



# The Amazing, Unique Ecosystems of Georgian Bay

photo by Karl Schiefer, PhD

**K**arl Schiefer shared these amazing facts about the Bay with participants at GBA's 100<sup>th</sup> Anniversary Symposium on the future of the Bay this past December. The following insights are from Karl's contribution to the new book *Georgian Bay: A Unique North American Ecosystem*, which will be launched at Georgian Bay Land Trust's Winterlude event on March 29<sup>th</sup> (see Upcoming Events).

Dr. Schiefer is an Aquatic Ecologist with over 30 years' experience in consulting and management of professional services companies. Having held academic and research positions, he is a widely recognized specialist in freshwater ecosystems and aquatic resources across Canada.

Part 1 of the list is here. Look for Part 2 in the next issue of *Update*.

**The greater Georgian Bay ecosystem has many unique features that distinguish it from all other parts of the Great Lakes and other water bodies in Canada and North America.** These include:

## An Archipelago Ecosystem

- Archipelago-based ecosystems are not common and a freshwater archipelago ecosystem on this scale is globally unique.
- From an ecological perspective, the following habitat components make it outstanding: exceptional terrestrial and aquatic habitat diversity, unprecedented amount of productive land/water interface (longer total shoreline than Lake Ontario), a very broad and productive littoral zone among the islands, an abundance of sheltered lakeshore habitats, a high diversity and abundance of coastal wetlands, and the close physical proximity of diverse habitats.

## Physical Environment

- Exceptionally diverse geology and topography with a granitic igneous and metamorphic complex to the east and north (Canadian Shield) and sedimentary limestone to the west and south (Niagara Escarpment).

➤ The gentle sloping of the Canadian Shield into the waters of Georgian Bay has created one of the largest and most ecologically diverse freshwater archipelagos in the world. Unlike most lakes, the basin of Georgian Bay slopes from east to west with a wide and shallow littoral zone among the islands on the east and very deep waters along the cliffs of the Niagara Escarpment on the west.

➤ One of the important hydrological features of the eastern Georgian Bay coast are the wind-driven seiche currents which develop in channels between the islands. These are ecologically important for mixing warm, nutrient-rich inshore water with cold, low nutrient offshore waters.

## Water Chemistry and Limnology

➤ Water chemistry is strongly influenced by the bedrock geology and glacial history of the region. The more soluble limestone bedrocks of the western basin result in waters that are clear, basic (non-acidic), and high in dissolved minerals ("hard" water). By comparison waters draining the lakes and acidic bogs perched on the insoluble granites of the Canadian Shield tend to be yellow or brown in colour, acidic, and low in dissolved minerals ("soft" water).

➤ The complexity of channels in the eastern archipelago results in a considerable diversity of water chemistry in this area, depending on the degree of influence of coastal tributaries or mixing with offshore waters.

➤ Thermal stratification is also highly variable in Georgian Bay. The waters of the western basin are strongly stratified in the summer with a large deep water zone of cold, oxygen-rich water. This provides excellent habitat for a cold-water fish community including Lake Trout, Chinook Salmon and Whitefish.

➤ The large and shallow littoral zone within the island archipelago does not thermally-stratify in most areas, with

summer waters warming from top to bottom. This warm, sheltered and biologically-productive littoral zone provides excellent habitat for a diverse warm-water fish community including Musky, Northern Pike, Bass, Walleye, Perch and many other species.

## Biological Environment

➤ On the Georgian Bay coast, as is the case everywhere, the biological component of the ecosystem develops in response to the physical and chemical environments that are available, combined with climate.

➤ The highly diverse physical and chemical features found on the Georgian Bay coast have produced a very high diversity of habitats for plants and animals. As a result, biodiversity is exceptionally high on this coast.

➤ The large archipelago of islands provides an excellent example of both habitat diversity and biodiversity gradients. From almost bare bedrock outer islands exposed to harsh storms through middle islands with sparse vegetation to larger and more sheltered interior islands and mainland coast with diverse mixed hardwood forests, biodiversity of plants and animals increases greatly.

➤ Coastal wetlands are an exceptional feature of this coast. The abundance of islands, shoals, bays and inlets found within the world's largest freshwater archipelago has created an abundance of opportunities for hundreds of wetlands to develop.

➤ Wetlands are among the most biodiverse and productive natural habitats in any ecosystem. The abundance and diversity of Georgian Bay's coastal wetlands are critical to the abundance and diversity of many plant and animal species here, including fish, reptiles, amphibians, shorebirds, waterfowl and aquatic mammals, such as moose, beaver, muskrat, otter and mink. ■



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# The Amazing, Unique Ecosystems of Georgian Bay Part 2

photo by Karl Schiefer, PhD

**K**arl Schiefer shared these amazing facts about the Bay with participants at GBA's 100<sup>th</sup> anniversary Symposium on the future of the Bay in December. They are from Karl's contribution to the new book *Georgian Bay: A Unique North American Ecosystem*. We printed part 1 in the Winter issue of *UPDATE*, and are pleased to share part 2 with you here.

The greater Georgian Bay ecosystem has many unique features that distinguish it from all other parts of the Great Lakes and other water bodies in Canada and North America. These include:

## Fish

- The wide diversity and quality of aquatic habitats have supported over 85 species of fish in Georgian Bay, a high number for any waterbody in Canada.
- The offshore, cold-water fish community consists of lake trout, rainbow trout, pacific salmon, and several whitefish and cisco species. The inshore, warm-water fish community benefits from the large and productive littoral zone, sheltered habitats and coastal wetlands in the island archipelago, with the result that many inshore species are found here. These include musky, sturgeon, northern pike, walleye, bass, perch and dozens of smaller forage fish species.

- The east coast rivers provide important spawning habitat for walleye, sturgeon, suckers and other species. These rivers warm in the summer as the shield lakes, which they drain, also warm. By comparison, the south coast rivers are all spring-fed, remaining relatively cold all summer. These provide critical spawning and juvenile rearing habitat for rainbow trout, brown trout and the several salmon species found in Georgian Bay.

## Reptiles and Amphibians

- Georgian Bay boasts the highest concentration of reptile and amphibian species in Canada at 34. This is directly related to the wide diversity and quality of habitats found here.
- Many of these species are at the northern limit of their range, and a number are rare or considered at risk, including the Massasauga rattlesnake and eastern foxsnake, two iconic species of the eastern Georgian Bay coast.

## Mammals

- The Georgian Bay coastal ecosystem supports at least 44 mammal species, ranging from small rodents and bats to large ungulates, such as whitetail deer and moose, and predators, including the grey wolf and black bear.

➤ Because the northern and southern biomes meet on the Georgian Bay coast, mammal species from both are found here. Species associated with the Southern Ontario mixed hardwood forest biome include the grey squirrel, chipmunk, whitetail deer and cottontail rabbit. Other species more typical of the boreal forest zone to the north include the moose, grey wolf, lynx, fisher, marten and snowshoe hare.

➤ Because of the large sheltered and productive littoral zone within the island archipelago, aquatic mammals like the beaver, muskrat, mink and otter are very abundant here.

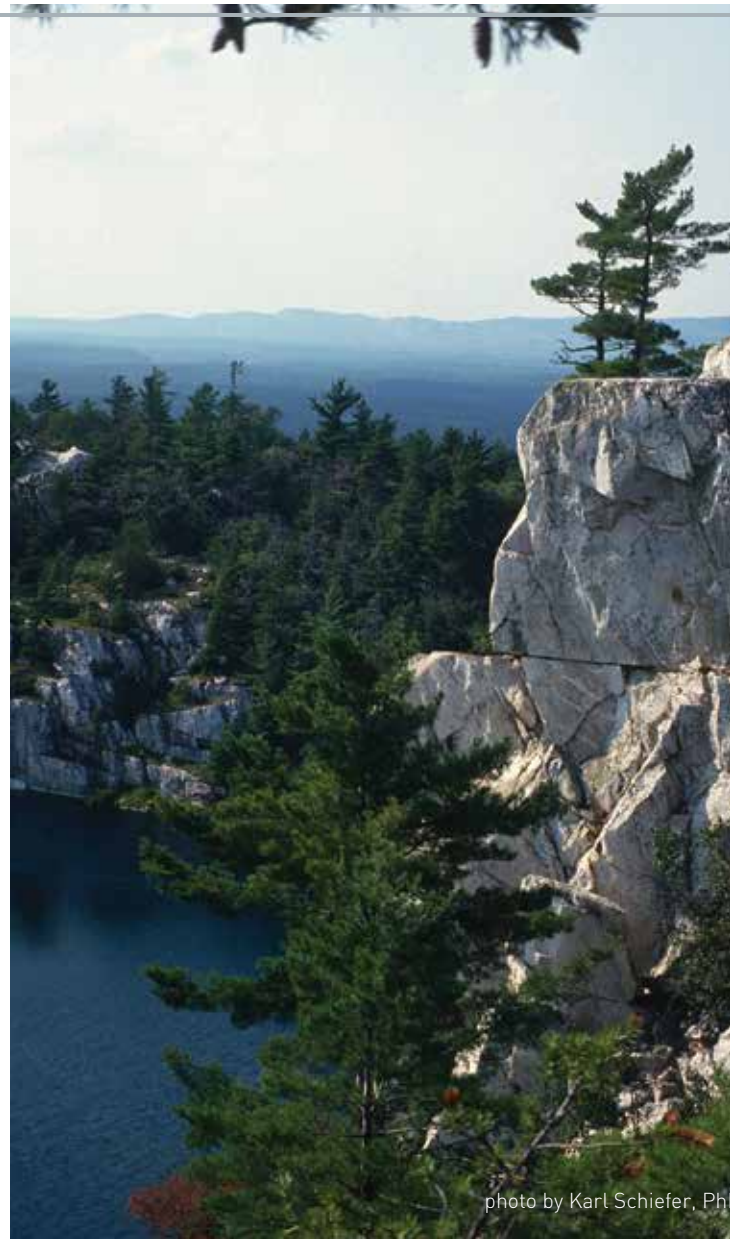
## Birds

➤ The great diversity of both terrestrial and aquatic habitats on the Georgian Bay coast attracts a large and diverse avifauna. Over 170 species of breeding birds nest on this coast, and the numbers increase if we include seasonal migrants that spend a short time here in the spring and fall as they migrate to and from the northern boreal and sub-arctic habitats. The eastern Georgian Bay coast is a well-documented north/south migration flyway for these species.

➤ Bird species diversity ranges from large predators (eagles, hawks, osprey) to waterfowl (geese, ducks), aquatic birds (gulls, terns, loons) and many smaller woodland and meadow species (sparrows, wrens, warblers).

➤ Many offshore islands support seasonally large populations of colonial nesting birds, such as the herring gull, ring-billed gull, common tern, Caspian tern, cormorant and rare great black-backed gull.

➤ The osprey and common loon are two iconic species for this coast. As fish eaters, the large and productive littoral zone found in the island complex provides excellent habitat for both.



## Humans in the Georgian Bay Ecosystem

➤ Humans have been a part of the Georgian Bay ecosystem for at least 10,000 years.

➤ Over the past several centuries, the human presence has changed from a sustainable ecosystem participant to the dominant agent of ecosystem change.

➤ Continued rapid human population growth and a value system (anthropocentrism) that prioritizes short-term human desires over longer-term ecosystem protection are the greatest threats to the future of this unique ecosystem.

➤ As the size of the human “footprint” on the landscape increases, natural ecosystems will continue to change and, in most cases, decline. This is certainly the case for what remains of the Georgian Bay wilderness and the unique ecosystems that it supports. ■