



# BIODIVERSITY

## Ecosystem Services, Habitat Loss and Species at Risk

*Why is biodiversity so important to the Great Lakes?*

GREAT LAKES FACT SHEET



8

## Background

The Great Lakes region includes several types of biomes – large communities of plants and animals that occupy a distinct type of environment.

Wetlands consist of land that is saturated with water either seasonally or all the time. The Great Lakes and their tributaries are home to more than 700 square kilometres of diverse wetlands, ranging from small wetlands nestled in scattered bays to extensive shoreline wetlands and river estuaries. By absorbing and retaining rainwater and runoff, wetlands help to manage the flow of water through the Great Lakes, reducing the risk of flooding. They also help to cleanse water by filtering out sediment and pollutants. Wetlands provide essential spawning grounds, habitat and food resources for many species of insects, birds, fish and other wildlife.

Forests help to moderate local climates by absorbing carbon from the atmosphere (carbon sequestration), by providing shelter against the wind and by helping to cool and moisten the air. They also maintain water quality and quantity by filtering out pollutants, by allowing water to infiltrate the soil where it pools into groundwater, and by reducing soil erosion and the amount of sediment that makes its way into rivers and lakes. While much of the original forest within the Great Lakes Basin was cut for lumber or cleared for agricultural and urban development, the total forested area has begun to recover in recent decades due to conservation efforts. The forests of the Great Lakes region are diverse, providing a wide range of wildlife habitat and resources. In Canada, deciduous forests are found along the northern shores of Lake Erie and Lake Ontario and the southeastern shore of Lake Huron; the Great Lakes–St. Lawrence forest extends along the St. Lawrence River across central Ontario to Lake Huron and west of Lake Superior along the Minnesota border; and the predominantly coniferous boreal forest lines the north shore of Lake Superior.

Most of North America's alvar ecosystems – consisting primarily of grassland, savanna and sparsely vegetated barrens – are found in the Great Lakes Basin. Alvars are typically waterlogged in the spring but dry out over the summer. Many rare plant species grow in alvar habitats around the Great Lakes, including the lakeside daisy, which survives only in this special environment.



## WHAT IS BIODIVERSITY?

The term “biodiversity” describes the diversity of life and its processes on Earth. It includes the variability of all species of organisms, the genetic differences within a species, the ecosystems in which they live, and the ways in which they interact with one another and their environment. Biodiversity also includes all the benefits that an ecosystem provides for humans. Often referred to as “ecosystem services,” these benefits include clean water to drink, clean air to breathe and healthy food to eat as well as the regulation of climate and the raw materials upon which the economy and society depend.

Variations in lake depth, climate and geology in the Great Lakes region help sustain a rich array of ecosystems and over 3,500 plant and animal species, some of which are found nowhere else on Earth. The lakes themselves are divided into different zones, each catering to different species, based on habitat conditions such as light, water temperature and oxygen levels. Lake trout, for example, prefer to live in deep areas of the lakes where the water is cooler and there is less light, while the shoreline areas support other forms of life, such as birds, mammals and amphibians. The lakes, rivers and streams that flow into the Great Lakes also support immensely diverse ecosystems, further enriching biodiversity in the region.

## HOW DOES BIODIVERSITY LOSS AFFECT THE GREAT LAKES?

### Biodiversity loss ...

- **threatens the sustainability of Great Lakes species:** Each species depends on a particular habitat for its survival, and any change in the fortunes of one species affects the entire ecosystem and food web of which that species is a part. When an ecosystem is altered, habitat can be lost, depriving a species of the essentials for survival: food, shelter and breeding or spawning grounds. This can put species at risk or even result in their extinction. Species that depend on highly specialized habitat are particularly vulnerable. The **eastern prairie fringed orchid** depends on the presence of special fungi in the soil for seed germination and seedling growth. The loss of this specialized habitat, possibly compounded by declines in the populations of pollinating insects, has caused a marked decline in orchid numbers. The loss of genetic diversity within a species can also affect survival because it leaves the species more susceptible to threats. For example, West Nile virus dramatically reduced the number of blue jays in the region several years ago. Had a small number of birds not been immune to the virus, the species would not have been able to repopulate. Declines in both the numbers and resilience of native species make resources and habitat more readily available to invasive species, further altering the balance of biodiversity in the region.
- **affects ecosystem productivity and resilience:** Diverse habitats are far more productive than simple habitats. They produce a wide array of nutrients and organic matter that can be used as food sources for a broad range of organisms, thus ensuring ecosystem resilience. As wetlands and forests are lost, the quality and supply of water is threatened, and the region becomes more vulnerable to the effects of climate change.
- **has an economic impact:** Biodiversity loss undermines the economic health of the Great Lakes region. For example, declines in populations of bees and other pollinators have resulted in reduced crop yields. Reductions in fish numbers and species have affected the productivity of commercial and sport fisheries.
- **affects human health:** Biodiversity loss can be linked to a number of human health effects. For example, because forests help to filter pollutants from the air, deforestation can result in an increase in respiratory problems. Convenient access to green spaces and wilderness makes it easier for people to be physically active, which helps to protect them from conditions that have been linked to inactivity, such as obesity, high blood pressure, heart disease and diabetes.



## CHALLENGES AHEAD

The decline in biodiversity is one of the most serious environmental issues facing the Great Lakes region. Factors such as habitat loss, climate change, invasive species, urban sprawl, pollution and unsustainable use of resources threaten the natural riches of the region and the ecosystem services on which its human population depends. Looking at how these factors have put some of the region's species at risk is one way of measuring the severity of this problem. Species at risk are categorized by federal and provincial agencies as extirpated (no longer found in the region but still occurring elsewhere), endangered, threatened, or of special concern. All of the species described in the examples below are currently classified as endangered in Ontario.



**Habitat loss:** Agricultural and urban development around the lakes, and the infrastructure associated with it, such as highways and hydro dams, has fragmented open spaces, disrupted migratory routes and breeding grounds, and destroyed habitat. The **American eel**, a fish born in the ocean, matures in freshwater like the Great Lakes and returns to the ocean to spawn. Hydro dams and turbines make its migration

dangerous and often simply impossible. Another species put at risk by habitat loss, the **Lake Erie watersnake** is found exclusively around the western end of Lake Erie, where its habitat has been dramatically reduced by the development of cottages and homes along the shoreline. Similarly, the population of **American badgers** in Ontario has declined sharply with the loss of its grassland habitat to development. The loss of grassland habitat and hunting grounds has also had a drastic effect on the **barn owl** population, of which fewer than five pairs remain in Ontario.



**Invasive species:** Biodiversity is put at risk when invasive species outcompete native species for food or habitat or indirectly change the food web or physical environment. Rare native species with limited habitat may be particularly vulnerable. The **fawnsfoot** is a small, freshwater mussel with a greenish-brown shell with distinctive chevron-shaped markings. It inhabits rivers with slow-flowing water and, in Canada, can be found only

in Great Lakes tributaries. Invasive zebra and quagga mussels compete with the fawnsfoot for habitat and interfere with its feeding, respiration, locomotion and reproduction. Invasive species can also take the form of invasive pathogens, introducing new diseases. The **American chestnut**, once abundant throughout the eastern Great Lakes region, has all but disappeared owing to chestnut blight, a fungus accidentally introduced with the importation of non-native chestnut trees from Asia in the early 1900s.



**Climate change:** The extreme weather associated with climate change has the potential to disturb ecosystems, imperilling native species and increasing their vulnerability to invasive species. For example, the decreases in water levels expected to result from climate change may reduce spawning grounds for fish and shoreline habitat for birds, reptiles and amphibians, threatening their reproductive success.

Species such as the **spotted turtle**, already endangered by habitat destruction and pollution, could lose yet more of their vital habitat in ponds, marshes and bogs as wetlands and waterways dry up. Other species will be affected by the warmer temperatures expected to accompany climate change. For example, warmer water temperatures will decrease habitat for cold-water fish such as **Aurora trout** (a type of brook trout), and reduced snow and ice cover could also affect food supplies and spawning grounds for a wide range of wildlife species. Many species will

not be able to alter their habitat or migration patterns fast enough to keep pace with the changing climate. They will find themselves in climates unsuitable for their survival or will be under severe stress through increased vulnerability to disease, parasitism and predation.



**Harmful pollutants:** When a harmful pollutant enters an ecosystem, it can affect an organism's ability to develop, reproduce and survive. The **rapids clubtail**, a small, brightly coloured dragonfly, is found in localized distributions throughout eastern North America. It lays its eggs on the surface of fast-flowing rivers that float the eggs downstream into slow-moving pools where they hatch into larvae. Pollution has been

a key factor in reducing or eliminating rapids clubtail populations in two of the four rivers in Ontario where they are usually found.

## WHAT IS BEING DONE?

The following are some examples of the initiatives and strategies that are currently in place to address biodiversity loss in the Great Lakes region:

### International Collaboration

» **Great Lakes Water Quality Agreement (GLWQA):** In 1972, Canada and the United States signed the GLWQA in order to "restore and maintain the chemical, physical, and biological integrity of the waters of the Great Lakes." Amended most recently in 2012, the agreement continues to emphasize the importance of protection, conservation and recovery of biodiversity and habitats.

### Federal Initiatives

- » **Canadian Biodiversity Strategy (1995):** This strategy sets out measures for Canada to meet its obligations under the United Nations Convention on Biological Diversity (1992) by enhancing coordination of national efforts to conserve biodiversity and use natural resources in sustainable ways.
- » **Species at Risk Act (2002):** The purpose of this act is to protect wildlife populations at risk in Canada. The federal Committee on the Status of Endangered Wildlife in Canada (COSEWIC) is responsible for evaluating the status of each species and determining whether it should be included on the list of species at risk that forms part of the act.

### Federal-Provincial Collaboration

- » **Canada-Ontario Agreement Respecting the Great Lakes Basin Ecosystem (COA):** This agreement, ratified in 1971 and currently being updated to reflect recent amendments to the GLWQA, makes provision for the federal and provincial governments to work together to protect the Great Lakes ecosystem. One of the COA's main goals is to "conserve and protect aquatic ecosystems, species and genetic diversity of the Great Lakes Basin."

### Provincial Initiatives

- » **Ontario Biodiversity Strategy (2005):** Renewed in 2011, this strategy aims to conserve Ontario's biodiversity and the forests, wetlands, lakes and rivers that are essential to it. The goals of the strategy include promoting stewardship and integrating biodiversity conservation into land use planning.
- » **Ontario Endangered Species Act (ESA):** Originally passed in 1971 and renewed in 2007, this act provides protection for species at risk and their habitats as well as measures to support the recovery of threatened and endangered species. The act includes the Species at Risk in Ontario (SARO) list.

## WHAT CAN YOU DO?

- **Make informed purchasing decisions:** Ensure that your wood and paper products are from a sustainable source. Look for the Forest Stewardship Council (FSC) label indicating that the product comes from a healthy forest and supports strong communities. Wherever possible, use 100% recycled paper. Ask where wildlife products are sourced and encourage local suppliers to stock only legal and sustainable products to avoid those made from threatened or endangered species.
- **Protect your part of Great Lakes habitat:** If you are a gardener, plant native species to reduce the risk of invasive species accidentally being released into the local ecosystem. If you are responsible for rural or cottage property, minimize your alterations of the environment. Disruptions such as shoreline development and hardening as well as the clearing of brush and grassland can devastate the habitat of a wide range of species and alter the balance of the ecosystem around you.
- **Get involved:** Look for opportunities to get involved in public consultations on important issues such as biodiversity and on agreements and legislation related to the Great Lakes. Urge government, businesses and other organizations to take action on Great Lakes issues. Join citizens across the province who are heading outside and looking for plants, birds, amphibians and mammals as part of citizen science initiatives, such as NatureWatch.



## SELECTED RESOURCES

For more information on biodiversity and the Great Lakes, consult the following resources:

Environment Canada. Canadian Biodiversity Strategy: Canada's Response to the Convention on Biological Diversity. <http://www.ec.gc.ca/Publications/default.asp?lang=En&xml=5609B7BF-5895-4E79-B1C6-C98B465E3949>

Environment Canada. Nature. <http://www.ec.gc.ca/nature/default.asp?lang=En&tn=EAC9183B-1>

Federal, Provincial and Territorial Biodiversity Working Group. <http://www.biodivcanada.ca/>

Government of Canada. Canadian Biodiversity Information Network. <http://publications.gc.ca/site/eng/276293/publication.html>

Nature Canada. <http://www.naturewatch.ca/english/>

Ontario Ministry of Natural Resources. Biodiversity in Ontario – Protecting What Sustains Us. <http://www.mnr.gov.on.ca/en/Business/Biodiversity/index.html>

Ontario Ministry of Natural Resources. Ontario's Species at Risk Program. <http://www.mnr.gov.on.ca/en/Business/Species/index.html>



150 Ferrand Drive, Suite 208  
Toronto, Ontario Canada M3C 3E5

Tel 416.926.1907  
Fax 416.926.1601

[www.pollutionprobe.org](http://www.pollutionprobe.org)

© 2013 Pollution Probe

### PHOTOS

Front cover: Barn owl (*Tyto alba*) in the rain. © R.G. Campbell. <http://www.russ-campbell.net/>

Background: Lakeside daisies (*Hymenoxys herbacea*) growing in an alvar habitat on Manitoulin Island. © Linda Pim

Habitat loss: Lake Erie watersnake (*Nerodia sipedon insularum*)

Invasive species: American chestnut (*Castanea dentata*)

Climate change: Spotted turtle (*Clemmys guttata*). © Todd Pierson

Harmful pollutants: Rapids clubtail (*Gomphus quadricolor*). © Dan Irizarry

Back cover: Eastern prairie fringed orchid (*Platanthera leucophaea*). © Glenn Hanson