WHY ARE NON-NATIVE AQUATIC SPECIES A PROBLEM IN THE GREAT LAKES AND HOW ARE THEY GETTING HERE?

The introduction and spread of non-native aquatic species threaten the ecology and economy of the Great Lakes region. Human activities associated with shipping are responsible for over one-third of the non-native aquatic species introductions to the Great Lakes.

The Issues

- The Great Lakes have been changed forever by the introduction of at least 169 non-native aquatic species. The spread of non-native species is one of the most serious threats to the integrity of the Great Lakes ecosystem.

- Once a non-native species establishes itself in the Great Lakes ecosystem, it is virtually impossible to eliminate. For this reason, further invasions must be prevented.

- Non-native aquatic species also impose a serious toll on the economy of the region. Sea lamprey controls alone currently cost governments over $16 million annually. Non-native aquatic species also threaten the sport and commercial fishing industry that is valued at almost $4.5 billion annually and supports more than 80,000 jobs.

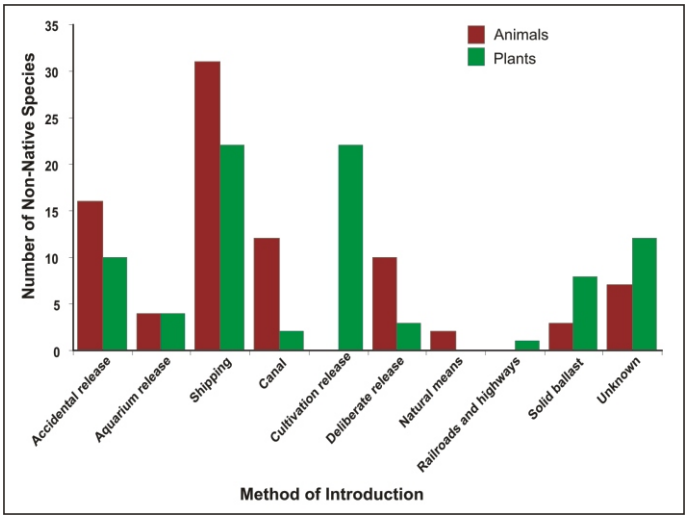
The Indicators

The introduction of non-native aquatic species to the Great Lakes has lead to unpredictable and irreversible changes to the ecosystem. Documenting the presence of these species and their modes of introduction into the Great Lakes allows assessment of the health of the ecosystem and identifies mechanisms by which to prevent further invasions.

Sea lamprey abundance is an example of an indicator directly related to the damage that non-native aquatic species can inflict upon fish communities and aquatic ecosystems of the Great Lakes. The eel-like sea lamprey is a parasite that feeds on the body fluids of other fish. Its invasion into the upper lakes in the early 1900s led to the devastation of many native fish populations, particularly top predators such as lake trout.

The Assessment

Human activities associated with shipping are responsible for over one-third of the non-native species introductions to the region. In fact, since the opening of the St. Lawrence Seaway in 1959, over 70 percent of non-native animal introductions have been attributed to the release of contaminated ballast water into the Great Lakes or from biofouling (the undesirable accumulation of organisms) on the hulls of ocean-going ships. Ballast water is carried by ocean-going ships for stability and is exchanged at various ports. In the 1980s, after the introduction of the Eurasian ruffe and the zebra mussel, voluntary ballast management measures were put into effect. This was followed by mandated regulations in 1993. Contrary to expectations, the reported rate of invasion has not declined since these measures began. Current enforcement practices and treatment technologies may be inadequate to prevent additional invasions.



Methods of introduction for non-native aquatic species established in the Great Lakes basin since the 1830s. Source: *State of the Great Lakes 2005* report.

Other methods of non-native aquatic species introduction to the Great Lakes include their direct release by humans, unintentional transfer or escape from captivity. Of particular concern are activities related to aquaria, garden ponds, baitfish, and live fish markets. For example, bighead and silver carp, fish species reported to have escaped from aquaculture facilities and fish farm ponds adjacent to the Mississippi River in the 1980s and 1990s, have become established in the Mississippi River Basin. These species are now making their way upstream in the Illinois River toward Lake Michigan, and they may still be used for live bait by anglers and sold live at some fish food markets within the Great Lakes region.

Sea lamprey, documented in Lake Ontario since the early 1800s, invaded the other Great Lakes after the Welland Canal between Lake Ontario and Lake Erie opened in 1920. Lampricide treatments are the mainstay of control and have reduced sea lamprey populations to levels that allow lake trout to survive to maturity in all five Great Lakes and to be fully self-sustaining in most areas of Lake Superior. Target ranges of sea lamprey abundance have been set by the Great Lakes Fishery Commission (GLFC) and fishery management agencies. Sea lamprey populations are still above target levels in all three upper Great Lakes and are increasing in abundance in Lake Michigan.

Sea lamprey and wounded coho salmon. Photo: Roger Bergsted (USGS) and Marc Gaden (GLFC).

Current Actions

Connecting channels and canals continue to allow non-native aquatic species access o the Great Lakes. In response to the threat of the Asian carp invasion in the Great Lakes, an electric dispersal barrier in the Chicago Sanitary and Ship Canal was activated in 2002 to block the movement of species between the Mississippi River and the Great Lakes basins. Construction of a second dispersal barrier is underway. Although all eight Great Lake states and the province of Ontario have issued some restrictions on the sale of live Asian carp in markets, enforcement in private sales remains a challenge.

Measures have been established to control sea lamprey, including treating larval lamprey habitats in streams with lampricides, trapping spawning lamprey, and the release of sterile male lamprey. The GLFC continues to focus on research and development of alternative control strategies to improve the effectiveness of the control program and to reduce reliance on lampricides.

Outreach efforts have been initiated to educate recreational water users and management agencies about practices that reduce the spread of non-native aquatic species.

Actions Needed

To be effective in preventing new invasions, management strategies must focus on linkages between non-native aquatic species and their modes of travel between their native habitat and the Great Lakes. Measures are needed that will effectively eliminate or minimize the role of shipping and other methods of introduction. If this does not occur, we can expect the number of non-native aquatic species in the Great Lakes to continue to rise, with an associated loss of native biodiversity and an increase in unpredicted ecological damage.

To Learn More

For further information on non-native aquatic species in the Great Lakes, refer to the ***State of the Great Lakes 2005*** report which, along with other Great Lakes references, can be found at **www.epa.gov/glnpo/solec**.

Zebra mussels. Photo: U.S. EPA Great Lakes National Program Office.

02/06
EPA 905-F-06-903
IISG-05-29