Industry Engagement

- St. Marys River Area of Concern is working with local industry to identify point sources and associated impacts, polycyclic aromatic hydrocarbons (PAHs) and on a multi-agency sediment management plan.
- Local golf courses have been engaged to begin discussion on pesticide use, and more environmentally friendly products.
- Ski hill operations have been encouraged to maintain ground cover to prevent run off and sedimentation in streams.

Community Awareness & Action

- A Peasemarsh Nature Reserve has been adopted to routinely clean-up garbage and plastics, and submit findings to the Great Canadian Shoreline Cleanup database. This also provided an opportunity to interact and raise awareness with visitors.
- Participated in local events, like “Love Your Greats” day.
- Raised awareness of the dangers of Karst topography in the spread of household contaminants.
- Increased awareness and communication by the media.

Identification and Research

- Great Lakes Network created a ‘Toxic Free’ sub-network that includes bi-national groups that have identified chemicals of mutual concern under the Great Lakes Water Quality Agreement.
- Aquahareliiy Plastic Fibre created a laundry filter to capture plastic fibers.

b. Tracking Achievements in Addressing Chemical Contaminants

Legislation & Policy

- The results of advocacy work on the issue of microbeads led to legislative change and a prohibition by January 2019.

Monitoring

- Monitoring the policy progress and the number of organizations involved in addressing chemical contaminants.
- Coordinating, monitoring and studying about contaminated sediments (e.g., fish tumor studies or sediment flow and transportation studies).
- Reviewing field monitoring data.

c. Needs to Address Chemical Contaminants

Legislation & Policy

- Government legislation requiring testing before a chemical is approved for use.
- AOC program should address chemicals of emerging concern.
- A policy for wetland net gain policy in Ontario (wetland offsets).
- Better understanding of chemicals of emerging concern, and what management (e.g., regulations) could be placed around them.
- Coordination of efforts at all levels of government.

Community Awareness & Action

- Expand buffer zones along and within golf courses.
- To understand the barriers to changing consumer expectations.
- More volunteers to clean up plastic pollution and help with education.
- Increased stormwater retention.
- Increased awareness of the impact of stormwater on water quality and assistance to landowners to implement BMPs.
- More people taking action.
- Increased awareness about the use and impact of plastics.
- Connect on the ground 'stories' with the national and bi-national levels.

Information and Knowledge

- Better understanding of how local groups can help address chemical issues (e.g., urban inputs, plastics).
- Research including sediment analysis for chemical contaminants.
- Information on the long-term impact of certain chemicals.
- Information about the cumulative impact of chemicals on water quality.
- Information about what chemical contaminants are found in stormwater ponds.
- Additional research on the significance of stormwater on water quality.
- More focus on change in human behaviour.
- Need a long-term approach as it can be a challenge to monitor chemicals.

d. Opportunities to Better Address Chemical Contaminants

Knowledge & Communication

- Identify additional bi-national 'chemicals of mutual concern' under the Great Lake Water Quality Agreement.
- Identify BMPs and chemicals for use on golf courses.
- Approaches and advocacy to change consumer behavior.
- Improve understanding of cumulative effects of chemicals at a watershed scale.
- Address hazardous waste.
- Funding to evaluate chemicals and impacts.

Legislation & Policy

- Establish provincial-level setback controls for development.
- Improve Canada's chemical management policy framework.
- Regulation for setbacks on Lake Huron and inland lakes.

Awareness & Collaboration

- Improve coordination and information sharing between governments and non-governmental organizations.
- Have more Health-Unit involvement in the Lake Huron network.
- Continued efforts by community action groups and organizations.
- Increased citizen awareness and concern.
- Expand the work with golf courses to implement BMPs.

2. Nutrients and Bacterial Pollution

a. Successful Efforts to Address Nutrients and Bacterial Pollution

Awareness & Education

- Public meetings to discuss conservation have been successful, especially if the messages are specifically designed for the particular audience (i.e., not targeting pasture walks during hay season)
- Peer to peer and citizen ambassadors for education.
- Progressing in steps to encourage the community to move from being educated to taking action (e.g., if the objective is to have septic systems cleaned out, as a first step conduct a site visit to find out if the systems are working correctly).
- One on one engagement.
- Using education to change expectations that one project is going to make the difference.
- Encouraging the use of BMPs.
- Working with an individual landowner to implement BMPs and then building an ongoing relationship.
- Use of social media to share information and answer questions (i.e., Twitter and farmers).

Collaboration

- Multi stakeholder collaboration with other environmental groups, agencies and industry.
- Collaborative issue identification and planning.
- Multi-stakeholder evaluation of urban and rural BMPs.
- Working with other sectors to deliver a conservation message.
- Working with industry to implement BMPs (e.g., encouraging ski hills to use cover).
- Incorporating citizen scientists to help with monitoring to expand a program.
- Involving non-traditional partners.

Action & Approaches

- Establishing clear and concrete action to reach a target and working together with any affected group to put in place policies and programs.
- Farm visits by trusted people to develop plans with farmers for livestock exclusion from streams.
- Contacting landowners 'one on one' to encourage stream monitoring on private property.
- Teaching children in a way they can relate to a topic. For example, during an event to see the annual salmon run also provide education about other regional environmental concerns.
- Planting buffers with the community (including all ages) and inviting other types of groups (e.g., a children's hockey team) to participate. These events also provide an opportunity for education.
- Incorporating rain gardens into municipal projects and including educational signs in the garden.
- Tree planting programs for landowners.
- Nutrient monitoring and identifying long term trends.
- Providing incentives for action. For instance, $4,000 (1/3 of the cost) was provided for new septic systems near Parry Sound.
- Concentrating focus in one area in order to address a threat.
- Using visual displays to explain complex issues.
- Demonstration events where landowners or farmers lead the discussion.
- Monitoring in the open water of Severn Sound.
- Long term stream monitoring of creeks in Blue Mountain.

b. Tracking Achievements in Addressing Nutrients and Bacterial Pollution

Monitoring

- Monitoring finished projects and determine if they need maintenance and whether they are working as intended.
- Long term water quality monitoring, modelling and identifying trends (including benthic monitoring).
- Monitoring tributaries to identify any problems. Tributaries have an ecosystem value that should be considered beyond being a conduit to Lake Huron-Georgian Bay.
- Adjusting sampling programs to reflect different geographic conditions (e.g., different embayments in Georgian Bay).
- Monitoring BMPs and land use activities to determine effectiveness (e.g., the impact of significant development adjacent to the Black Ash buffer strip).

Surveys and Tracking

- Creating surveys to gauge public knowledge and priorities around different issues.
- Tracking:
  - Land owners and land use decisions after a project.
  - Number of projects.
  - Economic impacts to compare yield and potential water quality differences.
  - Number of septic systems pumped out and repaired.
  - Engagement with municipal officials.
  - Changes in plans by comparing draft plans to the final version.
- Photographic surveys using drones.
- Using social media statistics.
- Measuring the potential impact of influence rather than the number attending a workshop (i.e., acres per workshop).
- Land management surveys with landowners after projects have been completed.
- Approval of grant applications.

Action & Approaches

- Tracking achievements varies in scale from pictures and stories to long-term research with graphs and data.
- Different approaches to measuring success depends on the project and the audience.
- Creating watershed report cards in collaboration with others and collecting data with partners.
- Using drone footage to see how water moves and to show how water movement can change after implementing tiny agricultural BMPs.
- Offering field experiences so participants will have more understanding of the complexity of the issues.
- Evaluating the impact of undertaking water quality BMPs.

Communication & Collaboration

- Communicating the need for conservation in a way that resonates with a particular sector (i.e., agricultural or development).
- Encouraging participants in existing projects to undertake further initiatives.
- Partnering with others to get data and information about the ecological impacts.
- Building relationships with other sectors as communication is a two-way endeavour.

c. Needs to Address Nutrients and Bacterial Pollution

Communication

- Messages will need to be relevant to the various audiences.
- When trying to address threats, relate the messages to the values of industry or land users.
- Remain current with the social media and the way diverse audiences use it (e.g., farmers use Twitter for professional communications or Snapchat is used by the youth).

- Provide more information about the complexity of decisions being made in urbanizing and farming landscapes.
- Rebrand environmental terms respecting Ecoli and nutrients (e.g., algal outbreaks rather than algal blooms).
- Acknowledge the persistent threats.
- Broaden perspectives on issues as they can be complex (e.g., water quality is not a single issue).
- Be responsive to change. For example, the ecosystem is changing (pasture to crop, farm to urban), and how we communicate is changing. Talking about values may need to be the starting point.

Awareness and Education

- Greater public awareness and education.
- Share the lessons learned from the efforts on other Great Lakes.
- Change consumer expectations.
- Awareness about the risk from pathogens such as Ecoli when visiting the beach.
- Methods to engage landowners in stewardship and build a connection to the land.
- Resources to understand how to motivate change in behaviour.

Action

- Increased focus on tributary water quality and development of associated policy.
- Monitoring along the escarpment.
- Knowledge and technology transfers to communicate effectiveness in monitoring and research findings to technical staff.
- Reducing risk so that behaviour will be adopted (e.g., have a peer demonstrate success).

Requirements

- Build accountability into plans, especially the LAMP, by identifying the agencies responsible, establishing timelines and the action proposed.
- Enforcement needs to be clear with respect to jurisdiction.
- Establish regulations for buffers.
- Environmental assurance programs that are implemented by the private sector (e.g., in the US, bankers ask for conservation and financial plans when being asked for agricultural loans).

Resources

- Longevity in programs (which may be affected by funding and political cycles).
- Continued support from agencies.
- Dissemination of research, resources, and data including US sources.
- More research in specific areas.
- New BMPs.
- Diverse staff abilities and staff with specialized expertise to lead projects.
- Volunteers
- Time to implement shifts in behaviour.
- Time for reporting.
- Better predictive modelling to determine nutrient targets for embayment s in Georgian Bay.

Collaboration

- Multi-stakeholder collaboration with industry and conservation organizations.
- Provide support to municipalities in taking action by considering the municipal perspective on the threat and determine who would be most effective in working together to address that issue (i.e., municipal drains).
- Consistent partnerships to establish positive working relationships.
- Greater data sharing.
- Promote understanding between landowners and boaters.

d. Opportunities to Better Address Nutrients and Bacterial Pollution

Education

- Work with schools and educate youth.
- Conduct demonstrations at farms and connect people to the environment.
- Promote old ideas as new ideas (e.g., wind breaks, pasture, cover crops).
- Identify methods of effectively highlight issues for Lake Huron (Annex 4 will show there is no issue).
- Address perceived risks associated with change and use trusted champions in delivering messages.

Engagement & Collaboration

- Multi-stakeholder discussions and collaborative problem solving.
- Create a communication hub.
- Identify methods of encouraging bureaucrats and politicians to become involved.
- Continuous support from OMAFRA.
- Greater coordination between governments and NGOs.
- Publicly share experiences.
- Provide mentoring programs.
- A support group for those in environmental work to keep them positive and optimistic.
- Create an icon for water quality like the polar bear for climate change.
- Share results from more extensive monitoring programs.
- The Initiative for Canadian Action website could provide tools for citizen scientists and be used to store data in a central repository.

Actions

- Apply bioengineering projects to degraded streams.
- Identify new technologies to address the impact of septic systems in areas like eastern Georgian Bay where there is little overburden.
- Create ecosystem models that help to set regional targets and quantify the effects of different BMPs.
- Develop new approaches that are flexible rather than regulatory
- Undertake more monitoring
- Encourage land rental agreements that incorporate BMPs.
- Evaluate the impact of ethanol production on nutrient loading and water quality.
- Decommission municipal drains.

- Encourage cottage owners to pump out septic systems.
- Focus on smaller geographic areas for greater understanding and accountability.

3. Loss of Habitat and Native Species

a. Successful Efforts to Address Loss of Habitat and Native Species

Involving the Public in Habitat Restoration

- Integration of stream and wetland restoration projects (pre and post-projects) with water quality, benthos and fish monitoring (both inland and at the lake) to capture habitat function as an endpoint.
- Integration of hands on, visual and interactive community engagement activities as a component of habitat restoration and stewardship projects.
    - Examples ranged from simple (e.g., riparian planting and cattle fencing) to innovative, such as the restoration of Brook Trout through in-stream egg incubation with scientifically tested plastic egg incubation units (Scotty Boxes).
    - Visuals and active participative type of learning for the public, such as lunch and learn opportunities.

Assess Habitat and Restoration Needs

- Systematic assessment of aquatic habitat for the purpose of impact assessments and project prioritization has been successful for Manitoulin Streams Improvement Association in their Island-wide assessment and prioritization of projects, and the Eastern Georgian Bay Stewardship Council and their tributary assessment and restoration project.
- Environmental impact statements should reflect the needs of socioeconomic actors and be incorporated to provide a balanced approach. The assessment:
    - Determines ecological and public value.
    - Establishes criteria and evaluate vulnerability of the habitat to localized stressors.
    - Identifies restoration needs, opportunities, and feasibility.
    - Prioritizes projects.
- With much of the attention focused on restoration, the needs and opportunities for habitat protection must also be closely considered given the high quality of habitat in the northern part of the watershed.

Balance Restoration with Protection

- The Nature Conservancy of Canada's land acquisition efforts are at the forefront of land protection as well as those of the Georgian Bay Land Trust (not in attendance at the Summit). A recent example is the acquisition of much of Cockburn Island in the North Channel. These organizations are willing participants in land protection initiatives.
- Acquire lands that require studying and develop long-term stewardship plans to maintain the ecological character and significance of protected lands.

Private Landowners are the Key to Conservation

- Private landowners are the key to conservation and so we must look for innovative ways of engaging and compensating landowners who set aside land for restoration and protection. This sustains

agriculture, wildlife, natural spaces and water quality. The example provided was the Alternative Land Use Services (ALUS). The ALUS program works with farmers and ranchers to produce valuable ecological services on Canadian farmland.

- Continue to educate landowners about the various incentive programs such as:
    - Managed Forest Tax Incentive Program.
    - Conservation Land Tax Incentive Program.
    - Conservation Easement opportunities.

Education and Engagement

- Municipal councils and mayors must be continually engaged and educated.
- Development of science-based natural heritage strategies that reflect solid criteria, clear needs and opportunities, cost-benefit analysis and long-term stewardship.

b. Tracking Achievements in Addressing Loss of Habitat and Native Species

New Technologies and Approaches

- New approaches that use automated drones to capture high quality aerial images.
- Other remote sensing technologies such as satellite images and ortho-rectified photography.
- Less expensive alternatives such as animal infra-red cameras.
- Quantifiable measurement of habitat response (e.g., extent of Phragmites).

Monitoring Species Response to Habitat Quantity and Function

- A more simplistic approach to tracking achievements following project implementation is using sentinel species as integrators of habitat quality. Tracking the response of species such as Bald Eagles (sensitive species) integrates the ecosystem response and is a practical and simple approach that can involve the public.
- Use of biological end points for pre and post projects:
    - Use established protocols such as CABIN and OBBN, upload synthesized data into an open access information database (across agencies and organizations); and,
    - Sometimes the best answer is the simplest approach. Use simple physical parameters such as stream temperature and turbidity over time to assess response of restoration projects.
- Incorporate the strategic use of citizen science to monitor and track the success of habitat and species restoration projects.
- Develop standardized monitoring approaches so that you can compare spatial and time trends (comparing apples to apples).

c. Needs and Opportunities to Address Loss of Habitat and Native Species

Proactive Approaches

- Educate municipal councils (improved awareness and understanding or active participation and buy-in).
- Coordinate between regulators and stewardship staff.
- Always look for tangible results: science leading to actual results.

- Work with naturalist clubs to share lists of priorities and collaborate.
- Strategic communications targeted to most likely partners and stakeholders.
- Involve First Nations and all potential partners.
- Involve a local champion or ambassador with a strong voice that can influence Council.

Provide Alternatives for Land Owners

- Engineering alternatives to hardening shorelines.
- Land stewardship guidance to landowners.
- Tax incentives and easements, and new regulatory tools.

Land Protection

- Large scale plans to meet land conservation goals (17% of the land surface in Canada) have yet to be met. Local, provincial and federal authorities and community members must work together to:
    - Improve existing land use policy frameworks.
    - Link key restoration sites as part of acquisition plan (e.g., corridors that connect high quality areas).
- Enhance enforcement frameworks and compliance.
- Incorporate economic value assessments.
- Monitor (e.g. set banks and buffer strips).
- Greater protection for globally rare ecotypes with the greatest abundance in the Lake Huron watershed (e.g., Alvars) and species protection plans.

Communication

- Produce and submit more newsletters and articles to newspapers and magazines to engage and educate the public and politicians.
- Improve the number and quality of websites and design websites to educate, share information and engage the public.

4. Invasive Species

a. Successful Efforts to Address Invasive Species

Collaboration

- The New York USA PRISMs program is a collaborative where a number of counties have joined together and funded staff in the field to undertake an early detection and response to stop new invasive terrestrial species.
- Bruce Peninsula Biosphere Association identified a terrestrial Invasive Species Task force that is being created and involves a collaborative with other organizations that have staff in the field undertaking invasive species removal. This includes a limited spray initiative along county roads.
- Collaborative initiatives to address common issues such as invasive mussels and programs that include academia.

Programs & Approaches

- Door County Soil and Water Conservation District in the USA has implemented a tiered watershed approach to listing Phragmites as a noxious weed. The County identified a ten-year period of time to list Phragmites as a noxious weed and during that to year period mapped its locations and completed education and awareness programs.
- Due to the huge impact of Phragmites, approaches have varied from a watershed approach to just focussing on protecting the highly diversified areas.
- Manitoulin Streams Improvement Association undertakes a well marketed program called 'Phrag Week', which is a designated week where landowners, staff and volunteers all work together to blitz Phragmites removal and provide educational programs. Removal using a Truxor-mechanical during this program has proven to be very cost effective for big patches, but still requires volunteers to deal with the removal of the cut Phragmites.
- Grey Sauble Conservation Authority lends trimmers to community groups to cut Phragmites.
- Public education on the importance of choosing native species and working with the landscaping industry to eliminate invasive species and provide native species options.
- Native species sales in communities.
- Early detection approaches to monitor places where invasive species might be expected to emerge (e.g., Department of Fisheries Asian Carp monitoring).
- Programs to deter the spread of invasive species such as boat washing stations or boot washing after field work.
- Surveys are being undertaken for Lake Huron and Georgian Bay and are providing important data on aquatic invasive species.
- Monitoring the distribution of Dreissenids and the effects of mussels on the ecosystem.

b. Tracking Achievements in Addressing Invasive Species

Documentation

- Long term mapping and data collection (e.g., weight removed) to track invasive species as the situation changes and to understand what approaches are effective.
- Long term monitoring programs (ten years) are important since invasive species can re-emerge (e.g., Garlic Mustard).
- Use of aerial photography, drones to track invasive species and impact of programs
- Before and after photo documentation.
- Track volunteer hours and community efforts.

Management and Strategies

- Systematic adaptive management using predictive models so that the results of different treatments can be compared and approaches can be adapted.
- Great Lakes Phragmites Collaborative and the collective impact approach which uses a common agenda and a system of shared metrics.
- Management plans to address invasive species specifically and invasive species control should also be incorporated into other broader management plans for example plans for forested land or road construction.

c. Needs to Address Invasive Species

Education and Engagement

- Strategic public education and community engagement in the issues and reaching beyond those who are already informed and interested.
- Make sure that education programs are designed to fit each community and a particular audience.
- Target education to those in the landscaping industry including garden centres, contractors, landscapers so that invasive species are not introduced and equipment is cleaned to prevent the spread of invasive species.
- A coordinated Ministry of Transportation commitment in all regions to address invasive species along highways and a program to ensure equipment cleaning to prevent the spread of these species to other locations.

Strategies

- Strategies are needed to address the likelihood of more invasions being the reality in the future as species move north with climate change.
- Research.
- Monitoring and detection of new invasive species moving north due to climate change.

Resources

- Able bodied volunteers, youth involvement and community support and commitment.
- There is some thought that chemical control should be an option in Canada to address Phragmites in the water. Chemical application could be targeted and strategically used. However, this approach is used in the USA and has not put them further ahead in dealing with this invasive species.

Collaboration

- Knowledge sharing amongst concerned groups and organizations to learn from the experience of other groups.
- Multi level government collaboration and information sharing.

d. Opportunities to Better Address Invasive Species

Strategies & Programs

- Implement prevention programs at point of contact and in the field (e.g., boat ramp washing stations and equipment cleaning).
- A combination of physical and tactical chemical solutions.
- Native and non-native Phragmites are being found together and hybrids are emerging that may pose a greater problem. A pilot to do genetic tests could be undertaken and then shared.
- Research and the development and use of new technologies such as the Truxor Amphibious Machine cutter.
- Create a system to report and respond to observation of new invasive species.
- Use of GPS and GIS systems for mapping, location and identification.
- Finding ways to use invasive species and seeking markets for them so the there would be economic value to remove them.

- Research how the invasive species are being used in other countries.
- New business creation (e.g., landscape companies) to tackle invasive species on a fee for service basis.

Resources

- Dedicated staff and a team (could be youth) for removal.
- Strategic and dedicated funding. Provide funding in a strategic manner by funding regional or collaborative approaches rather than spreading scarce resource widely.

Collaboration

- Wider sharing of knowledge and approaches.
- Collaborative programs and networks.
- Innovative partnerships such as using cycling or hiking clubs to help with mapping.

Communication

- Revisit projects that received funding and are now affected by invasive species as a way to communicate the economic and ecological impact and to raise community concern.
- Use an economic loss message that explains how invasive species affect other habitats and the associated economic impacts (e.g., buffer strips).

5. Climate Change Impacts

a. Successful Efforts to Address Climate Change

Resources

- The LAMP and associated documents that support organizations and communities to take action.
- Ontario Centre for Climate Change Impacts and Adaptation provides resources about climate change (http://www.climateontario.ca/).
- Georgian Bay Forever Engineering study identifies approaches to plan ahead in identifying the need for structures.
- Great Lakes Environmental Research Laboratory provides data and reports.
- Environment and Climate Change Canada newsletters and articles.
- Federation of Ontario Cottage Associations provides information about climate change impacts on cottage country.
- Muskoka Watershed Council has developed a discussion paper to build awareness and regional understanding of climate change impacts in Muskoka.

Programs & Action

- The collection of baseline data on Manitoulin and the provision of trends over time. Also, the collection of anecdotal data from landowners to better understand what impacts they're seeing and anticipating.
- Nottawasaga Valley Conservation Authority recently created a climate change strategy that empowers work and action. Nottawasaga Valley Conservation Authority has also identified brook trout as a climate change indicator species, used short climate change videos on youtube for communication,

and is practicing adaptive management through species selection for example picking tree species for climate change resiliency.

- Ausable Bayfield Conservation Authority has implemented a 'Carbon Footprint to Forests' program where individuals can determine how many trees they need to plant to offset their carbon footprint.
- Save ON Energy conservation programs for home and business are designed to make it easier than ever to manage electricity use.
- Tree planting programs and stream restoration programs to protect headwaters.
- Promoting and implementing best management practices such as shoreline buffers for resiliency and encouraging their use on private property.
- Funding assistance to landowners to make a change.
- Monitoring and documenting change including long term monitoring of open water to track changes.
- Managing invasive species.
- Creating beach buffer zones and undertaking restoration.
- Reducing construction near bluffs and gullies.
- The requirement for municipalities to measure climate change and have energy use reduction targets.

Awareness & Education

- The LAMP is used to inform, build awareness and guide action.
- Ausable Bayfield Conservation Authority provides education on the top decisions that can be made to reduce individual carbon footprints.
- Incentive programs to increase uptake and encourage behavioural change.
- Energy forums hosted by organizations for education, community engagement and strategic planning purposes.
- Commute to work challenges.
- Use of bio tools to manage livestock and methane.
- A variety of communication from the complex to the local experience.
- Collection of traditional stories of land and the associated knowledge.
- Build awareness by tying what is happening in a community to climate change.
- Citizen science to collect data about topics that are not being addressed.
- Sharing research results to understand impacts.
- Resilience engineering to create processes that are robust yet flexible, to monitor and revise risk models, and to use resources proactively in the face of disruptions.
- Future focused studies and realizing that understanding is the early stages.

b. Tracking Achievements in Addressing Climate Change

Monitoring & Data

- The LAMP tracks progress and provides updates on a 5-year basis and in the future, will identify actions taken for the lake.
- Severn Sound Environmental Association conducts open water monitoring.
- Nottawasaga Valley Conservation Authority is using brook trout as a climate change indicator in report cards.

- Lake Huron Centre for Coastal Conservation coast watchers is an example of citizen science collection of data about wind, wave, water temp, fish die off and algal blooms.
- Monitoring at multiple scales including: federal, provincial, regional (conservation authorities) and community (citizen science).
- Creating new citizen science monitoring programs to track climate change impacts (lake ice, stream temperature).
- Analyzing long term databases.
- Connecting regional to local data.
- Tributary monitoring.
- Rain logger events.
- Tracking actions of groups and communities.
- Early detection and rapid response programs for invasive species.

Awareness & Perception

- Awareness of global information and perspective so that people can think globally and act locally.
- Municipal participation in the programs offered by conservation authorities.
- Measuring awareness and acceptance through surveys and collecting baseline data on perceptions.
- Providing the opportunity for local discussion of the issues.
- Knowledge sharing opportunities.

c. Needs to Address Climate Change

Collaboration & Participation

- Collective participation from a diversity of groups including environmental, social and economic experts and groups.
- High level coordination and oversight that would facilitate comparison of regional data sets.
- Basin wide monitoring with select monitoring locations to track trends and changes. Consider effectiveness evaluation of this monitoring.
- Standardized approaches, ideas and methods to track actions.
- Provision of support to municipalities to promote greater understanding and participation.
- Build trust and relationships.
- Data sharing between groups (there can be challenges accessing data from partners).
- Landowner cooperation and community buy-in.

Education & Research

- Science to support action.
- Research to focus monitoring and synthesize data.
- Focused studies and evaluation of monitoring data to evaluate effectiveness.
- Evaluate threats to Species at Risk.
- Training for NGOs, conservation authorities and others about climate change related impacts and BMPs.
- Reporting of successes and challenges to identify the most effective approaches and learn from mistakes.

- Public awareness and education about the local impacts of climate change that can reach a variety of audiences and change values and voting.

Action and Approaches

- Effective environmental change at local level (e.g. Municipal level). Barriers need to be eliminated through education, understanding, communications and plans.
- Expanded floodplain planning.
- A coastal climate plan could identify the threats and science needs.
- Create resiliency mapping for shorelines and watersheds to identify areas that need investment to protect ecological function.
- Eliminate pharmaceuticals in sewage treatment.
- Broader reporting of carbon footprints.
- Action on energy consumption technology and consumption.
- Options for green infrastructure to mitigate risk.

d. Opportunities to Better Address Climate Change

Education & Collaboration

- Enhancing agency coordination.
- Convening a dedicated climate change workshop for environmental organizations to learn from peers and other organizations about their approaches and actions.
- Capturing traditional knowledge bases (e.g., farmers).
- Incorporating traditional ecological knowledge into modelling.
- Identifying communication opportunities.
- Creating conceptual frameworks and tools in communities that NGOs, conservation authorities and others can use to start climate change conversations, strategies, reports and templates.
- Using food as a good story to help the public relate to climate change.

Social Change

- Recognizing water as having a spirit and as a ‘person’ to give it a legal standing (e.g., Maori New Zealand and Colorado River).
- Creating social change to instill values that place nature before economics and that can result in lifestyle change.
- Encouraging people to become active and involved in politics to advocate for change.
- Identifying methods of tracking behavioural change.
- Incentivizing action and change through cost savings.
- Undertaking life cycle and full system assessments.
- Creating sustainability plans for communities.
- A paradigm shift in perspective and approaches.

D. Priority Needs Across the Watershed

A plenary session provided an opportunity for the Lake Huron-Georgian Bay Initiative for Community Action Steering Committee to hear priority needs of people and organizations to advance environmental action in the watershed. Summit participants were asked to record their priority needs on a brainstorming sheet, and then post them on a map based on the following four principles of the Initiative.

1. Building Awareness and Capacity

- Build awareness of the Initiative for Community Action and increase assistance/opportunities to provide knowledge and equipment.
- Build partnerships with and support technical capacity for First Nations environmental departments.
- Identify effective citizen engagement approaches to reach a wider audience.
- Promote understanding of the threats at a community and public level.
- Share specific restoration techniques, knowledge and data.
- Create a collective impact structure for action and google groups for a Healthy Lake Huron.

2. Support Community Involvement

- Understand and document the projects that have worked, and which have not been successful.
- Improve access to funding to understand the ecosystems current status in addition to the current funding for restoration.
- Improve access to funding for human resources, training and equipment.
- Identify approaches for recruiting volunteers for boards of organizations and action.
- Identify approaches for connecting landowners to the ecosystem.

- Create a variety of opportunities for community involvement.
- Encourage municipalities to become involved especially where there is no economic incentive.
- Consider all Georgian Bay in the State of the Bay Report.

3. Take Action to Restore

- Collect baseline data (e.g., spawning habitat, invasive species or past restoration projects).
- Focus on habitat protection.
- Provide BMPs to landowners especially in areas where there are no active organizations providing information.
- Incorporate socio-cultural values into the ecological assessment process in a relevant manner.
- Increase monitoring.
- Increase buy-in from municipalities and community members for green infrastructure projects.
- Create a common GIS platform to track projects and initiatives in a comprehensive manner.

4. Measure Success and Adopt

- Undertake more monitoring and baseline data to understand the system status and track changes over time.
- Provide a framework for citizen science and coordinate public reporting.
- Share monitoring results between organizations, agencies and the public.
- Develop a handbook on successful approaches and techniques for conservation, restoration, preservation and community involvement that will encourage some standardization.
- OMNRF should lead a plan to reach the 17% target for lands set aside for conservation and report on its progress.
- Change the use of class 9 pesticides in Ontario that cannot be measured.
- Improve post BMP reporting and landowner follow up.
- Create an independent agency to assess whether current plans are sufficient to meet national targets for greenhouse gas emissions.

Appendix 1 – List of Summit Participants

Agency / Organization	Contact Name
Aamjiwnaang First Nation	1. Johnston, Sharilyn
Ausable Bayfield Conservation Authority	2. Veliz, Mari*
Beaver River Watershed Initiative	3. Crosskill, Debbie 4. McKee, Andy
Blue Mountain Watershed Trust	5. Bristow, Duncan 6. Guyatt, Blanka 7. Juhasz, Stella 8. Kerr, Don 9. Powell, George 10. Smeh, Wendy
Bruce Peninsula Biosphere Association	11. McLeod, Katherine 12. Munk, Neils 13. Stanger, Amanda 14. Thorn, Elizabeth 15. Thorn, Jeremy
Canadian Freshwater Alliance	16. Telfer, Lindsay
Central Algoma Freshwater Coalition	17. Miller, Chuck
Nottawasaga Watershed Improvement Program	18. Waind, Robert B.
Chippewa of Nawash Unceded First Nation	19. Keeshig, Joanne
East Georgian Bay Stewardship Council	20. Krievins, Katrina 21. Sutton, Julia
Environment Climate Change Canada	22. Mayne, Greg* 23. Hyde, Rob 24. Pershbacher, Ellen 25. Youssef, Fatima
French Planning Services Inc.	26. French, Marg 27. French, Randy
Freshwater Future Canada	28. Goucher, Nancy
Georgian Bay Association	29. Duncanson, Bob 30. Stewart, Anne
Georgian Bay Biosphere Reserve	31. Bywater, David 32. Mason, Greg*
Georgian Bay Forever	33. Sweetnam, David
Great Lakes Commission	34. Alexander, Karen
Grey Sauble Conservation Authority	35. Bittorf, John 36. Ferguson, Rebecca
Historic Saugeen Metis	37. McGuire, Jenna
Lake Huron Centre for Coastal Conservation	38. Brenot, Tineasha 39. Cann, Hannah
Lake Superior Watershed Conservancy	40. Burtch, Peter
Maitland Valley Conservation Authority	41. Fleischhauer, Sarah

Agency / Organization	Contact Name
Manitoulin Streams Improvement Association	42. Beaudin, Jesse 43. Deschenes, Seija
Muskoka Watershed Council, District of Muskoka	44. Willison, Rebecca
Nature Conservancy of Canada	45. Batten, Esme 46. Deschamps, Vince
Nottawasaga Valley Conservation Authority	47. Campbell, Sarah 48. Dobbs, Fred
Ontario Ministry of Agriculture, Food and Rural Affairs	49. Colquhoun, Matt 50. Empson Laporte, Jacqui 51. Cushman, Dorienne
Ontario Ministry of Environment and Climate Change	52. Howell, Todd 53. Briggs, Ted *
Ontario Ministry of Natural Resources and Forestry	54. Todd, Craig 55. Ritchie, Jason* 56. Liskauskas, Arunas*
Pine River Watershed Initiative Network	57. Faragher Robertson, Penny 58. Martin, Emily
Saugeen Valley Conservation Authority	59. Anthony, Shaun 60. Harbinson, Jo-Ann
Severn Sound Environmental Association	61. Cayley, Julie 62. Chiandet, Aisha 63. Lesperance, Carl 64. Madill, Paula
South Simcoe Streams Network	65. Pedrazzi, Silvia
St Marys River Remedial Action Plan	66. Derickx, Lisa
St. Clair Region Conservation Authority	67. Van Zwol, Jessica
The Gordon Foundation	68. Livingstone, Aislin
USDA-Natural Resources Conservation Service	69. Shaffer, Ruth

* *Indicates member of Summit Steering Committee*

Appendix 2 – Acronyms

AFN	Aamjiwnaang First Nation
ABCA	Ausable Bayfield Conservation Authority
BMPs	Best Management Practices
CA	Conservation Authority
CABIN	Canadian Aquatic Biomonitoring Network
COA	Canada-Ontario Agreement
ECCC	Environment and Climate Change Canada
GBBR	Georgian Bay Biosphere Reserve
GLWQA	Great Lakes Water Quality Agreement
LAMP	Lakewide Action and Management Plan
NEB	National Energy Board
NGOs	Non-Government Organizations
OBBN	Ontario Benthos Biomonitoring Network
OMAFRA	Ontario Ministry of Agriculture, Food and Rural Affairs
OMNRF	Ontario Ministry of Natural Resources and Forestry
OMOECC	Ontario Ministry of Environment and Climate Change
PRISM	Partnerships for Regional Invasive Species Management