

LAKE HURON CANADIAN NEARSHORE Assessment



2021 HIGHLIGHTS
REPORT

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This document supports Canadian commitments in the 2012 Great Lakes Water Quality Agreement.

The Great Lakes Water Quality Agreement, 2012. Environment and Climate Change Canada and the United States Environmental Protection Agency, 2012.

https://binational.net/wp-content/uploads/2014/05/1094_Canada-USA-GLWQA- e.pdf

The Great Lakes Nearshore Framework, Environment and Climate Change Canada and the United States Environmental Protection Agency, 2016.

<https://binational.net/wp-content/uploads/2016/09/Nearshore-Framework-EN.pdf>

Report prepared by: Janette Anderson, Julia Hatcher, Jody McKenna and Jocelyn Sherwood, Strategic Policy Branch, Environment and Climate Change Canada. Many thanks go to the individuals and agencies who provided data, advice and reviews of this first nearshore assessment of Lake Superior. This assessment would not be possible without the contributions from: Mary Thorburn, Satyendra Bhavsar, and Ashleigh Boucher (the Ontario Ministry of Environment, Conservation and Parks); Dr. Lee Grapentine (ECCC); Dave Gondar (the Ontario Ministry of Northern Development, Mines, Natural Resources and Forestry); Richard Stumpf (National Oceanic and Atmospheric Administration); Michigan Tech Research Institute (MTRI); Peter Zuzek and Kevin Grootendorst (Zuzek Inc.) and ECCC program staff. Supporting Documents and Data Sources are listed at the end of this document.

OVERALL ASSESSMENT OF THE STATE OF NEARSHORE WATERS Resources

Lake Huron Canadian Nearshore Assessment, 2021 Results.

Cat. No.: En164-71/5-2021E-2-PDF; ISBN: 978-0-660-36634-0

Canadian Great Lakes Nearshore Assessment, Detailed Methodology.

Cat. No.: En164-71/1-2021E-PDF; ISBN: 978-0-660-39154-0

Assessment data available from Government of Canada

Open Data: <https://open.Canada.ca/en/open-data>

The Great Lakes Nearshore Framework

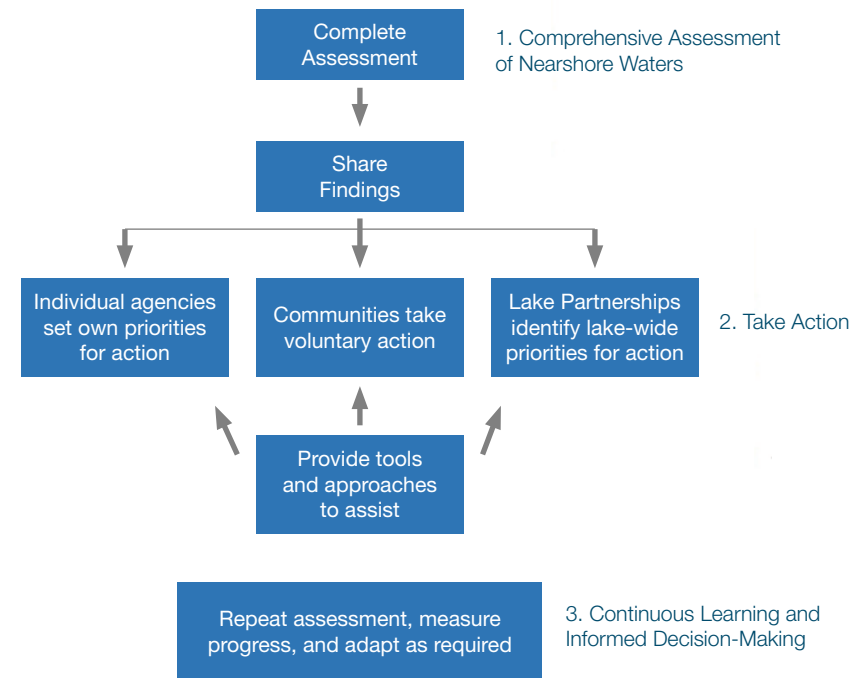
The Nearshore Waters

The waters of the Great Lakes, together with their 16,000 kilometres of coastline, connecting river systems and watersheds are globally significant ecosystems. Nearshore areas are a key priority for restoration and protection because they are the source of drinking water for most communities within the basin, are the areas of the lakes where most human recreation (e.g., swimming, boating, fishing, wildlife viewing) occurs, and are the critical ecological link between watersheds and the open waters of the Great Lakes.

About the Framework

As envisioned by the updated Great Lakes Water Quality Agreement (GLWQA) of 2012, Canada is implementing a “Nearshore Framework” to provide a cumulative effects assessment of nearshore waters; share the information from the assessment; identify areas that would benefit from protection, restoration or prevention activities; and identify causes of impairment and threats. Data used in the assessment came from existing monitoring programs, from a range of partners, and varied in type, format and resolution. Key considerations in the selection of data were the spatial and temporal resolution, availability of the data, and amount of processing required. Using a weight of evidence approach, disparate data that traditionally has been evaluated separately was integrated into the first cumulative assessment of the Lake Huron Canadian Nearshore. Through the sharing of these assessment results and with added detailed local information from communities and organizations, users can set their own priorities and take action. This document describes the findings of the Lake Huron assessment.

Nearshore Framework Components



Long Term Outcomes:

- Improved water quality and ecosystem health at both the local and lake-wide scale;
- Improved and more resilient structure and function of nearshore ecosystems;
- Reduced cumulative impacts of human activities in nearshore areas;
- Decrease in unsustainable uses of nearshore waters;
- Increased provision of ecosystem services from Great Lakes waters; and
- Increased public and partner awareness of the value, stewardship of, and investment in the Great Lakes.

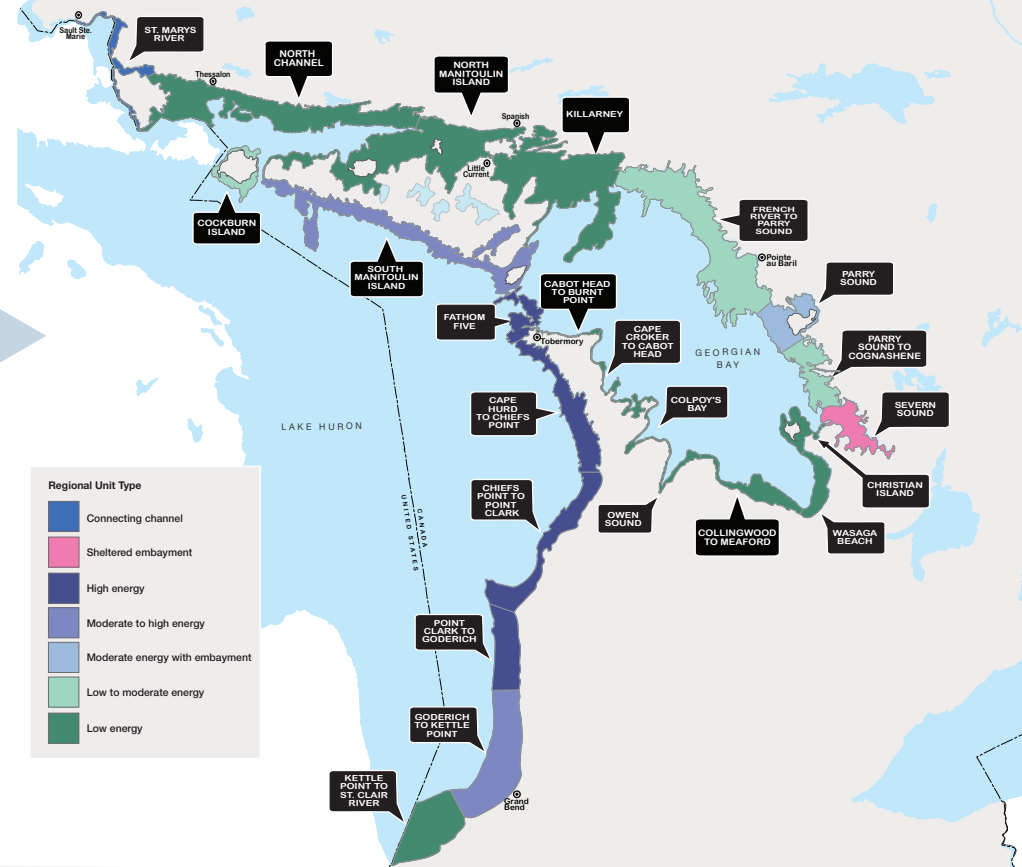
Canadian Assessment Methodology

1

The nearshore was delineated into distinct Regional Units using physical characteristics such as bathymetry (up to 30 m depth), bottom substrate type, wave energy and littoral cells. The units were then classified based on their overall ecological type. These Regional Units provide an ecologically relevant scale for the assessment.

2

The assessment consists of 11 individual measures grouped into four categories that were developed with consideration of the GLWQA General Objectives. Each measure was evaluated to be of low, moderate or high stress based on documented ecological thresholds or best professional judgement, and then grouped into an overall cumulative assessment for each Regional Unit. A special status was assigned to Regional Units where there is concern to human and ecosystem health due to Cyanobacteria.



General Objectives state the waters of the Great Lakes should...

Support healthy & productive habitats to sustain native species; Be free from negative impacts on chemical, physical or biological integrity

Be free from pollutants harmful to humans, wildlife, aquatic organisms

Be free from nutrients in amounts that promote excessive algae & cyanobacteria growth, interfere with ecosystem health or human uses

Be a source of safe, high quality drinking water, allow for consumption of fish/wildlife, swimming and other recreational uses

Measures

Shoreline Hardening
Littoral Barriers
Tributary Connectivity

Water Quality
Sediment Quality
Benthic Community

Cyanobacteria
Cladophora

Beach Postings
Fish Consumption
Treated Drinking Water

Categories

Coastal Processes

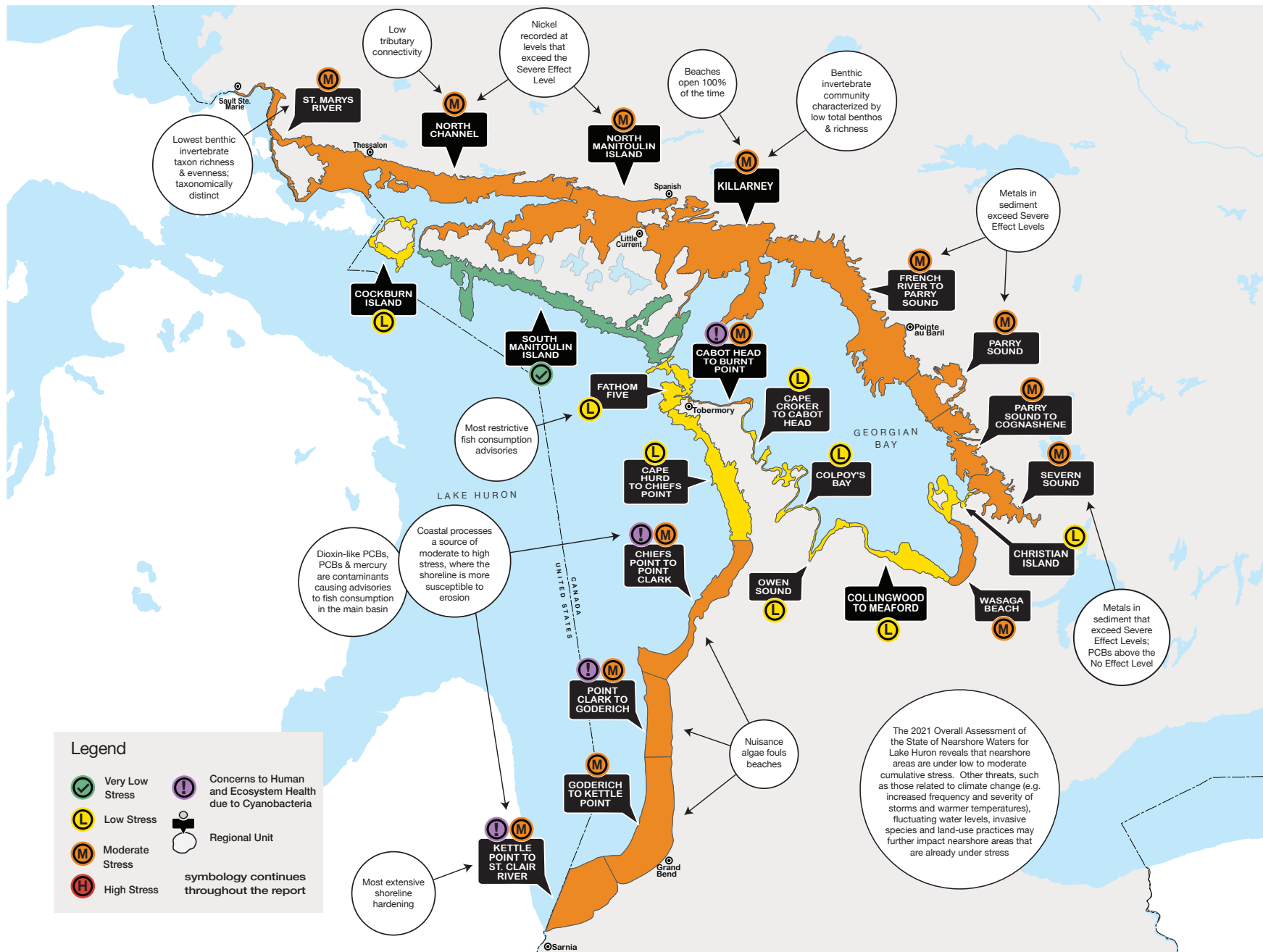
Contaminants in
Water and Sediment

Nuisance and
Harmful Algae

Human Use






Regional Unit
Stress Score

Nearshore Assessment Lake Huron 2021












Description of Assessment Measures & Thresholds

Nuisance & Harmful Algae

Cyanobacteria	Cladophora
<p>Cyanobacteria, a blue-green algae, occurs naturally in freshwater, however an overgrowth of cyanobacteria can result in a harmful algae bloom that can release toxins dangerous to human and ecosystem health. Cyanobacteria is assessed by calculating the extent of a bloom in a Regional Unit in 7-day satellite composites (June – Oct., 2019). An additional flag is assigned to Regional Units where cyanobacteria is a source of high stress, as it is considered a serious concern. Thresholds for severity are based on World Health Organization guidelines; thresholds for extent are based on binational and domestic nutrient management efforts.</p>	<p><i>Cladophora</i> is a native filamentous green algae that typically grows on hard substrate in shallow waters. It can become a nuisance when it detaches from the bottom and washes onto shore where it can foul beaches and water intakes.</p>
<p> No cyanobacteria bloom detected in any 7-day composites</p>	<p> <20% coverage</p>
<p> Cyanobacteria bloom detected in one or more 7-day composites</p>	<p> 20-35% coverage</p>
	<p> >35% coverage</p>

-  Low Stress
-  Moderate Stress
-  High Stress

Contaminants in Water & Sediment

Water Quality	Sediment Quality	Benthic Community
<p>Contaminants in water can have acute and chronic impacts on aquatic organisms that depend on water for some part of their life cycle. Water quality is assessed by determining the number of sampling events for which contaminant levels exceeded Provincial or Federal water quality guidelines at Federal long-term monitoring stations for the most recent sample years (2015, 2017 and 2018). Thresholds are based on best professional judgement.</p>	<p>Contaminants in bottom sediment have the potential to be released into the water column and enter the food chain, which can lead to toxic and reproductive effects in species, as well as bioaccumulation in aquatic life. Sediment quality is assessed using the severity of median contaminant levels in sediment for four categories (metals, organochlorine pesticides, PAHs and PCBs) at Provincial long-term monitoring stations (2009, 2011 and 2015). Thresholds are based on best professional judgement using Provincial & Federal Guidelines.</p>	<p>The general health of an ecosystem may be reflected in the benthic invertebrate community, as composition can vary from habitat conditions and human stressors. Contaminants in benthic communities can bioaccumulate or biomagnify in the food chain and become a source of contamination to other aquatic life and to humans. The benthic community is assessed through statistical analysis of 2010-2014 Environment and Climate Change data using total benthos, taxon richness and evenness. Thresholds were set by a statistical analysis.</p>
<p> 0 exceedances</p>	<p> <ul style="list-style-type: none"> • PCBs < No Effect Level • Organochlorine pesticides & PAHs < Lowest Effect Levels • Metals < Probable or Severe Effect Levels </p>	<p> Benthic community condition is functional</p>
<p> 1 - 2 exceedances</p>	<p> <ul style="list-style-type: none"> • PCBs > No Effect Level OR • Organochlorine pesticides & PAHs > Lowest Effect Levels OR • Metals > Probable Effect Levels but < Severe Effect Levels </p>	<p> Benthic community condition degraded but functional</p>
<p> >2 exceedances</p>	<p> Any contaminant > Severe Effect Level</p>	<p> Benthic community condition degraded and not functional</p>

Description of Assessment Measures & Thresholds (cont.)

Coastal Processes

Shoreline Hardening	Littoral Barriers	Tributary Connectivity
<p>Across the Great Lakes, much of the nearshore, waters edge or back of beach has been altered with engineered structures or artificial material. Hardened shorelines reduce coastal resiliency by altering sediment dynamics, accelerating erosion, increasing water turbidity & eliminating local vegetation. Shoreline hardening is assessed by determining the percent of the total length of shoreline in a Regional Unit that is hardened. Thresholds are based on best professional judgement.</p>	<p>The supply, transport and deposition of sediment are natural processes that form and maintain coastal features like wetlands and beaches. Artificial shore perpendicular structures (littoral barriers) can disrupt natural movements of sediment and affect the integrity of ecosystems. Littoral barriers is assessed by counting the number of littoral barriers (>100 m in length) in a Regional Unit. Thresholds are based on best professional judgement.</p>	<p>Connectivity between watersheds and the nearshore supports healthy habitats and promotes natural physical processes. Barriers to connectivity can restrict access of fishes to spawning/nursery habitats and alter nutrient flows and coastal processes. Tributary connectivity is assessed by calculating the percent of the total length of tributaries flowing into a Regional Unit that are connected to the nearshore. Thresholds are based on the State of the Great Lakes Aquatic Habitat Connectivity sub-indicator for Aquatic Habitat Connectivity.</p>
<p>L <25% of the shoreline has been hardened</p>	<p>L 0 littoral barriers</p>	<p>L >75% of the total length of tributaries are connected to the Regional Unit</p>
<p>M 25-50% of the shoreline has been hardened</p>	<p>M 1 littoral barrier</p>	<p>M 25 to 75% of the total length of tributaries are connected to the Regional Unit</p>
<p>H >50% of the shoreline has been hardened</p>	<p>H >1 littoral barriers</p>	<p>H < 25% of the total length of tributaries are connected to the Regional Unit</p>

Human Use

Beach Postings	Fish Consumption	Treated Drinking Water
<p>Across Lake Huron, public beaches are popular recreation spots and use should not be restricted by environmental quality concerns. Poor water quality at beaches due to bacterial contamination can have negative effects on human health and limit recreational use. Beach postings are assessed by calculating the average percent of time that beaches within a Regional Unit were posted as unsafe for swimming during July and August of 2016 -2020. Thresholds are based on best professional judgement.</p>	<p>In Lake Huron, fish such as Lake Trout, Rainbow Trout, Yellow Perch, Smallmouth Bass, and Walleye are a diverse and accessible source of food. Different fish species are targeted in different regions of the lake therefore different species were considered for each Regional Unit. Depending on the size and location, harmful substances such as PCBs and Mercury can result in consumption advisories in fish species. Fish consumption is assessed by calculating the average number of meals per month recommended for size classes most representative of fish caught and kept for consumption. Thresholds based on best professional judgement through consultation with MECP.</p>	<p>The Great Lakes are a source of drinking water for millions of Canadians and should not have an adverse impact on human health. Water intended for human consumption should not contain disease-causing organisms (e.g. E.coli) or other hazardous concentrations of toxic chemicals or radioactive substances. Treated drinking water is assessed by determining whether adverse water quality incidents were reported at any water treatment plants between 2015 and 2020. Thresholds based on Ontario Drinking Water Quality Standards.</p>
<p>L Beaches posted for 5% or less of the time</p>	<p>L ≥ 8 meals per month</p>	<p>L No adverse water quality incidents</p>
<p>M Beaches posted 5 to 20% of the time</p>	<p>M 1-7 meals per month</p>	<p>H Adverse water quality incident reported</p>
<p>H Beaches posted more than 20% of the time</p>	<p>H <1 meal per month</p>	

St. Marys River

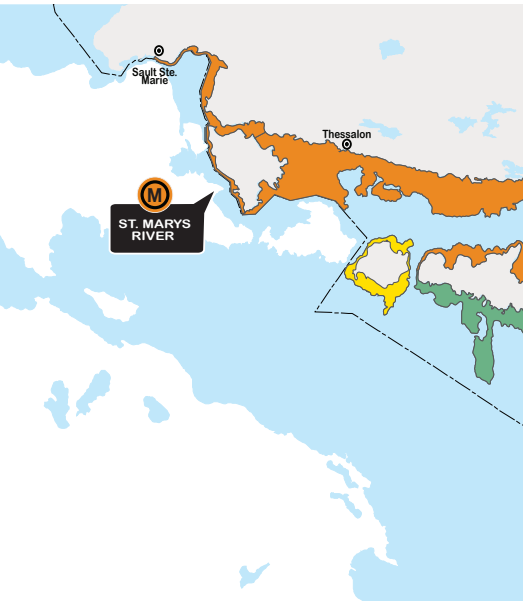
Ecological Unit Type:

Connecting Channel Embayment

Area (ha): 14,000

M Moderate Stress

The St. Marys River is under moderate stress from the cumulative impact of poor benthic community quality and beach postings. Benthic communities were taxonomically distinct from all other Regional Units with the lowest richness and evenness. The one monitored beach was posted an average of 12.5% of the swimming season. There are no ambient monitoring data for water or sediment quality in the river, although more localized information will be available for ongoing efforts in the binational St. Marys River Area of Concern. Canada and Ontario have drafted a contaminated sediment strategy which outlines actions to manage specific locations on the Canadian side and community engagement is ongoing. At 8 meals per month for Smallmouth Bass, Walleye and Yellow Perch, fish consumption is a source of low stress.



- Large areas of intact natural shoreline
- Major conduit between Lake Superior and Lake Huron: relatively short length (approx. 120 km) and high flow volumes create a variety of habitats
- Upper River: rapids with facilities and channels for navigation, hydropower, water regulation
- Diverse fish community supported by large areas of coastal habitat
- Critical habitat and corridor for lake sturgeon

L Coastal Processes

SHORELINE HARDENING
16% Hardened

LITTORAL BARRIERS
Not applicable: littoral drift is not a significant process in this Regional Unit

TRIBUTARY CONNECTIVITY
75% of the total length of tributaries are hydrologically connected to Lake Huron

H Contaminants in Water and Sediment

WATER QUALITY
Data Gap: no recent sampling

SEDIMENT QUALITY
Data Gap: no ambient sampling within Regional Unit

BENTHIC COMMUNITY
Lowest taxon richness and evenness

L Nuisance and Harmful Algae

CYANOBACTERIA
No Blooms

CLADOPHORA
Not applicable: conditions not conducive to *Cladophora* growth

M Human Use

BEACH POSTINGS
Monitored beaches were posted 13% of the time in July & August

FISH CONSUMPTION
8 meals/month

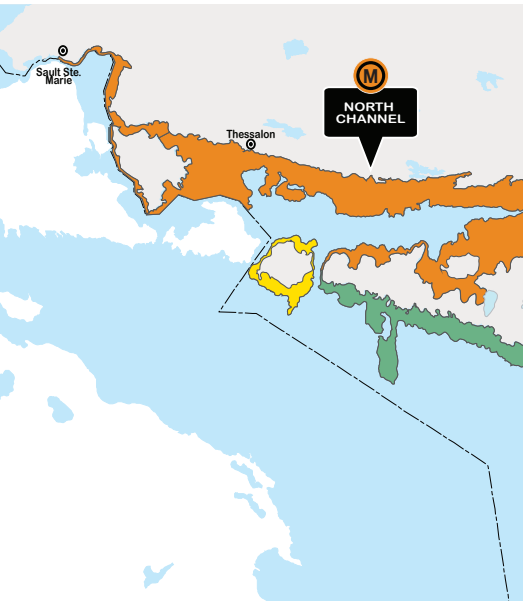
TREATED DRINKING WATER
No adverse water quality incidents

North Channel

Ecological Unit Type:
Low Energy
 Area (ha): 131,300

M Moderate Stress

The North Channel is under moderate stress from the cumulative impact of low tributary connectivity, contaminants in water and sediment and restrictions on fish consumption. Barriers on the Blind River, Lauzon Lake and at Espanola impede connectivity for 93% of the total length of tributaries. Water and sediment quality are sources of moderate and high stress, respectively, due to contaminants recorded at levels that exceed provincial guidelines. With an average of 6 meals per month for Smallmouth Bass, Walleye and Yellow Perch, fish consumption is a source of moderate stress and advisories are due to mercury and PCBs. Three (Sellers Park Beach, Beharriell Park and Forbes Park) of the seven beaches were open 100% of the swimming season.



- Bedrock shores and cliffs
- Dense archipelagoes of small Precambrian Shield islands
- Spanish River delta: important deposition zone with coastal wetlands
- Confluence of large rivers with the North Channel provides diverse fish assemblages
- Unusual coastal features including bedrock islands resembling whalebacks
- Mississagi River Delta
 - Unique “birdsfoot delta”
 - Important lake sturgeon spawning area
 - Potential lake trout and lake whitefish spawning areas

M Coastal Processes

L **SHORELINE HARDENING**
 6% Hardened

NA **LITTORAL BARRIERS**
 Not applicable: littoral drift is not a significant process in this Regional Unit

H **TRIBUTARY CONNECTIVITY**
 7% of the total length of tributaries are hydrologically connected to Lake Huron

M Contaminants in Water and Sediment

M **WATER QUALITY**
 1 contaminant found in excess of guidelines (Anthracene)

H **SEDIMENT QUALITY**
 1 metal found above the Severe Effect Level

M **BENTHIC COMMUNITY**
 Low total benthos and richness but high evenness

L Nuisance and Harmful Algae

L **CYANOBACTERIA**
 No Blooms

? **CLADOPHORA**
 Unable to verify result

M Human Use

M **BEACH POSTINGS**
 Monitored beaches were posted 5% of the time in July & August

M **FISH CONSUMPTION**
 6 meals/month

L **TREATED DRINKING WATER**
 No adverse water quality incidents

North Manitoulin Island

Ecological Unit Type:
Low Energy
 Area (ha): 125,000

M Moderate Stress

North Manitoulin Island is under moderate stress from the cumulative impact of contaminants in sediment, moderate benthic community quality and fish consumption advisories. Nickel was recorded at concentrations in sediment that exceed the provincial Severe Effect Level, and the benthic community is characterized by low total benthos and taxon richness. Fish consumption advisories for Smallmouth Bass, Walleye and Yellow Perch are related to mercury. Three of the four monitored beaches were open 100% of the swimming season (Gore Bay Beach, Maple Ridge Sandy Beach and Little Current Beach) and Kagawong Village Beach was posted as unsafe for swimming 4% of the time.



- Bedrock shores and cliffs
- Remnant lake sturgeon populations
- Several large protected areas including La Cloche Provincial Park
- commercial fish farms grow rainbow trout
- Limestone alvar islands west of Little Current
- La Cloche Ridge on the north shore (unusual geological formation)
- Recognized as one of the best freshwater boating areas of the world

M Coastal Processes

L **SHORELINE HARDENING**
 1% Hardened

NA **LITTORAL BARRIERS**
 Not applicable: littoral drift is not a significant process in this Regional Unit

M **TRIBUTARY CONNECTIVITY**
 70% of the total length of tributaries are hydrologically connected to Lake Huron

M Contaminants in Water and Sediment

L **WATER QUALITY**
 No contaminants found in excess of guidelines

H **SEDIMENT QUALITY**
 1 metal found above the Severe Effect Level

M **BENTHIC COMMUNITY**
 Low total benthos & richness

L Nuisance and Harmful Algae

L **CYANOBACTERIA**
 No Blooms

? **CLADOPHORA**
 Unable to verify results

L Human Use

L **BEACH POSTINGS**
 Monitored beaches were posted 1% of the time in July & August

M **FISH CONSUMPTION**
 7 meals/month

L **TREATED DRINKING WATER**
 No adverse water quality incidents

Cockburn Island

Ecological Unit Type:
Low to Moderate Energy
 Area (ha): 14,200

L Low Stress

Cockburn Island is under low cumulative stress. Although there is no data available to assess sediment quality or benthic community condition, water quality meets all guidelines. Fish consumption advisories for Smallmouth Bass, Walleye and Yellow Perch are a source of low stress however there are no monitored beaches or drinking water treatment plants so the Human Use category could not be assessed. Cockburn Island is separated from the westernmost point of Manitoulin Island by the Mississagi Strait and a large portion of it is privately owned and conserved.



- Supports a variety of globally significant species
- One of the most undisturbed islands in the Great Lakes
- Year round population: 1
- >60% of the island is protected
- Stopover and breeding habitat for migrating songbirds and waterfowl



L Coastal Processes

L **SHORELINE HARDENING**
 <1% Hardened

NA **LITTORAL BARRIERS**
 Not applicable: littoral drift is not a significant process in this Regional Unit

L **TRIBUTARY CONNECTIVITY**
 100% of the total length of tributaries are hydrologically connected to Lake Huron

? Contaminants in Water and Sediment

L **WATER QUALITY**
 No contaminants found in excess of guidelines

? **SEDIMENT QUALITY**
 Data Gap: no sampling stations within Regional Unit

? **BENTHIC COMMUNITY**
 Data Gap: no sampling stations within Regional Unit

L Nuisance and Harmful Algae

L **CYANOBACTERIA**
 No Blooms

? **CLADOPHORA**
 Unable to verify results

? Human Use

NA **BEACH POSTINGS**
 Not applicable: no monitored beaches within the Regional Unit

L **FISH CONSUMPTION**
 9 meals/month

NA **TREATED DRINKING WATER**
 Not applicable: no drinking water plant

South Manitoulin Island

Ecological Unit Type:
Moderate to High Energy
 Area (ha): 92,000

L Very Low Stress

South Manitoulin Island is under very low cumulative stress. All four categories are assessed as low stress and each measure where data was available is low stress. Manitoulin is the largest freshwater island in the world, and it is largely unaltered. Less than 1% of the shoreline has been altered and most tributaries are connected to the lake. South Baymouth Beach was open for 100% of the swimming season and Providence Bay Beach for 97% of the swimming season. Fish consumption advisories for Rainbow Trout, Lake Trout and Yellow Perch reflect low stress.



- Manitoulin Island: Largest freshwater island in the world
- Highly productive fishery
- Limestone dominates the coast
- Very high diversity of high quality ecosystems: sand beaches, dunes, alvars, cobble beaches & steep coastal cliffs
- Nearshore and offshore spawning reefs; littoral nursery habitat

L Coastal Processes

L **SHORELINE HARDENING**
 <1% Hardened

NA **LITTORAL BARRIERS**
 Not applicable; littoral drift is not a significant process in this Regional Unit

L **TRIBUTARY CONNECTIVITY**
 79% of the total length of tributaries are hydrologically connected to Lake Huron

L Contaminants in Water and Sediment

L **WATER QUALITY**
 No contaminants found in excess of guidelines

L **SEDIMENT QUALITY**
 0 contaminants found in excess of guidelines

? **BENTHIC COMMUNITY**
 Data Gap: no sampling stations within Regional Unit

L Nuisance and Harmful Algae

L **CYANOBACTERIA**
 No Blooms

? **CLADOPHORA**
 Unable to verify results

L Human Use

L **BEACH POSTINGS**
 Monitored beaches were posted 2% of the time in July & August

L **FISH CONSUMPTION**
 8 meals/month

L **TREATED DRINKING WATER**
 No adverse water quality incidents

Killarney

Ecological Unit Type:
Low Energy
 Area (ha): 141,000



M Moderate Stress

The Killarney Regional Unit is under moderate stress from the cumulative impact of low tributary connectivity, poor benthic community quality and fish consumption advisories. Barriers at Three Narrows, George Lake and Collins Inlet impede connectivity for approximately 715 km of tributaries. The benthic invertebrate community is degraded due to low total benthos and richness. Fish consumption advisories for Smallmouth Bass, Walleye and Yellow Perch are related to mercury. Both of the beaches, Sheguindah and Manitowaning, are on Manitoulin Island and were open for 100% of the swimming season.



- Extensive coastal wetlands; provincially significant
- Lake trout sanctuary
- North Coast = iconic pink granite
- Spawning habitat for lake trout, lake whitefish, walleye, lake sturgeon, muskellunge
- McGregor Bay was a favourite site of the Group of Seven

M Coastal Processes

L **SHORELINE HARDENING**
 <1% Hardened

NA **LITTORAL BARRIERS**
 Not applicable; littoral drift is not a significant process in this Regional Unit

M **TRIBUTARY CONNECTIVITY**
 58% of the total length of tributaries are hydrologically connected to Lake Huron

M Contaminants in Water and Sediment

L **WATER QUALITY**
 No contaminants found in excess of guidelines

? **SEDIMENT QUALITY**
 Data Gap: no sampling stations within Regional Unit

H **BENTHIC COMMUNITY**
 Low total benthos & richness

L Nuisance and Harmful Algae

L **CYANOBACTERIA**
 No Blooms

? **CLADOPHORA**
 Unable to verify results

L Human Use

L **BEACH POSTINGS**
 Monitored beaches were posted 0% of the time in July & August

M **FISH CONSUMPTION**
 7 meals/month

L **TREATED DRINKING WATER**
 No adverse water quality incidents

French River to Parry Sound

Ecological Unit Type:
Low to Moderate Energy
 Area (ha): 147,500

M Moderate Stress

French River to Parry Sound is under moderate stress from the cumulative impact of low tributary connectivity, degraded benthic and sediment quality and fish consumption advisories. Dams at Moose Lake, Harris Lake and the Naiscoot River impede tributary flow for 64% of the tributaries downstream of a waterfall. Nickel was recorded at concentrations in sediment that exceed the provincial Severe Effect Level, and the benthic community quality is moderate. Advisories for consumption of Smallmouth Bass, Walleye and Yellow Trout are related to mercury and are a source of moderate stress. The beach at Sturgeon Bay Provincial Park was posted an average of 6% of the swimming season.



- Most extensive and high quality coastal wetland complexes in the Great Lakes
- UNESCO Biosphere Reserve: stretches approximately 200 km from French River to Severn River
- Critical spawning channel
- Georgian Bay: Largest freshwater archipelago in the world
- Important Bird Area: Limestone Islands
- Habitat for Walleye, Lake Sturgeon and Muskellunge
- Highly variable shoreline, high level of biodiversity

M Coastal Processes

L **SHORELINE HARDENING**
 <1% Hardened

NA **LITTORAL BARRIERS**
 Not applicable: littoral drift is not a significant process in this Regional Unit

M **TRIBUTARY CONNECTIVITY**
 36% of the total length of tributaries are hydrologically connected to Lake Huron

M Contaminants in Water and Sediment

L **WATER QUALITY**
 No contaminants found in excess of guidelines

H **SEDIMENT QUALITY**
 1 metal found above the Severe Effect Level

M **BENTHIC COMMUNITY**
 Moderate total benthos; high richness & evenness

L Nuisance and Harmful Algae

L **CYANOBACTERIA**
 No Blooms

? **CLADOPHORA**
 Unable to verify results

M Human Use

M **BEACH POSTINGS**
 Monitored beaches were posted 6% of the time in July & August

M **FISH CONSUMPTION**
 7 meals/month

NA **TREATED DRINKING WATER**
 Not applicable: no drinking water plant

Parry Sound

Ecological Unit Type:

Moderate Energy with embayment

Area (ha): 31,900

M Moderate Stress

Parry Sound is under moderate stress from the cumulative impact of low tributary connectivity, contaminants in sediment and fish consumption advisories. Barriers at Nine Mile Lake and the Seguin River impede tributary connectivity and are a source of moderate stress. Although the benthic invertebrate community exhibits the highest total benthos, richness and evenness, metals were detected in sediment above provincial guidelines and are a source of high stress. Fish consumption advisories for Smallmouth Bass, Walleye and Yellow Perch are related to mercury. Waubuno Beach was posted as unsafe for swimming an average of 5% of the swimming season but all five beaches at Killbear Provincial Park were open 100% of the swimming season.



- Parry Sound: deep (~100 m) and sheltered from Georgian Bay
- Parry Sound houses the world's deepest natural freshwater port
- Hundreds of small islands along the coast
- Killbear Provincial Park - rugged, rocky shoreline mixed with numerous sand beaches
- Spawning habitat for Lake Trout, Lake Whitefish, Cisco, Smallmouth Bass

M Coastal Processes

L **SHORELINE HARDENING**
4% Hardened

NA **LITTORAL BARRIERS**
Not applicable: littoral drift is not a significant process in this Regional Unit

M **TRIBUTARY CONNECTIVITY**
51% of the total length of tributaries are hydrologically connected to Lake Huron

M Contaminants in Water and Sediment

L **WATER QUALITY**
No contaminants found in excess of guidelines

H **SEDIMENT QUALITY**
1 metal above Severe Effect Level

L **BENTHIC COMMUNITY**
Highest total benthos; richness & evenness

L Nuisance and Harmful Algae

L **CYANOBACTERIA**
No Blooms

? **CLADOPHORA**
Unable to verify results

M Human Use

L **BEACH POSTINGS**
Monitored beaches were posted 1% of the time in July & August

M **FISH CONSUMPTION**
7 meals/month

NA **TREATED DRINKING WATER**
Not applicable: no drinking water plant

Parry Sound to Cognashene

Ecological Unit Type:
Low to Moderate Energy
 Area (ha): 34,100

M Moderate Stress

Parry Sound to Cognashene is under moderate stress from the cumulative impact of low tributary connectivity, moderate sediment quality and a degraded but functional benthic community. Much of the tributaries are naturally disconnected by waterfalls, but 41% of those downstream of a waterfall are disconnected from the nearshore by dams. Sediment quality is a source of moderate stress due to PAHs recorded at levels above federal guidelines. Low total benthos characterize the benthic community quality, resulting in moderate stress. With an average of 8 meals per month of Smallmouth Bass, Walleye and Yellow Perch, fish consumption is a source of low stress.



- Moon River Archipelago : regional biodiversity hotspot
- Provincially significant wetlands at Twelve Mile Bay and Tadenac Bay
- Habitat for cool and warm-water fish species
- Coastal bedrock
- Muskellunge spawning habitat

M Coastal Processes	M Contaminants in Water and Sediment	L Nuisance and Harmful Algae	? Human Use
<p>L SHORELINE HARDENING <1% Hardened</p> <p>NA LITTORAL BARRIERS Not applicable: littoral drift is not a significant process in this Regional Unit</p> <p>M TRIBUTARY CONNECTIVITY 59% of the total length of tributaries are hydrologically connected to Lake Huron</p>	<p>? WATER QUALITY Data Gap: no recent sampling</p> <p>M SEDIMENT QUALITY Metals and PAHs found at levels above guidelines</p> <p>M BENTHIC COMMUNITY Low total benthos</p>	<p>L CYANOBACTERIA No Blooms</p> <p>? CLADOPHORA Unable to verify results</p>	<p>NA BEACH POSTINGS Not applicable: no monitored beaches within the Regional Unit</p> <p>L FISH CONSUMPTION 8 meals/month</p> <p>NA TREATED DRINKING WATER Not applicable: no drinking water plant</p>

Severn Sound

Ecological Unit Type:
Sheltered Embayment
 Area (ha): 26, 900

M Moderate Stress

The Severn Sound Regional Unit is under moderate stress from the cumulative impact of impaired coastal processes, contaminants in sediment and fish consumption advisories. Severn Sound has the second lowest overall tributary connectivity, with 91% of the total length of tributaries disconnected from the nearshore. In addition, there is shoreline alteration associated with hardening and dredging. Metals were detected in sediment in levels that exceed provincial Severe Effect Levels, resulting in high stress. Fish consumption advisories for Smallmouth Bass, Walleye and Yellow Perch are related to mercury contamination. Of the six beaches, MacKenzie Beach was posted as unsafe for swimming for the most amount of time (19% of the swimming season), then Patterson Park Beach (7.5%), Gawley Park Beach (6.7%), Magnus Park (5%), Huronia Park Penetang (4%) and Port Severn (0%).



- Former Great Lakes Area Of Concern (delisted in 2003)
- Complex group of productive bays and coastal wetlands
- RAMSAR site: Matchedash Bay
- Spawning and nursery habitat for a variety of cool and warm-water fish species
- Georgian Bay Islands National Park: barren, glacier-scraped rock and windswept pines

H Coastal Processes	M Contaminants in Water and Sediment	L Nuisance and Harmful Algae	M Human Use
<p>M SHORELINE HARDENING 32% Hardened</p> <p>NA LITTORAL BARRIERS Not applicable: littoral drift is not a significant process in this Regional Unit</p> <p>H TRIBUTARY CONNECTIVITY 9% of the total length of tributaries are hydrologically connected to Lake Huron</p>	<p>L WATER QUALITY No contaminants found in excess of guidelines</p> <p>H SEDIMENT QUALITY Metals and PCBs found at levels above guidelines</p> <p>M BENTHIC COMMUNITY Low total benthos & taxon richness</p>	<p>L CYANOBACTERIA No Blooms</p> <p>NA CLADOPHORA Not applicable: conditions not conducive to <i>Cladophora</i> growth</p>	<p>M BEACH POSTINGS Monitored beaches were posted 7% of the time in July & August</p> <p>M FISH CONSUMPTION 7 meals/month</p> <p>L TREATED DRINKING WATER No adverse water quality incidents</p>

Christian Island

Ecological Unit Type:
Low Energy
 Area (ha): 13,100



L Low Stress

Christian Island is under low cumulative stress. Tributary connectivity is high and only a small amount of the shoreline has been altered – mostly on the mainland. The benthic invertebrate community is functional but degraded, characterized by low average total benthos. Fish consumption advisories for Rainbow Trout, Lake Trout, Walleye and Yellow Perch are a source of low stress. The four monitored beaches are all at Awenda Provincial Park; two were posted as unsafe for swimming 2.5% of the swimming season and two were open for 100% of the swimming season.



- Favorite destination for scuba divers: many shipwrecks (most going back a century or more)
- Christian Island Lighthouse is one of six “Imperial Towers” on Lake Huron
- Sediment is mainly sand – remnants of Glacial Lake Algonquin
- Limestone bedrock
- “Ice Age Grass” – a prehistoric species, has been found on the island

L Coastal Processes

L **SHORELINE HARDENING**
 12% Hardened

NA **LITTORAL BARRIERS**
 Not applicable: littoral drift is not a significant process in this Regional Unit

L **TRIBUTARY CONNECTIVITY**
 100% of the total length of tributaries are hydrologically connected to Lake Huron

M Contaminants in Water and Sediment

L **WATER QUALITY**
 No contaminants found in excess of guidelines

? **SEDIMENT QUALITY**
 Data Gap: no sampling stations within Regional Unit

M **BENTHIC COMMUNITY**
 Moderate total benthos; high richness & evenness

L Nuisance and Harmful Algae

L **CYANOBACTERIA**
 No Blooms

? **CLADOPHORA**
 Unable to verify results

L Human Use

L **BEACH POSTINGS**
 Monitored beaches were posted 1% of the time in July & August

L **FISH CONSUMPTION**
 9 meals/month

NA **TREATED DRINKING WATER**
 Not applicable: no drinking water plant

Wasaga Beach

Ecological Unit Type:
Low Energy
 Area (ha): 19,300

M Moderate Stress

The Wasaga Beach Regional Unit is under moderate stress. The benthic invertebrate community is characterized by the lowest total benthos of all Regional Units. Although coastal processes are low stress overall, barriers impede connectivity for 74% of the total length of tributaries. Fish consumption advisories for Rainbow Trout, Lake Trout, Walleye and Yellow Perch are low stress. There are six monitored beaches; the beach at Jackson Park was posted as unsafe for swimming 19% of the swimming season, Woodland Beach was posted 11%, Wasaga Beach Zone A was posted 7% and Wasaga Beach Zone B was posted for 2% of the swimming season. Two beaches (Wasaga Beach Zone C and Tiny Beaches Road North) were open for 100% of the swimming season.



- Wasaga Beach is the longest freshwater beach in the world
- Nottawasaga River important Lake Sturgeon spawning habitat
- First provincial park in Canada to be awarded the “Blue Flag” designation: Wasaga Beach
- Nottawasaga River system one of largest producers of Rainbow Trout and Chinook Salmon in Lake Huron basin
- Extensive sand beaches and coastal dune systems

L Coastal Processes

L **SHORELINE HARDENING**
 25% Hardened

L **LITTORAL BARRIERS**
 0 littoral barriers

M **TRIBUTARY CONNECTIVITY**
 26% of the total length of tributaries are hydrologically connected to Lake Huron

M Contaminants in Water and Sediment

? **WATER QUALITY**
 Data Gap: no recent sampling

L **SEDIMENT QUALITY**
 No contaminants found in excess of guidelines

M **BENTHIC COMMUNITY**
 Lowest total benthos

L Nuisance and Harmful Algae

L **CYANOBACTERIA**
 No Blooms

? **CLADOPHORA**
 Unable to verify results

M Human Use

M **BEACH POSTINGS**
 Monitored beaches were posted 7% of the time in July & August

L **FISH CONSUMPTION**
 9 meals/month

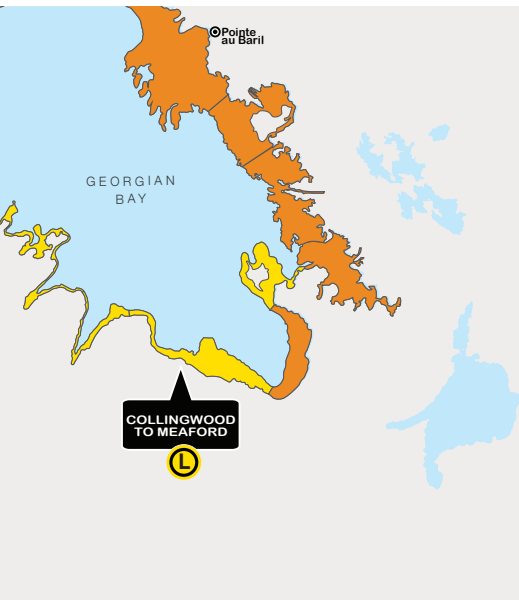
NA **TREATED DRINKING WATER**
 Not applicable: no drinking water plant

Collingwood to Meaford

Ecological Unit Type:
Low Energy
 Area (ha): 24,700

L Low Stress

Collingwood to Meaford is under low cumulative stress. No contaminants were found in water or sediment above guidelines. With an average of 9 meals per month for Rainbow Trout, Lake Trout, Walleye and Yellow Perch, fish consumption is low stress. Coastal processes are a source of moderate stress, with barriers that impede tributary connectivity and shoreline alteration related to recreational development. The beach at Little River Park was posted as unsafe for swimming 17% of the swimming season and Northwinds Beach was posted 9% of the swimming season.



- Collingwood AOC: first AOC to be delisted in the Great Lakes (1994)
- Silver Creek Wetland Complex: provincially significant
- Fractured oil shale plates at Craigeleith Provincial Park contain fossils >450 million years old
- Mary Ward shoal system: important fish spawning area
- Cobble shores

M Coastal Processes	L Contaminants in Water and Sediment	L Nuisance and Harmful Algae	L Human Use
<p>M SHORELINE HARDENING 45% Hardened</p> <p>NA LITTORAL BARRIERS Not applicable: littoral drift is not a significant process in this Regional Unit</p> <p>M TRIBUTARY CONNECTIVITY 45% of the total length of tributaries are hydrologically connected to Lake Huron</p>	<p>L WATER QUALITY No contaminants found in excess of guidelines</p> <p>L SEDIMENT QUALITY No contaminants found in excess of guidelines</p> <p>? BENTHIC COMMUNITY Data Gap: no sampling stations within Regional Unit</p>	<p>L CYANOBACTERIA No Blooms</p> <p>? CLADOPHORA Unable to verify results</p>	<p>M BEACH POSTINGS Monitored beaches were posted 13% of the time in July & August</p> <p>L FISH CONSUMPTION 9 meals/month</p> <p>L TREATED DRINKING WATER No adverse water quality incidents</p>

Owen Sound

Ecological Unit Type:

Low Energy

Area (ha): 6,200

L Low Stress

Owen Sound is under low cumulative stress. No contaminants were recorded in water or sediment at levels of concern. Fish consumption advisories for Rainbow Trout, Lake Trout, Walleye and Yellow Perch are a source of low stress. A moderate amount of the shoreline has been altered, particularly along the west side of the Regional Unit. The benthic invertebrate community is taxonomically distinct from other areas but is characterized by low evenness.



- Mouth of the Sydenham River
- Indian Falls: 15 m high waterfall formed by erosion of soft shale under hard dolomite
- Lake Sturgeon (Great Lakes - upper St. Lawrence River population) and Deepwater Sculpin
- Owen Sound Bay depth ranges from 75 to 100 m
- Fairly steep nearshore slope

M Coastal Processes

M **SHORELINE HARDENING**
35% Hardened

NA **LITTORAL BARRIERS**
Not applicable: littoral drift is not a significant process in this Regional Unit

L **TRIBUTARY CONNECTIVITY**
89% of the total length of tributaries are hydrologically connected to Lake Huron

L Contaminants in Water and Sediment

L **WATER QUALITY**
No contaminants found in excess of guidelines

L **SEDIMENT QUALITY**
Metals found in sediment but not at levels of concern

M **BENTHIC COMMUNITY**
High total benthos; low evenness

L Nuisance and Harmful Algae

L **CYANOBACTERIA**
No Blooms

? **CLADOPHORA**
Unable to verify results

L Human Use

NA **BEACH POSTINGS**
Not applicable: no monitored beaches within the Regional Unit

L **FISH CONSUMPTION**
9 meals/month

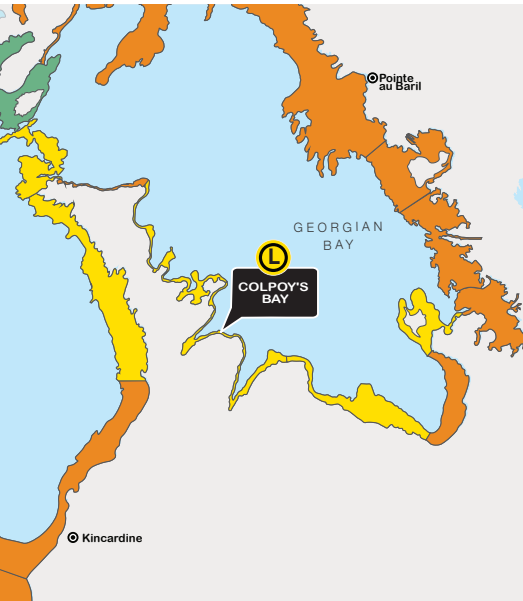
L **TREATED DRINKING WATER**
No adverse water quality incidents

Colpoy's Bay

Ecological Unit Type:
Low Energy
 Area (ha): 3,300

L Low Stress

The Colpoy's Bay Regional Unit is under low cumulative stress. Although tributary connectivity is high, shoreline alteration is a source of moderate stress. Most of the altered shoreline is along the coast near Wiarton. The benthic community is characterized by high evenness. Fish consumption advisories for Rainbow Trout, Lake Trout, Walleye and Yellow Perch are a source of low stress but there are no monitored beaches or treated drinking water plants so the Human Use category could not be assessed.



- Lake Sturgeon (Great Lakes – upper St. Lawrence River population)
- Clear water: popular area for diving & exploring the shoreline
- Steep limestone cliffs
- Unique shoreline features caused by uneven erosion of the Niagara Escarpment
- Gundersen Shoal, fishing location off White Cloud Island

M Coastal Processes

M **SHORELINE HARDENING**
 25% Hardened

NA **LITTORAL BARRIERS**
 Not applicable: littoral drift is not a significant process in this Regional Unit

L **TRIBUTARY CONNECTIVITY**
 100% of the total length of tributaries are hydrologically connected to Lake Huron

L Contaminants in Water and Sediment

? **WATER QUALITY**
 Data Gap: no recent sampling

L **SEDIMENT QUALITY**
 Metals found in sediment but not at levels of concern

L **BENTHIC COMMUNITY**
 Moderate total benthos & richness; high evenness

L Nuisance and Harmful Algae

L **CYANOBACTERIA**
 No Blooms

? **CLADOPHORA**
 Unable to verify results

? Human Use

NA **BEACH POSTINGS**
 Not applicable: no monitored beaches within the Regional Unit

L **FISH CONSUMPTION**
 9 meals/month

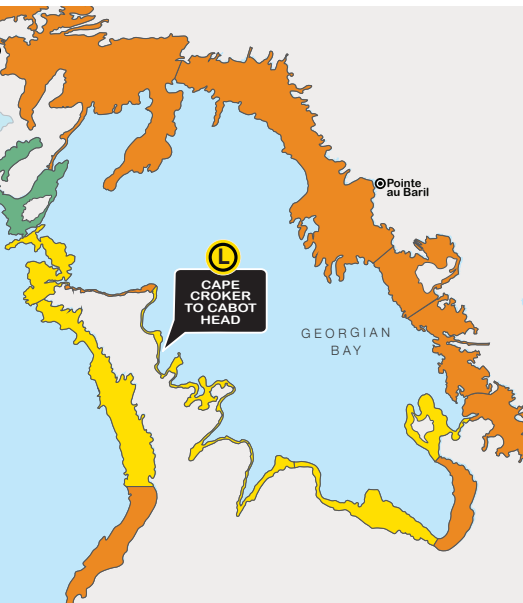
NA **TREATED DRINKING WATER**
 Not applicable: no drinking water plant

Cape Croker to Cabot Head

Ecological Unit Type:
Low Energy
 Area (ha): 9,700

L Low Stress

Cape Croker to Cabot Head is under low cumulative stress. All tributaries are connected to the nearshore and only a very small portion of the shoreline has been hardened. Fish consumption advisories for Rainbow Trout, Lake Trout, Walleye and Yellow Perch are low stress. The beach at Lion's Head was open for 100% of the swimming season in 2019 and 2020, but in 2018 was posted as unsafe for swimming for 66% of the time. Although there are no exceedances in water quality guidelines, the benthic community quality exhibits low taxon richness and total benthos.



- High cliffs and steep slopes associated with Niagara escarpment
- Lake Sturgeon (Great Lakes – upper St. Lawrence River population)
- Lion's Head – limestone cliff overlooking Georgian Bay - is located on the 45th parallel (halfway between the Equator and the North Pole!)
- Glacial outwash and eroded potholes
- Devil's Monument – largest of the Bruce Peninsula flowerpot formations

L Coastal Processes	M Contaminants in Water and Sediment	L Nuisance and Harmful Algae	L Human Use
L SHORELINE HARDENING 6% Hardened	L WATER QUALITY No contaminants found in excess of guidelines	L CYANOBACTERIA No Blooms	M BEACH POSTINGS Monitored beaches were posted 19% of the time in July & August
NA LITTORAL BARRIERS Not applicable; littoral drift is not a significant process in this Regional Unit	? SEDIMENT QUALITY Data Gap: no sampling stations within Regional Unit	? CLADOPHORA Unable to verify results	L FISH CONSUMPTION 9 meals/month
L TRIBUTARY CONNECTIVITY 100% of the total length of tributaries are hydrologically connected to Lake Huron	H BENTHIC COMMUNITY Low total benthos & taxon richness		L TREATED DRINKING WATER No adverse water quality incidents

Cabot Head to Burnt Point

Ecological Unit Type:
Low Energy
 Area (ha): 1,600



M Moderate Stress

! Concerns due to Cyanobacteria

Cabot Head to Burnt Point is under moderate cumulative stress. Characterized by rocky bedrock, the shoreline is naturally hard and has not been altered, and the full length of tributaries remain connected to the nearshore. Although no water quality exceedances were recorded, the contaminants category could not be assessed due to a lack of data on sediment quality and benthic community. Fish consumption advisories are based on Lake Trout only and are a source of moderate stress due to dioxin-like PCBs. Cyanobacteria was detected in one seven day composite in 2019 and is flagged as a concern to human and ecosystem health.



- Northern tip of Niagara Escarpment Biosphere Reserve: Globally significant ecosystem
- Bruce Peninsula National Park
- Wingfield Basin: only protected bay along exposed coast; spawning habitat
- Very narrow Regional Unit – steep cliffs along the coast and deep water near the shore

L Coastal Processes

L **SHORELINE HARDENING**
 <1% Hardened

NA **LITTORAL BARRIERS**
 Not applicable: littoral drift is not a significant process in this Regional Unit

L **TRIBUTARY CONNECTIVITY**
 100% of the total length of tributaries are hydrologically connected to Lake Huron

? Contaminants in Water and Sediment

L **WATER QUALITY**
 No contaminants found in excess of guidelines

? **SEDIMENT QUALITY**
 Data Gap: no sampling stations within Regional Unit

? **BENTHIC COMMUNITY**
 Data Gap: no sampling stations within Regional Unit

H Nuisance and Harmful Algae

H **CYANOBACTERIA**
 Cyanobacteria bloom was detected in 2019

? **CLADOPHORA**
 Unable to verify results

? Human Use

NA **BEACH POSTINGS**
 Not applicable: no monitored beaches within the Regional Unit

M **FISH CONSUMPTION**
 5 meals/month

NA **TREATED DRINKING WATER**
 Not applicable: no drinking water plant

Fathom Five

Ecological Unit Type:
High Energy
 Area (ha): 20,000

L Low Stress

Fathom Five is under low cumulative stress, with fish consumption advisories the only source of moderate stress. Advisories for Lake Trout are due to dioxin-like PCBs and, at 3 meals per month, are some of the most restrictive of all Regional Units. Barriers do not impede tributary connectivity and the shoreline remains natural. No contaminants were found in water or sediment above provincial or federal guidelines. Much of the Regional Unit is within Fathom Five National Marine Park – a protected area characterized by ancient rock formations that resemble flower pots and unique submerged geology.



- Northern terminus of the Niagara Escarpment
- Fish spawning habitat at Russel Island
- Coastal wetlands at Hay Bay
- 22 ships wrecks popular for divers



L Coastal Processes

L **SHORELINE HARDENING**
 4.5% Hardened

NA **LITTORAL BARRIERS**
 Not applicable: littoral drift is not a significant process in this Regional Unit

L **TRIBUTARY CONNECTIVITY**
 100% of the total length of tributaries are hydrologically connected to Lake Huron

L Contaminants in Water and Sediment

L **WATER QUALITY**
 No contaminants found in excess of guidelines

L **SEDIMENT QUALITY**
 Metals found in sediment but not at levels of concern

? **BENTHIC COMMUNITY**
 Data Gap: no sampling stations within Regional Unit

L Nuisance and Harmful Algae

L **CYANOBACTERIA**
 No Blooms

? **CLADOPHORA**
 Unable to verify results

? Human Use

NA **BEACH POSTINGS**
 Not applicable: no monitored beaches within the Regional Unit

M **FISH CONSUMPTION**
 3 meals/month

NA **TREATED DRINKING WATER**
 Not applicable: no drinking water plant

Cape Hurd to Chiefs Point

Ecological Unit Type:
High Energy
 Area (ha): 53,100

L Low Stress

The Cape Hurd to Chiefs Point Regional Unit is under low cumulative stress. Coastal processes are intact and contaminants were not detected in water or sediment at levels of concern. The single beach in the Regional Unit, Singing Sands, was never posted as unsafe for swimming. Fish consumption advisories for Rainbow Trout, Lake Trout, Walleye and Yellow Perch are due to dioxin-like PCBs and mercury contamination.



- Highest annual wave energy in Lake Huron
- Coastal dunes, fens and meadow marsh at Dorcas Bay
- Fishing Islands: over 70 dolomite islands
- Rare alvar ecosystems along the shoreline
- Bass spawning at Gauley Bay and Stokes Bay

L Coastal Processes

L **SHORELINE HARDENING**
 4% Hardened

NA **LITTORAL BARRIERS**
 Not applicable: littoral drift is not a significant process in this Regional Unit

L **TRIBUTARY CONNECTIVITY**
 100% of the total length of tributaries are hydrologically connected to Lake Huron

L Contaminants in Water and Sediment

L **WATER QUALITY**
 No contaminants found in excess of guidelines

L **SEDIMENT QUALITY**
 Metals found in sediment but not at levels of concern

M **BENTHIC COMMUNITY**
 Moderate total benthos; high richness

L Nuisance and Harmful Algae

L **CYANOBACTERIA**
 No Blooms

M **CLADOPHORA**
 Covers 28%

M Human Use

L **BEACH POSTINGS**
 Monitored beaches were never posted in July & August

M **FISH CONSUMPTION**
 6 meals/month

NA **TREATED DRINKING WATER**
 Not applicable: no drinking water plant

Chiefs Point to Point Clark

Ecological Unit Type:

High Energy

Area (ha): 56,500



M Moderate Stress

I Concerns due to Cyanobacteria

Chiefs Point to Point Clark is under moderate stress from the cumulative impact of impaired coastal processes and nuisance and harmful algae. Barriers on the Saugeen River impede tributary connectivity and three littoral barriers restrict movement of sediment along the coast. Nuisance algae was detected in the nearshore, and has been known to foul local beaches. Cyanobacteria was detected in June, 2019 and is flagged as a concern to human and ecosystem health. At 6 meals per month, fish consumption advisories for Rainbow Trout, Lake Trout, Walleye and Yellow Perch are moderate stress. Beaches at Southampton, Station Park and MacGregor Point Provincial Park were posted as unsafe for swimming between 6% and 12% of the season and beaches at Port Elgin, Inverhuron Provincial Park posted between 2% and 4% of the season. Sauble Beach was never posted as unsafe for swimming.



- Sauble Beach: one of the longest freshwater sand beaches in the world
- Freshwater mussels at the mouth of the Saugeen River
- Shoreline supports variety of dune and wetland habitats
- 2 Provincial Parks: MacGregor Point and Inverhuron
- Baie du Dore: large wetland complex

H Coastal Processes

L **SHORELINE HARDENING**
17% Hardened

H **LITTORAL BARRIERS**
3 littoral barriers

H **TRIBUTARY CONNECTIVITY**
15% of the total length of tributaries are hydrologically connected to Lake Huron

L Contaminants in Water and Sediment

L **WATER QUALITY**
No contaminants found in excess of guidelines

L **SEDIMENT QUALITY**
No contaminants found in excess of guidelines

? **BENTHIC COMMUNITY**
Data Gap: no sampling stations within Regional Unit

H Nuisance and Harmful Algae

H **CYANOBACTERIA**
Cyanobacteria bloom was detected in 2019

M **CLADOPHORA**
Covers 24%

L Human Use

L **BEACH POSTINGS**
Monitored beaches were posted 5% of the time in July & August

M **FISH CONSUMPTION**
6 meals/month

L **TREATED DRINKING WATER**
No adverse water quality incidents

Point Clark to Goderich

Ecological Unit Type:
High Energy
 Area (ha): 42,700



M Moderate Stress

! Concerns due to Cyanobacteria

Point Clark to Goderich is under moderate stress from the cumulative impact of nuisance and harmful algae, fish consumption and beach postings. Nuisance algae was detected in the nearshore, and has been recorded at localized areas like rivermouths. Cyanobacteria was detected in June, 2019 and is flagged as a concern to human and ecosystem health. Fish consumption advisories for Rainbow Trout, Lake Trout, Walleye and Yellow Perch are due to PCBs and mercury. Lake Trout advisories are the most restrictive at zero meals per month recommended. There are five beaches in the Regional Unit, with Ashfield Beach and Port Albert posted as unsafe for swimming for over 20% of the swimming season. Amberley Beach was posted 17% of the time, and Sunset Beach and Point Farms Provincial Park were posted for less than 5% of the swimming season.



- Black Redhorse, Lake Sturgeon and Deepwater Sculpin at mouth of the Maitland River
- Northern Brook Lamprey at Port Albert
- Staging/migration habitat for waterbirds
- Well-formed beach with dunes at Point Farms Provincial Park
- Point Clark Lighthouse – the only lighthouse on the Great Lakes registered as a National Historic Site of Canada

M Coastal Processes

L **SHORELINE HARDENING**
 15% Hardened

M **LITTORAL BARRIERS**
 3 littoral barriers

M **TRIBUTARY CONNECTIVITY**
 36% of the total length of tributaries are hydrologically connected to Lake Huron

L Contaminants in Water and Sediment

L **WATER QUALITY**
 No contaminants found in excess of guidelines

L **SEDIMENT QUALITY**
 No contaminants found in excess of guidelines

? **BENTHIC COMMUNITY**
 Data Gap: no sampling stations within Regional Unit

H Nuisance and Harmful Algae

H **CYANOBACTERIA**
 Cyanobacteria bloom was detected in 2019

M **CLADOPHORA**
 Covers 26%

M Human Use

M **BEACH POSTINGS**
 Monitored beaches were posted 14% of the time in July & August

M **FISH CONSUMPTION**
 7 meals/month

NA **TREATED DRINKING WATER**
 Not applicable: no drinking water plant

Goderich to Kettle Point

Ecological Unit Type:
Moderate to High Energy
 Area (ha): 90,900

M Moderate Stress

Goderich to Kettle Point is under moderate stress from the cumulative impact of impaired coastal processes, fish consumption advisories and beach postings. The eroding bluffs near Goderich provide sediment for beach replenishment near Grand Bend, however the presence of three littoral barriers restrict sediment transport. Shoreline alteration further impairs coastal processes. A moderate amount of nuisance algae was detected in the nearshore. At 6 meals per month, fish consumption advisories for Rainbow Trout, Lake Trout, Walleye and Yellow Perch are a source of moderate stress due to mercury and PCBs. Fourteen beaches are monitored for bacterial contamination, the most of all Regional Units, posted an average of 11% of the swimming season. Three beaches at Goderich were posted as unsafe for swimming for over 20% of the swimming season while beaches at the Pinery Provincial Park were open for 100% of the swimming season.



- Pinery Provincial Park: spawning habitat for Lake Herring, White Sucker, Grass Pickerel
- Agricultural watersheds: high nutrient and sediment loadings
- Old Ausable Channel: habitat for Pugnose Shiner and Lake Chubsucker
- Dune & coastal wetland ecosystem maintains coastal processes near Port Franks
- 4 ship wrecks

M Coastal Processes

SHORELINE HARDENING
 28% Hardened

LITTORAL BARRIERS
 3 littoral barriers

TRIBUTARY CONNECTIVITY
 90% of the total length of tributaries are hydrologically connected to Lake Huron

L Contaminants in Water and Sediment

WATER QUALITY
 No contaminants found in excess of guidelines

SEDIMENT QUALITY
 Metals found in sediment but not at levels of concern

BENTHIC COMMUNITY
 High total benthos; low evenness

L Nuisance and Harmful Algae

CYANOBACTERIA
 No Blooms

CLADOPHORA
 Covers 34%

M Human Use

BEACH POSTINGS
 Monitored beaches were posted 11% of the time in July & August

FISH CONSUMPTION
 6 meals/month

TREATED DRINKING WATER
 No adverse water quality incidents

Kettle Point to St. Clair River

Ecological Unit Type:
Low Energy
 Area (ha): 63,200

M Moderate Stress

! Concerns due to Cyanobacteria

The Kettle Point to St. Clair River Regional Unit is under stress from the cumulative impact of shoreline hardening, nuisance algae and fish consumption advisories. The percent of shoreline that has been hardened is the highest of all Regional Units, with groynes, jetties and steel sheet piling along the coast. A high cover of nuisance algae was detected in the nearshore and cyanobacteria was detected in June, 2019. At 5 meals per month, fish consumption advisories for Rainbow Trout, Lake Trout, Walleye and Yellow Perch are related to dioxin-like PCBs and mercury. The Bright's Grove beach was posted for just under 5% of the swimming season and the beach at Canatara Park was posted for less than 1% of the swimming season.

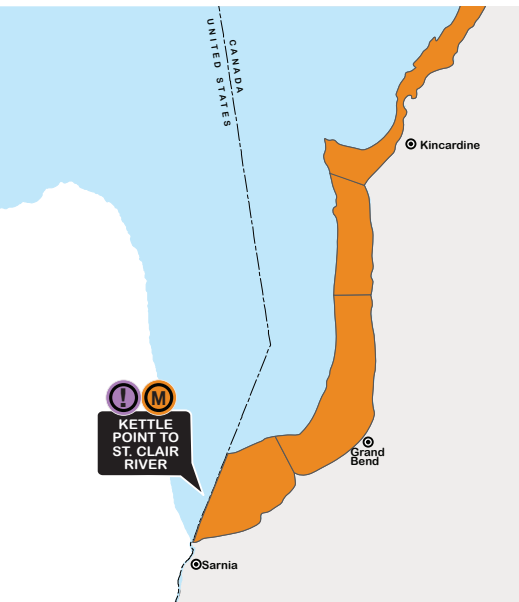


Kettle Point:

- rare shale outcrop
- spherical rock formations

St. Clair River:

- home to the largest spawning population of Lake Sturgeon in the Great Lakes



M Coastal Processes

! SHORELINE HARDENING
 56% Hardened

M LITTORAL BARRIERS
 1 littoral barrier

L TRIBUTARY CONNECTIVITY
 84% of the total length of tributaries are hydrologically connected to Lake Huron

? Contaminants in Water and Sediment

? WATER QUALITY
 Data Gap: no recent sampling

? SEDIMENT QUALITY
 Data Gap: no sampling stations within Regional Unit

? BENTHIC COMMUNITY
 Data Gap: no sampling stations within Regional Unit

H Nuisance and Harmful Algae

! CYANOBACTERIA
 Cyanobacteria bloom was detected in 2019

! CLADOPHORA
 Covers 38%

L Human Use

L BEACH POSTINGS
 Monitored beaches were posted 2% of the time in July & August

M FISH CONSUMPTION
 5 meals/month

L TREATED DRINKING WATER
 No adverse water quality incidents

Threats to Lake Huron Nearshore Waters

Changing Climate and Threats to Coastal Processes

The assessment of coastal processes focused in areas of Lake Huron where coastal processes are integral to a healthy nearshore, through quantifying the amount of shoreline hardened and identifying barriers that restrict sediment transport along the coast. Sand dunes and beaches rely on alongshore movement of sand from eroding shorelines and cliffs to replenish what is lost from wind and wave activity. However, by hardening the shore and installing barriers to littoral transport such as piers and groynes, sediment transport routes get disconnected and areas in critical need of replenishment undergo unnatural levels of erosion. Functioning coastal processes are vital to the southeast shore of Lake Huron with its sandy beaches, dunes and eroding bluffs between Chiefs Point and the St. Clair River. The four regional units on this shore were found to be under moderate to high stress due to the number of littoral barriers over 100 metres in length and the hardening of the shore.

The impacts of climate change are further threatening this stretch of coast. Lack of ice cover in winter, higher water levels and large storm events that bring strong winds and intense waves to an already high energy coast are drastically increasing erosion. Many cottage communities were built close to shore and at the time of development the threat from erosion was not apparent. These structures that were built at the top of eroding bluffs are now faced with erosion of up to 10 metres per year under the current climate regime and are at risk of slumping into the lake. The reactive approach attempts to restrict erosion for property protection including shoreline armouring such as steel sheet piling and armourstone slopes. But there is growing acceptance that these measures reduce coastal resilience and threaten ecosystem health. Nature based solutions such as managed retreat is currently being promoted by local organizations to move homes out of the erosion hazard zone and allow coastal processes to occur unhindered.

In recent years, the effects of climate change along Southern Georgian Bay have become more drastic. The area's sandy beaches are naturally resilient to the coastal processes of the lake, but as development has encroached on the nearshore along with high water levels, erosion threatens private properties and community infrastructure. The Wasaga Beach community for example, is regularly flooded and sand piles up on the door steps of area businesses. Nature-based solutions such as restoration of the foredune, would complement the ecological needs of the lake, while providing natural property protection.



Threats to Lake Huron Nearshore Waters (cont.)

Nuisance algae on the southeast shore

Although algae occurs naturally and is part of a healthy freshwater ecosystem, many areas in the Great Lakes have seen increases in the occurrence of nuisance algae. In Lake Huron, nuisance algae is generally comprised of *Cladophora*, a green filamentous algae that grows on hard substrate and Chara, a macroscopic algae with branchlike structures that grows in shallower water. Neither *Cladophora* nor Chara produce toxins but they can become a nuisance when they decompose and wash up on shore.

Currently, the data that is available to assess nearshore nuisance algae on a lakewide scale is a satellite derived submerged aquatic vegetation (SAV) mapping product from the Michigan Tech Research Institute. Ground-truthing and local observations are needed to verify results of the satellite product; however, such data was only available for the southeast shore of Lake Huron. Therefore, nuisance algae across the North Channel and Georgian Bay could not be assessed.

From Tobermory to the St. Clair River, the results of this assessment reveal that nuisance algae is a source of moderate to high stress to the nearshore ecosystem. These results are not surprising, as nuisance algae and in particular *Cladophora* has been a known issue on this stretch of shoreline for many years. In particular, fouling has been observed at areas where there are tributary inputs of nutrients. Further science is needed to better understand what is driving nuisance algae growth and distribution at a lakewide scale.

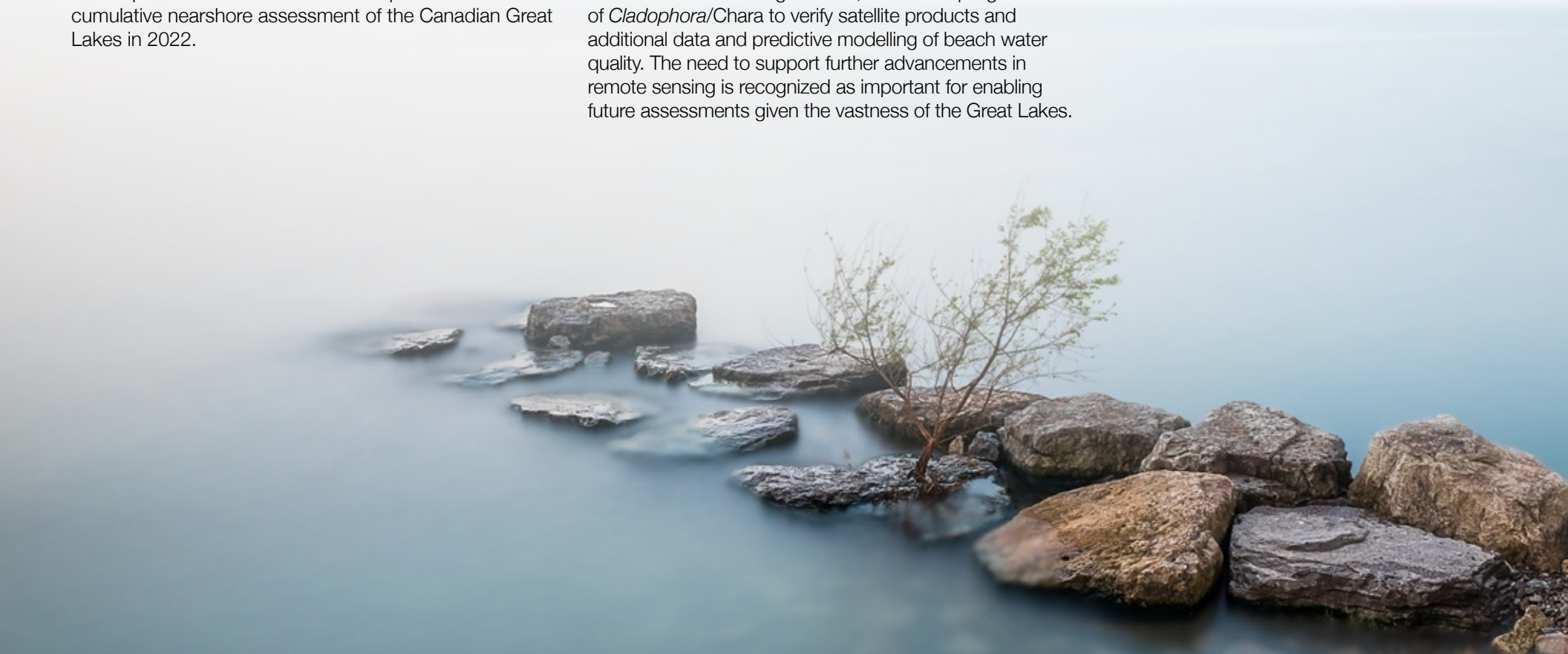


Nearshore Framework Next Steps

The Nearshore Framework Assessment Cycle

The results of this assessment have been included in the 2021 Lake Huron Lakewide Action and Management Plan (LAMP). The assessment will be repeated on a regular cycle to monitor change over time. A number of data gaps have been identified and will be considered within the lakewide management process when Cooperative Science and Monitoring priorities are identified. Progress continues for the remaining Canadian Great Lake nearshore assessments as respective LAMPs are developed. Assessments of Erie, Ontario, Huron and Superior will be combined and reported as the first cumulative nearshore assessment of the Canadian Great Lakes in 2022.

This report reflects the best efforts using readily accessible data. Methods and the decisions made for this assessment have been documented and revisions or improvements based on advances in science and expert judgment are part of the Framework's iterative learning process. This first assessment of Lake Huron has brought to light several limitations that may be improved upon in future including: regular updates of databases used to evaluate barriers to tributary connectivity; increased sampling effort at existing long-term water, sediment and benthos monitoring stations, in-situ sampling of *Cladophora/Chara* to verify satellite products and additional data and predictive modelling of beach water quality. The need to support further advancements in remote sensing is recognized as important for enabling future assessments given the vastness of the Great Lakes.



Taking Action Case Study: Healthy Lake Huron

The Healthy Lake Huron – **Clean Water, Clean Beaches partnership** (www.healthylakehuron.ca) is a concerted effort to address shoreline water quality concerns such as nuisance algae and bacterial issues and to promote safe and clean beaches from Sarnia to Tobermory.

Water quality concerns causing beach postings and nuisance algae wash up along the Lake Huron shoreline have been ongoing for many years and are highlighted by cumulative stress results in the nearshore assessment. This situation is caused by a combination of nutrient and bacterial pollution from sources such as poorly functioning private septic systems, municipal wastewater, runoff from farm fields and other rural and urban properties, and natural sources such as waterfowl. Canada and Ontario, in partnership with local municipal governments, local public health, conservation

authorities, and other local organizations, are working together through Healthy Lake Huron to take action aimed at lowering the amount of phosphorus and reducing incidences of high levels of bacteria (such as *E. coli*) entering the water.

Six key watersheds were identified as priorities for immediate action: Pine River, Garvey-Glenn (Garvey Creek and Glenn Drain), Bayfield North (Including Gully Creek), Main Bayfield and Lambton Shores (Tributaries in Lambton County) and the Six Stream Initiative (Bruce Peninsula). Long-term monitoring in each of these watersheds has also been underway since the project was initiated in 2011 and the results from this monitoring are beginning to show a reduction in pollutants coming from these watersheds.



Data Sources

MEASURE	DATA SOURCE(S)	YEARS ASSESSED
Shoreline Hardening	Zuzek, Inc. Shoreline Hardening and Littoral Sediment Budgets. Shoreline Hardening Methodology and Guidance Document	2015-2018
Littoral Barriers	SWOOP Orthophotography and ESRI World Imagery	(Imagery)
Tributary Connectivity	Ontario Ministry of Natural Resources and Forestry. <i>Ontario Integrated Hydro Network</i>	Last updated 2019
	Great Lakes Connectivity – FishWerks GIS platform	Accessed 2021
Water Quality	Ontario Ministry of Environment, Conservation and Parks. <i>Great Lakes Nearshore – Water Chemistry</i>	2015
	Environment and Climate Change Canada. <i>Great Lakes Water Quality Monitoring and Surveillance Data</i>	2015, 2017, 2018
Sediment Quality	Ontario Ministry of Environment, Conservation and Parks. <i>Great Lakes Nearshore – Sediment Chemistry</i>	2009, 2011, 2015
Benthic Community	Environment and Climate Change Canada. <i>Great Lakes Action Plan Area of Concern and Reference Sites Assessments</i>	2010-2014
Cyanobacteria	National Oceanic & Atmospheric Association. Harmful Algal Bloom Monitoring. 7-day satellite composite images, with Cyanobacteria Index algorithm	June to October 2019
<i>Cladophora</i>	Michigan Tech Research Institute (MTRI). Satellite-Derived Lake Submerged Aquatic Vegetation (SAV) Mapping. MTRI depth variant algorithm using Landsat 8 satellite collected during vegetative growing season.	2016-2019
Beach Postings	Swim Drink Fish Canada. <i>SWIMGuide</i>	July & August 2016-2020
Treated Drinking Water	Ontario Ministry of Environment, Conservation and Parks. <i>Drinking Water Treatment Plant Monitoring data</i>	2015-2020
Fish Consumption	Ontario Ministry of Environment, Conservation and Parks. <i>Guide to Eating Ontario Fish Advisory Database</i>	2015, 2017 & 2020

OVERALL ASSESSMENT OF THE STATE OF NEARSHORE WATERS Resources

Lake Huron Canadian Nearshore Assessment, 2021 Results.
Cat. No. En164-71/5-2021E-2-PDF; ISBN: 978-0-660-36634-0

Canadian Great Lakes Nearshore Assessment, Detailed Methodology.
Cat. No.: En164-71/1-2021E-PDF; ISBN: 978-0-660-39154-0

Assessment data available from Government of Canada
Open Data: <https://open.Canada.ca/en/open-data>