INDICATOR – Alien Species in the Great Lakes

STRATEGIC DIRECTION: Reduce Threats
TARGET: N/A
THEME: Pressures on Ontario's Biodiversity – Invasive Alien Species

Background Information:

Invasive species are one of the main threats to biodiversity at the global level and are a growing environmental and economic threat to Ontario (MEA 2005; OMNR 2012). Invasive species often act together with threats such as habitat loss and climate change to accelerate the loss of Ontario's biodiversity. Ontario's aquatic ecosystems have been particularly impacted by invasive species. Well-known examples of aquatic invasive alien species in Ontario include Round Goby, Zebra Mussel and the European sub-species of Common Reed (*Phragmites*). The Great Lakes have a long and well-documented history of aquatic alien species invasions (Mills et al. 1993, Ricciardi 2006). The Great Lakes are also the entry point for many alien species that subsequently invade Ontario's inland lakes and streams.

This indicator summarizes the cumulative number of established alien species in the Great Lakes and the rate at which establishments have occurred. Not all of these species are considered invasive – invasive species are those harmful alien species whose introduction or spread threatens the environment, the economy or society, including human health (OMNR 2012). Risk assessments to determine which species are invasive have not been completed for all alien species in the Great Lakes, so this indicator uses the number of alien species as an index of risks related to invasive species.

A companion indicator that provides an index of alien species in Ontario's inland lakes has also been developed. Comparable, comprehensive information on the distribution of terrestrial alien species and their introduction dates is not currently available, but is being assembled for the possible development of a terrestrial indicator.

Data Analysis:

The current list of nonindigenous species in the Great Lakes was downloaded from the Great Lakes Aquatic Nonindigenous Species Information System (GLANSIS - NOAA 2017). Species included are not native to any part of the Great Lakes basin, but are established in the Great Lakes and connecting waters. The database includes information on the origin of species and the year that they were first collected. Species were grouped into five taxonomic categories (bacteria/viruses, protists, plants, invertebrates and fishes) and the cumulative number and number of invasions per decade were graphed (Figures 1, 2).

There are some important caveats with respect to the information used for this indicator: some species established in U.S. waters of the Great Lakes and not yet found in Ontario waters are included; species native to one part of the Great Lakes basin that have been introduced to a new part of the basin are not included; and potential alien species whose origins are not clearly known are not included. Additional alien species are likely present and have not yet been found or established. There has also been no overall assessment to determine which species have been harmful (some, such as Pacific Salmon species have had positive economic and social impacts). However, this database is the best available information and is a good indicator of the risk to Ontario's biodiversity posed by alien species in the Great Lakes Ecozone.

- Access GLANSIS database

Results:

Trend: Improvement Data Confidence: High Geographic Extent: Great Lakes

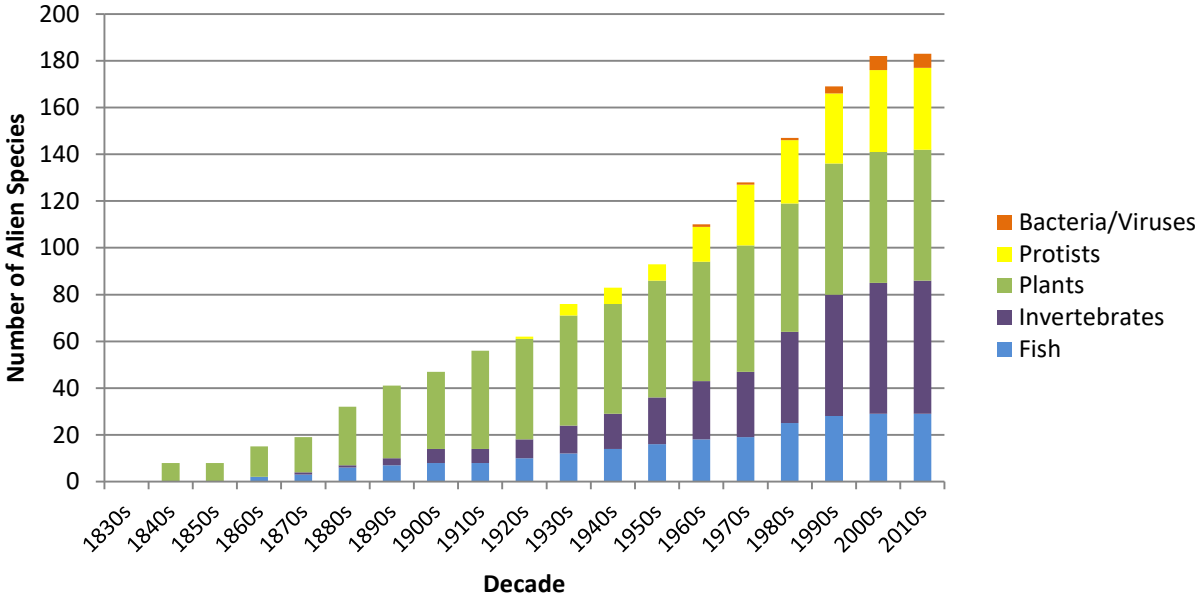

Figure 1. Cumulative number of established aquatic alien species in the Great Lakes by decade (note: protists include algae, diatoms and protozoans; invertebrates include annelids, bryozoans, coelenterates, crustaceans, insects, mollusks and platyhelminthes).

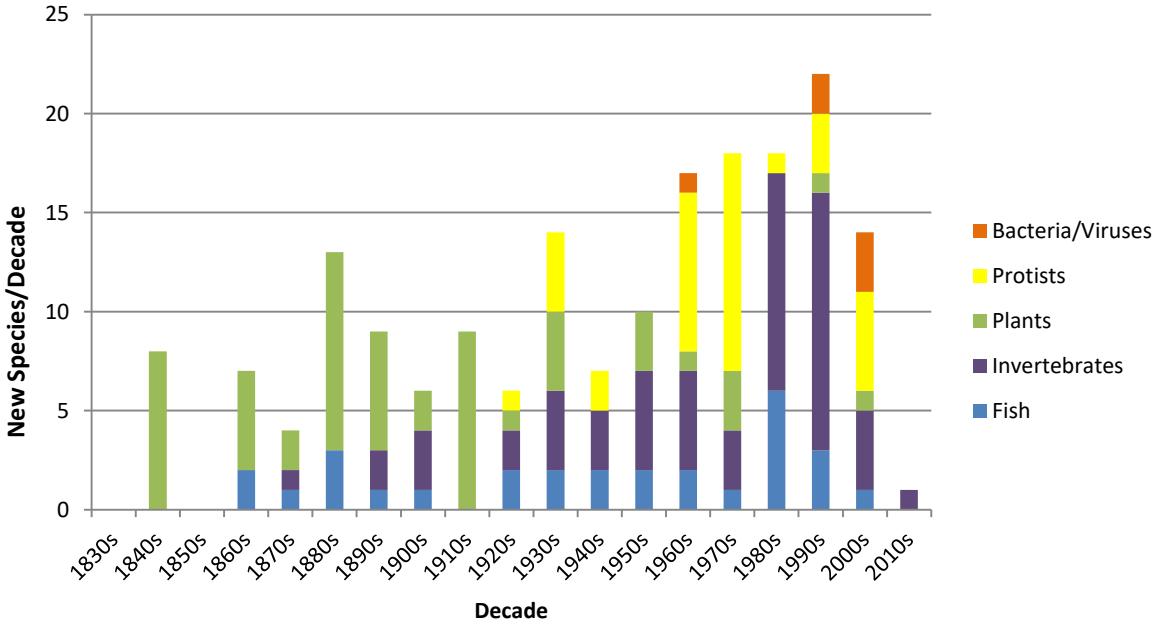

Figure 2. Number of established aquatic alien species discovered in the Great Lakes per decade.

Status:

- The number of aquatic alien species in the Great Lakes basin has steadily increased since the first species was documented in the 1840s. As of 2017, 183 alien species were established.
- The rate of newly established species increased up to 1999. Between 1839 and 1950, 6.9 new species were established per decade. Between 1950 and 1999, the rate increased to 17 newly established alien species per decade. This increased rate of establishment coincides with the opening of the St. Lawrence Seaway in 1959. It may also reflect increased detection efforts.
- Only one alien species, a planktonic crustacean (*Thermocyclops crassus*), has been discovered as established in the Great Lakes since 2010. The fact that only one new alien species has been established since 2010 may reflect a decrease in the invasion rate due to increased prevention efforts as well as the fact that accounting for the current decade is incomplete. No new fish species and a reduced number of invertebrate species have been detected as established since 2000.

Links:

Related Targets

7. By 2015, strategic plans are in place to reduce threats posed to biodiversity by invasive species

Related Themes

Pressures on Biodiversity – Invasive Species

Glossary

Established species- population that is self-sustaining and does not require re-introduction to maintain a population base

Web Links

Great Lakes Aquatic Nonindigenous Species Information System
http://www.glerl.noaa.gov/res/Programs/glansis/glansis.html

Ontario Ministry of Natural Resources and Forestry – Invasive Species
https://www.ontario.ca/environment-and-energy/how-government-combats-invasive-species#section-8

Ontario Federation of Anglers and Hunters – Invading Species Awareness Program
http://www.invadingspecies.com/

Ontario Invasive Plant Council
http://www.ontarioinvasiveplants.ca/

Invasive Species Centre
http://www.invasivespeciescentre.ca

References

Millennium Ecosystem Assessment (MEA). 2005. Ecosystems and human well-being: biodiversity synthesis. World Resources Institute, Washington, DC.

Mills, E. L., J. H. Leach, J. T. Carlton, and C. L. Secor. 1993. Exotic species in the Great Lakes; a history of biotic crises and anthropogenic introductions. Journal of Great Lakes Research 19: 1-54.

National Oceanic and Atmospheric Administration (NOAA). 2014. Great Lakes Aquatic Noninidigenous Species Information System. [Available at: http://www.glerl.noaa.gov/res/Programs/glansis/glansis.html (Accessed June 20, 2017)].

Ontario Ministry of Natural Resources (OMNR). 2012. Ontario invasive species strategic plan. Ontario Ministry of Natural Resources, Queen's Printer for Ontario, Peterborough, ON.

Ricciardi, A. 2006. Patterns of invasion in the Laurentian Great Lakes in relation to changes in vector activity. Diversity and Distributions 12: 425-433.

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