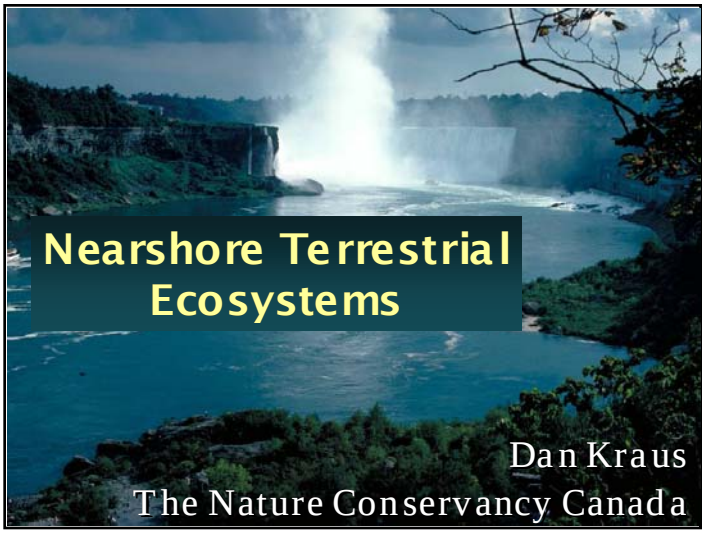


Good Afternoon - If we could have everyone in this room project one mental image of the Great Lakes , we'd probably see these images in two different groups. There would be those of us that would project a blue map of the waters, of the 5 GL and their connecting channels – and there would be folks that think of the lakes as a basin and include the land that forms the watershed

For this talk I want us to think of the lakes a little different – not quite water, not quiet land – but as a coastal landscape where the composition of the land shapes the waters, and where the forces of water shape the land. It's this narrow band of coastal terrestrial ecosystem that I will be presenting.

Project Goals

- Update from 1996 SOLEC report on Nearshore Terrestrial Ecosystems (Reid & Holland 1997)
- Establish baseline information
- Identify trends

This project provides an update of the original 1996 SOLEC chapter on coastal terrestrial ecosystems, and has two primary objectives:

To update baseline information on coastal terrestrial ecosystems.

To identify trends in these systems, and answer the question: *what has changed since 1996?*

Methods

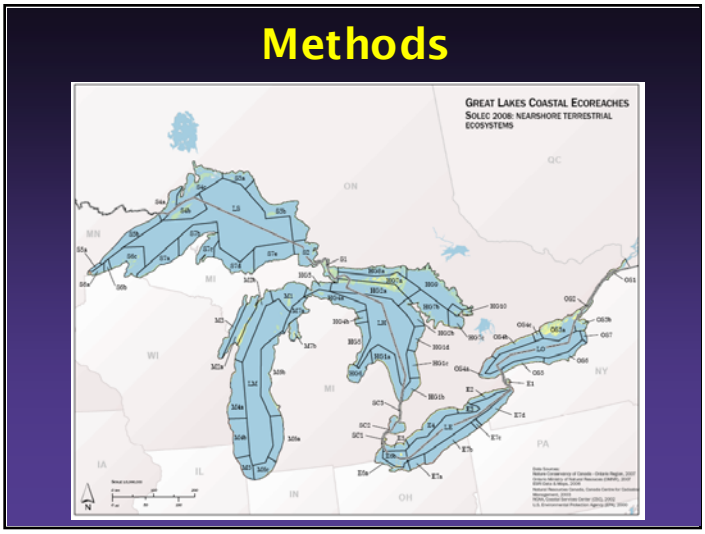
- Data-driven approach
- GIS analysis of coastal ecosystems to assess extent & distribution
- GIS assessment of condition/ pressures based on landcover
- Literature review to examine classification of coastal ecosystems, their condition & pressures

Now what has changed since 1996 is the information we have available and how we can use it

This project included the assembly and analysis of the best available spatial data on coastal terrestrial ecosystems, much of which was not available for the original report. This includes coastal mapping for Canada (Environment Canada, Ontario Ministry of Natural Resources) and the U.S. (National Oceanic and Atmospheric Administration), and classifications and descriptions of coastal terrestrial ecosystems from the Great Lakes region, Ontario and U.S. Great Lake states, including element occurrences (EOs) of coastal terrestrial vegetation communities.

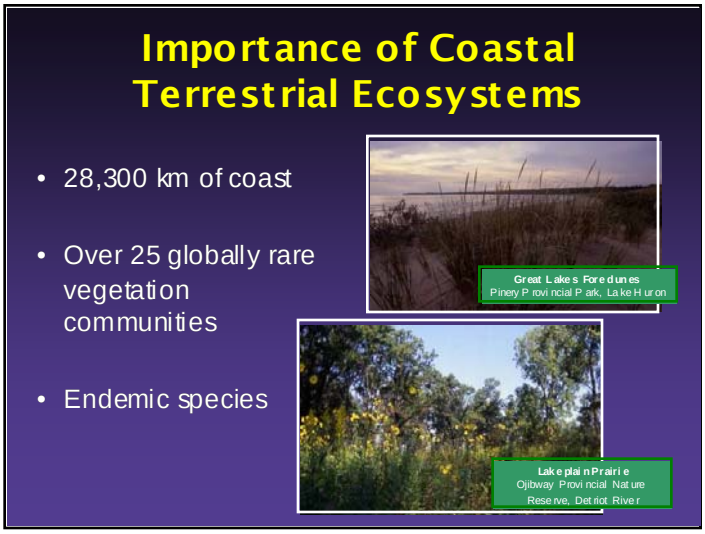
This spatial information was used to develop baseline information and assess status/ pressures – and a literature review was done to supplement the spatial data and look at trends

Methods



To conduct the analysis we stratified by the GL by coastal ecoreach, developed by SOLEC, some 5 additions to include offshore islands

This allows for great resolution in looking at the results



There are some general statements about the region – and there are two important things to remember:

To begin with, it's big

The Great Lakes coast is over 28,000 km in length, this includes the mainland and islands – a distance equal to a return trip from Buffalo to Bejiing - making it the longest freshwater coast in the world

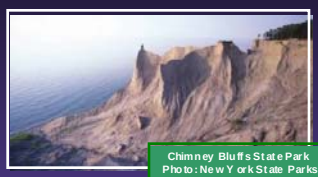
It's also incredibly diverse and important for biodiversity conservation

Driven by their close proximity to the world's largest freshwater seas, this coastal zone has been a catalyst for species and ecosystem diversity. Many of the terrestrial endemic species in the Great Lakes basin have evolved in the last 10,000 years in response to this coastal influence, and approximately 200 disjunct species persist due to the unique conditions of the coastal environment.

A large number of ecosystems have also developed in response to the special conditions of the Great Lakes coast. We share with the alpine regions of North America the most diverse assemblages of ecological systems in the United States and southern Canada. In addition, 25 globally rare vegetation communities that are restricted to the Great Lakes coast have been documented. Many of these communities are the focus of this report.

Importance of Coastal Terrestrial Ecosystems

- Linked to the biodiversity and health of nearshore waters
- Zone of transfer of biomass and sediments



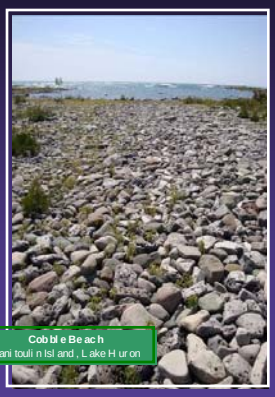
Chimney Bluffs State Park
Photo: New York State Parks

Mayflies
Lake Erie

➢The CTE is also a link between land and lake and lake to land, a zone of transfer of biomass and sediments

➢What happens to these lands impacts the lakes

Coastal Terrestrial Ecosystems



1. Great Lakes Sand Beaches
2. Great Lakes Foredunes
3. Coastal Back Dune Complexes
4. Bedrock Shores
5. Cobble Beaches
6. Shoreline Cliffs
7. Shoreline Bluffs
8. Lakeplain Prairies
9. Arctic-Alpine Disjunct Communities
10. Atlantic Coastal Plain Disjunct Communities
11. Rich Coastal Fens
12. Shoreline Alvars
13. Coastal Rock Barrens
14. Great Lakes Coastal Forests

The report deals with 14 systems, which we are calling Coastal Terrestrial Ecosystems

For each of these ecosystems, we have developed baseline measures on distribution and status, and assessed threats.

The report is structured to provide a fact sheet on each of the systems

Background, results of spatial analysis – status and trends by lake system

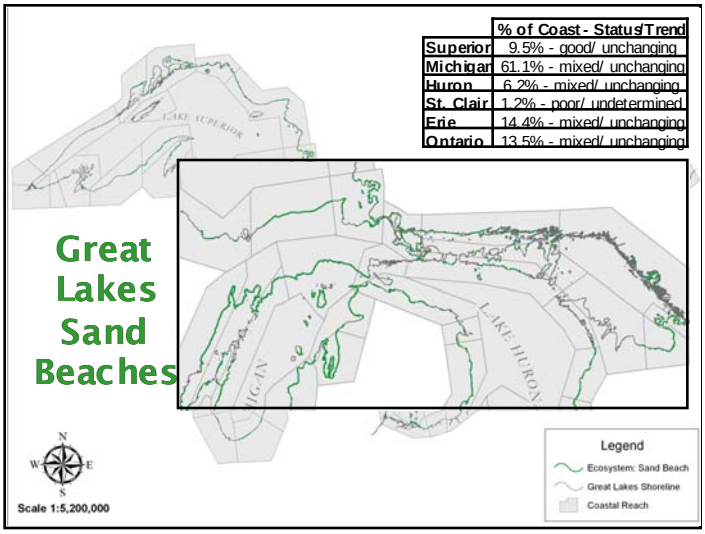
One of the first tasks in the project was to review and update the taxonomy of these systems. The names of some of the 1996 coastal terrestrial ecosystems has been changed to reflect the newer names of Great Lakes ecological systems (NatureServe, 2008), and two ecosystems, Great Lakes Coastal Forests and Rich Coastal Fens were added. Great Lakes Islands, originally included in the 1996 report, now have a separate SOLEC indicator report and are not addressed in this report.

I'll now provide details on a few examples.

Great Lakes Sand Beaches

- 3385 km
- Ranked globally rare
- Many key sites are within protected areas

GL sand beaches occur along over 3300 km of GL coast. This includes pure sand beaches, but also sand beaches that are mixed with pebbles. GL beaches are considered to be globally rare – although only one type has been formally described, and we know many of largest beach areas are within protected areas.



For systems such as sand beaches that have been included in comprehensive shoreline mapping, we have created maps showing the distribution – these are the green lines along the coast

Spatial information and background literature was used to look at the status (for example protected areas), and the trends since 1996

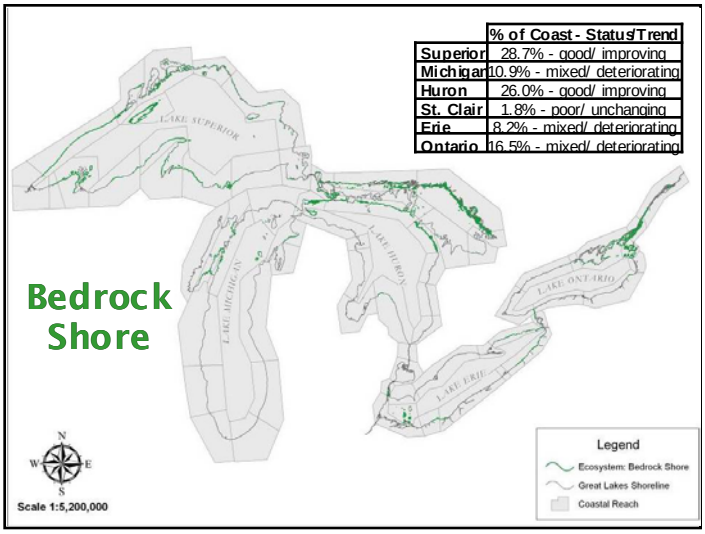
Bedrock Shores

- 6000 km
- Four major types identified based on substrate
- Limestone and sandstone types considered globally rare

Bedrock Shore (Alkaline)
Middle Point, Pelee Island, Lake Erie

Bedrock Shore (Non-Alkaline)
American Camp, Georgian Bay

Bedrock shores are more common in the GL, and are generally classified into four different groups depending on bedrock type



Not surprisingly bedrock shores tends to be more common in the northern lakes

In some areas such as L H and LS the status on these shorelines was ranked as improving because of large new protected areas in ON

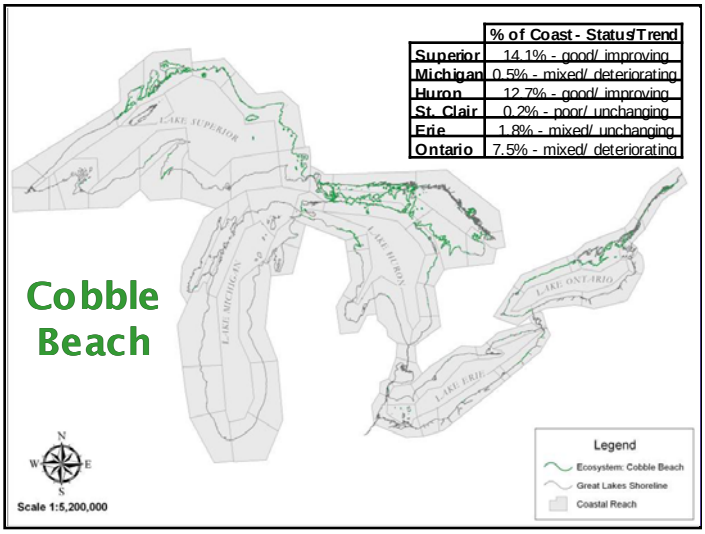
Cobble Beaches

- 2720 km
- Three major types identified based on substrate
- Limestone type considered globally rare

Cobble Beach
Gravelly Point, Bruce Peninsula, Georgian Bay

Cobble Beach
Cape Hurd, Bruce Peninsula, Lake Huron

Cobbles beaches while they can be locally very common, do have limited distribution in the GL with under 3000 km



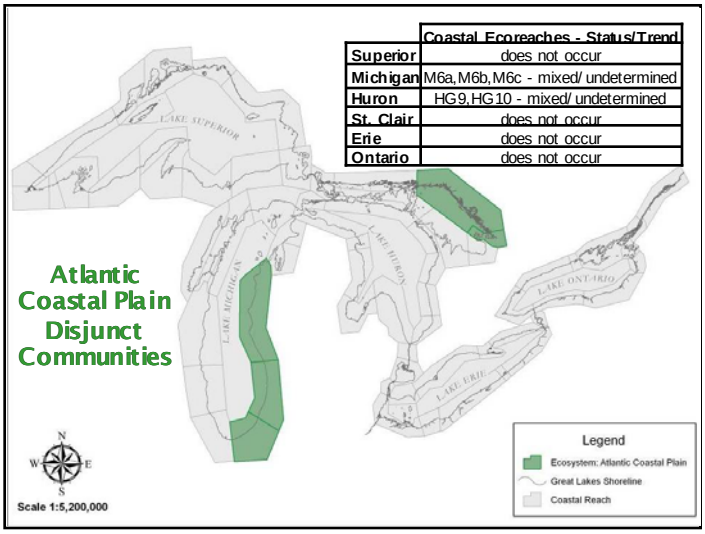
As with bedrock, they tend to be more common in the north with a few exceptions such as parts of LO

Atlantic Coastal Plain Disjunct Communities

- Globally rare
- Limited by specific habitat requirements
- Not restricted to Great Lakes shores

Baseline mapping for some of the coastal terrestrial ecosystems, such as Atlantic Coastal Plain Disjunct Communities, was based on element occurrence or data points from Great Lakes heritage programs.

Atlantic Coastal Plain Disjunct Communities are plant associations with their main range along the Atlantic seaboard – populations in the GL were once connected when the configuration of the lakes was very different



Atlantic Coastal Plain Disjunct Communities have a high fidelity to specific site conditions - This type has a very limited distribution and occurs in only a few of the coastal eco-reaches – these ecoreaches are highlighted on the map and listed in the table

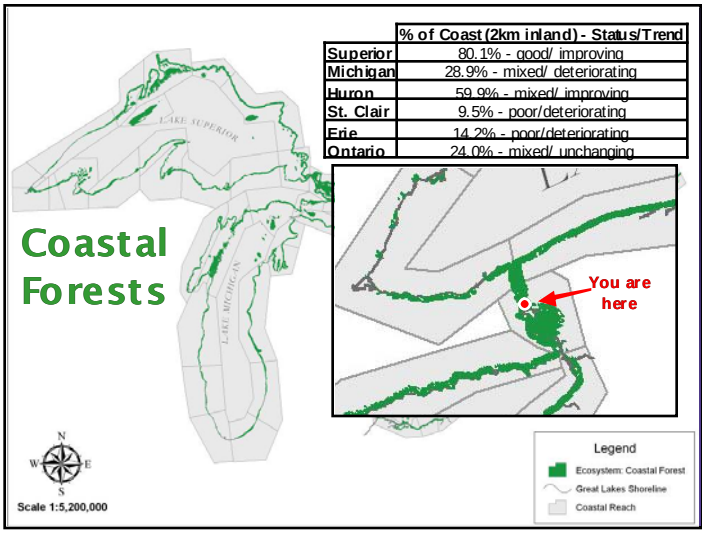
Final example is CF – while not included in 1996, this is a system that often exhibits unique structure and composition when in close proximity to the coast

This includes windswept or even krumholtz trees – or high richness and biomass of mosses and lichens due to high humidity and constant fog

Great Lakes Coastal Forests are one of 3 systems we recognize have many occurrences away from the coast (rock barrens, alvars are the others) – but that coastal occurrences are unique

Coastal Forests are also important in biomass transfer - there are logs and other biomass going into the water, like in river systems –

Forests are also important where aquatic insects emerge, providing resting areas and food sources for migratory birds



	% of Coast (2km inland) - Status/Trend
Superior	80.1% - good/ improving
Michigan	28.9% - mixed/ deteriorating
Huron	59.9% - mixed/ improving
St. Clair	9.5% - poor/deteriorating
Erie	14.2% - poor/deteriorating
Ontario	24.0% - mixed/ unchanging

This map shows forests within 2 km of the coast – not surprisingly we have a greater cover in the north – with Lake Superior having over 80% in this coastal band, and Lake Erie having only 14%

The Great Lakes coastal terrestrial zone is a key region for the conservation of globally significant biodiversity values and ecological phenomena.

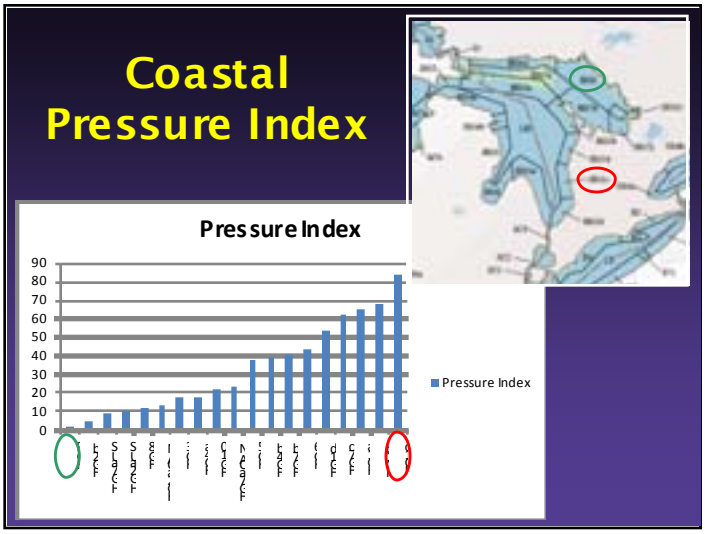
It is also a region under many pressures. No other part of the Great Lakes has the same depth and diversity of human history. For millennia coastal ecosystems have attracted human settlement for their access to transportation, natural resources, water and aesthetics. Today, the coastal terrestrial zone contains the largest concentrations of urban areas, industry and recreational sites in the Great Lakes basin. New development in the basin continues to be concentrated in coastal areas.

Coastal Pressure Index

- Index based on land use and shoreline alteration
- Applied to each coastal ecoreach

An automated analysis of pressures on coastal terrestrial ecosystems was conducted through GIS based on general landcover and shoreline modification within each coastal eco-reach.

Pressures were measured based on the percentage of urban cover and agricultural cover within 2 km of the coast, and the percentage of shoreline that was classified as “artificial”.

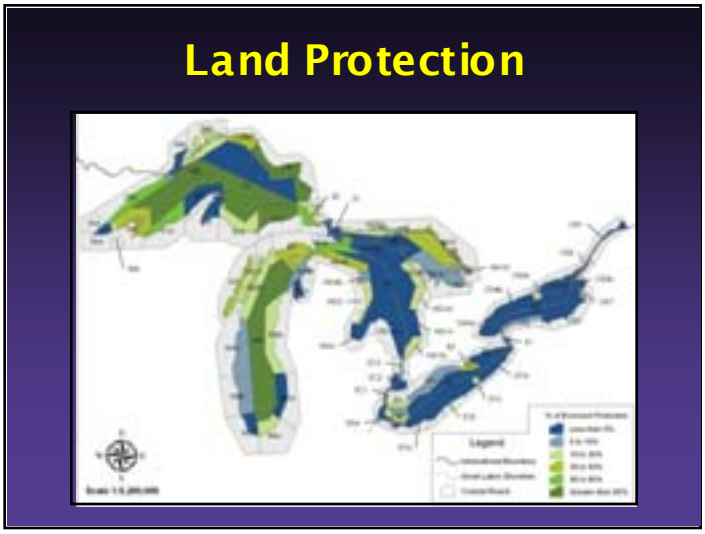


In this example you can see the different pressure measures of LH and GBay – provides content on areas with relatively lower pressures like E GBay **<click>** (very little shoreline alteration, and land cover is primarily natural) –

<click>

vs the eastern coast in the south with lots of people trying to build big beaches with shoreline structures, and much of the land converted for urban or agricultural land uses

Not to say there aren't sites with heavy pressures in EGBay or really wonderful, protected areas on the e coast of Lake Huron – provides some context to look at pressures in coastal ecoreaches and even look at pressures to specific CTE



The other side of looking at pressures is to look at existing land conservation within each coastal eco-reach. This map shows the amount of land protection within a 2 km coastal band and for all islands by coastal ecoreach.

. - basically green is good, blue is bad -

We typically have done more coastal conservation in the north

coastal eco-reaches in the south with higher amounts of land conservation tend to be smaller eco-reaches (e.g. Long Point in Lake Erie)

Management Implications

Coastal Ecoreach Report Cards

e.g. Western Bruce Peninsula (HG2b)

- 428.62 km
- Bedrock shore: dominant (~50%)
- Cobble beach: uncommon (~8%)
- Sand beach: very rare (<1%)
- Shoreline Cliff: rare (<4%)
- Four Coastal Alvar Types documented
- Approximately 19% of coast is protected.
- Coastal Pressure Index: Lower - 4.9 (range 0-193.6; median=44)

So this project has generated lots of new spatial files and data, let's look at some potential applications:

Information can be used to generate reports on each ecoreach – there's probably local information that could be incorporated to refine the report

In this example for the Western Bruce Peninsula, you can see the dominant shoreline types (predominantly bedrock), documented element occurrences (alvars) and the amount of coast (within a 2 km buffer) that in protected (about 19%)

This can be used to identified where field work is needed – for this example, we know that the cobble beaches are probably limestone which is a globally rare type, but there is no EO data – since most of the cobble beaches are outside of protected areas they could be a priority to do field work

There needs to be greater consensus on a taxonomy for coastal terrestrial ecosystems – similar systems have different name depending where it is located.

A “sea-rocket open mineral shoreline type” in Ontario is a “Great Lakes sparsely vegetated beach” in Pennsylvania and a “beach-dune community” in Ohio. Developing a basin-wide classification system is an important first step in better understanding the ecology and conservation needs of the coast.

New systems also need to be added. For example the coasts in the bottom photos on this slide would both be classified as “limestone cobble beach” - but they function under very different energy regimes, which results in very different vegetation communities. They are not the same time.

The information generated from this report can also be used to identify gaps in land protection within different coastal regions, but also for gaps in representation of all the coastal terrestrial ecosystems. Where gaps exist, this information can be used to focus land protection efforts.

There is good news. We've made great progress in the last 10 years. This includes the creation of large parks and protected areas in the northern Great Lakes and there are several excellent example of stewardship programs that could be expanded to other areas.

We also have a better understanding on the distribution and status of these Coastal Terrestrial Ecosystems – the draft information generated for this report can be improved with your input and we invite you to our session this afternoon to provide your input.

In conclusion our CTE are a key area for GL biodiversity. They support many of our endemic species and globally rare vegetation communities. The health of this coast also plays a role in the health of the nearshore waters. This is also a zone of many pressures and changing land uses.

There are still excellent opportunities to conserve and steward these areas. These opportunities are, however, finite and we hope the information in this report can help to better set and implement conservation actions, and to empower us to do, not what we can do, but what we must do to protect the Great Lakes Coast. **<click>**

Acknowledgments

- Funding provided by Environment Canada, Nature Conservancy of Canada, The Nature Conservancy
- Dave Ewert (TNC), Mary Harkness (TNC), Bonnie Henson (NHIC), Dan Kraus (NCC), Rachael Franks Taylor (TNC), Gary White (NCC)