# U.S. House of Representatives
## Committee on Transportation and Infrastructure
### Washington, DC 20515



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March 2, 2007

## SUMMARY OF SUBJECT MATTER

**TO:** Members of the Subcommittee on Water Resources and Environment

**FROM:** Subcommittee on Water Resources and Environment Staff

**SUBJECT:** Hearing on the impact of aquatic invasive species on the Great Lakes.

## PURPOSE OF HEARING

On Wednesday, March 7, 2007, at 2:00 p.m., in Room 2167, Rayburn House Office Building, the Subcommittee on Water Resources and Environment will receive testimony from representatives of the U.S. Environmental Protection Agency, the State of Michigan, the Great Lakes Commission, the City of Racine, Wisconsin, the Great Lakes and St. Lawrence Cities Initiative, the Little Traverse Bay Bands of Odawa Indians, academia, environmental groups, port facilities, and the power sector on the impact of aquatic invasive species on the Great Lakes.

## BACKGROUND

### Aquatic Invasive Species in the Great Lakes

***The Problem:*** As a result of the increasing globalization of trade, speed of maritime travel, volume of cargo shipments, and tourism, the probability of accidental introductions of aquatic invasive species in the United States has increased in recent decades. The Great Lakes region has been negatively impacted by aquatic invasive species in part because of its location as a center of population and trade. Of the estimated 230 non-native aquatic species that are now found in the United States, at least 70% - over 162 species – can be found in the waters of the Great Lakes. These invasive incursions have already had profound environmental, economic, and public health impacts on the region. Without additional federal, state, or local action, the numbers of aquatic invasive species – and the costs to the American public, businesses, and environment - are expected to increase over time.

Aquatic invasive species consist of fish, plants, mollusks, invertebrates, insects, algae, and micro-organisms that are not native to an aquatic ecosystem. Because aquatic invasive species do not have natural predators, they can quickly become established and disrupt many ecosystems. Not only can aquatic invasive species displace and degrade native species and ecosystems, they can also cause serious damage to water infrastructure. While aquatic invasive species have been brought into the waters of the United States since colonial times, the Great Lakes were first impacted on a major scale in the 1950s.

The Great Lakes are one of the most important water resources on Earth. All five lakes combine to contain around 20% of the total global fresh surface water. The region surrounding the Great Lakes (both the U.S. and Canada) has a population of around 40 million people. As home to some of the major industrial centers in the United States and Canada, the Great Lakes region is a major manufacturing, transportation, and trade hub. The lakes have, from the earliest human settlement, provided a convenient and effective means for transporting natural resources and manufactured goods around the region. In addition, the lakes support the largest freshwater fishery in the world – consisting of both commercial and recreational fishing. Because so much commerce relies and is centered on the lakes, a healthy Great Lakes ecosystem is critical not only for the economic health of the region, but for the nation as a whole.

Aquatic invasive species first disrupted the Great Lakes ecosystem on a large-scale in the 1950s. The sea lamprey is an eel-like fish from the coastal north Atlantic that attaches to other fish and drains them of blood and other bodily fluids. The sea lamprey entered the upper Great Lakes through the Welland Canal around Niagra Falls. By the 1950s, the top native predatory fish – the lake trout – was already in decline due to over-fishing and habitat degradation. This led the sea lamprey to become a dominant predatory species and begin to decimate other native Great Lakes fish populations. Moreover, in the absence of the lake trout as a predator, another invasive species – the common alewife – began to overpopulate. By the 1960s alewives were so populous that they outstripped their food sources and began dying in huge quantities. Billions of starved, dead alewives washed up on the shores of Lake Michigan. Lakeside municipalities along Lake Michigan had to expend considerable tax resources to clean up the dead alewives. In order to control the alewife populations, fishery managers introduced salmon to Lake Michigan - a non-native species to the Great Lakes – in the mid-1960s. The salmon were so successful in containing the alewife population that they, too, ended up outstripping this food source and washing up, themselves, on the shores of Lake Michigan. Today, fishery managers now must try to achieve a delicate balance between these two non-native species by stocking Lake Michigan with alewives as a food supply for the salmon (which are now fished by both recreational and commercial fishermen).

In 2001, scientists estimated that 162 aquatic invasive species of all varieties had taken up residence in the Great Lakes. Some researchers have found that figure now tops 170 aquatic invasive species. Researchers also estimate that a new invasive species will be discovered at a rate of one every eight months. The U.S. Geological Survey (USGS) has found that the largest group of aquatic invasive species in the Great Lakes is aquatic or wetland plants, followed by fish, then algae. Assorted other species, including mollusks, invertebrates and micro-organisms, combined for 22% of the total aquatic invasive species listed in the USGS survey.[1]

[1] http://biology.usgs.gov/s+t/noframe/x185.htm (accessed 26 February, 2007)

The following is a listing of some of the many aquatic invasive species that inhabit the Great Lakes and negatively impact the ecosystem and economy.

- **Zebra Mussel:** Small, opportunistic filter-feeding crustaceans from eastern Europe. Scientists believe that zebra mussels were introduced into the Great Lakes through contaminated ballast water in the late 1980s. They reproduce rapidly and consume very large amounts of microscopic plants and animals, depriving native species of food. While zebra mussels are individually very small, densities of over 1 million zebra mussels per square meter have been found in Lake Erie. The sheer mass of zebra mussels can clog and potentially overwhelm water-related infrastructure, such as fresh water intake pipes used for drinking water. While zebra mussels can improve water clarity, their feeding also dramatically impacts and depletes the food chain in the ecosystems the mussels have invaded. Researchers have also associated the presence of zebra mussels with toxic algal blooms that foul drinking water supplies.

- **Sea Lamprey:** An eel-like fish from the coastal north Atlantic that attaches to other fish and drains them of blood and bodily fluids. Scientists believe that the sea lamprey entered the Great Lakes through the Welland Canal in 1921. A single adult sea lamprey can kill as much as 40 pounds of fish in a 12- to 20-month period. This species has caused the extinction of three species of whitefish and the decline of several other major native fish species (including lake trout), resulting in negative impacts on commercial and recreational fisheries.

- **Quagga Mussel:** Small, opportunistic filter-feeding crustaceans from eastern Europe. Researchers believe that they entered the Great Lakes through ballast water around 1989. They reproduce rapidly and consume very large amounts of microscopic plants and animals, depriving native species of food. Very similar impacts to the zebra mussel.

- **Round Goby:** Aggressive fish from eastern Europe first discovered in the Great Lakes region in 1990. Scientists believe it probably arrived via contaminated ballast water. It has decimated the small-mouth bass population by consuming their eggs.

- **European Ruffe:** The European ruffe is native to northern Europe and Asia. Researchers believe that it probably entered the Great Lakes through contaminated ballast water in the early 1980s. The ruffe can compete for food and habitat with native Great Lakes fish such as yellow perch. They also consume large amounts of the eggs of commercially important native fish such as lake whitefish.

- **Viral Hemorrhagic Septicemia (VHS):** An infectious viral disease that affects fish. Originally a virus found in salt water, it has been a problem in Europe for many years. The virus made its first appearance in the Great Lakes region in 2005. Fishery managers believe that VHS was introduced through contaminated ballast water. The virus poses no human risk, but has been linked to several fish kills and is of increasing concern in the Great Lakes region. It causes internal bleeding in fish, destruction of internal organs, and can manifest itself with external tumors. National Oceanic and Atmospheric Administration (NOAA) researchers have found that VHS has been responsible for several large fishkills in the Great Lakes. They also believe that nearly 50 Great Lakes fish species are susceptible to the virus, including several commercially important ones.

- **Whirling Disease (*Myxobolus cerebralis*):** A pathogenic protozoan parasite from Europe that affects the nervous systems of trout. Researchers believe that the parasite entered the United States through contaminated trout in 1955. The parasite attacks the fish cartilage and has devastated some trout populations. It is a severe problem in rivers and streams in western states, but has been primarily confined to fish hatcheries where close fish proximity makes transmission easier.

- **Purple Loosestrife (*Lythrum salicaria*):** An ornamental, wetland plant from Eurasia that is displacing cattails and other native wetland vegetation. Scientists believe it was brought into the United States in the early nineteenth century. Purple Loosestrife has no value as a food source for native wildlife and is less suitable as habitat than native wetland plant species.

***Sources:*** Aquatic invasive species incursions are, in part, a function of human population migrations and increasing global trade. Increases in the number of people traveling, and the speed and methods of travel and trade have all played a part in increasing the rate of introduction and survival rates of non-native plants, animals, and micro-organisms into the Great Lakes.

Non-native species have a greater chance of surviving and then establishing themselves in new habitats when they come from a region that is similar to the ecosystem they are introduced to. For example, aquatic invasive species from northern and eastern Europe, Korea, northern China, and Japan may have an easier time establishing themselves in new habitats in the Great Lakes than species from, for example, south-east Asia. The NOAA's Great Lakes Environmental Research Laboratory reports that the most successful invasive species to take hold in the Great Lakes are from eastern Europe – specifically from the Black, Caspian, and Azov Seas. Species from the coastal North Atlantic Ocean are the second most established aquatic invasive species. They have not, however, been as effective at establishing new habitats as eastern European species.

Aquatic invasive species in the Great Lakes come from a variety of sources. In general, any untreated material (water, wood, soil, etc.) can serve as a possible pathway for aquatic invasive species. Among the most prevalent pathways, however, are cargo ships. The vectors can include a vessel's ballast water, anchor chains, and hulls. The recreational boating industry is also of concern because many invaders, such as zebra or quagga mussels, can survive for long periods of time in bilge water or while attached to the exterior of water-craft during transport. For example, California officials recently found quagga mussels in Lake Havasu near the Arizona border. They believe that a recreational boater unknowingly brought the mussels into the lake after returning from a trip to the Great Lakes and failed to adequately clean and dry the boat. Some non-native species – such as salmon – were introduced to the region to suppress other aquatic invasive species. Some of these now serve a central function in supporting recreational and commercial fisheries.

## Impact of Aquatic Invasive Species on the Great Lakes

***Environmental Impacts:*** Invasive species can have significant environmental impacts because they can disrupt ecosystems. Because non-natives often have no natural predators they can dominate ecosystems very quickly. Not only can their population skyrocket, they can compete for food

supplies, introduce new pathogens that can decimate native species populations, and consume native species. The environmental impacts of aquatic invasive species in the Great Lakes have included:

- The loss of the native lake trout population due to the sea lamprey;
- Zebra mussels improving water clarity, while at the same time disrupting the food chain of native species;
- The disappearance from Lakes Michigan, Huron, Erie, and Ontario of a small shrimp-like invertebrate called *Diporeia* – part of the native ecosystem food chain. NOAA scientists believe that the zebra mussel may be out-competing *Diporeia* for algae, a food source shared by both species ;
- Native clam and mussel population decreases due to competition from the zebra and quagga mussels;
- Declining health of the lake white fish – a commercially valuable Great Lakes fish. This is likely due to the disappearance of *Diporeia* – the lake whitefish's primary food;
- Declines in the yellow perch population in Lake Michigan. This is likely due to the increased frequency of toxic algal blooms associated with zebra mussels.

***Economic Impacts:*** While estimating the exact economic costs of aquatic invasive species is difficult, the financial burden placed on the nation is very large. A 2000 study by Cornell University in the scientific journal, *BioScience*, placed the damage costs to the entire country at $138 billion annually. A 2001 study attributed national net economic losses due to invasive fish at approximately $1 billion per year.

In the Great Lakes, zebra mussels have cost, according to some sources, an estimated $5 billion over ten years for cleaning infrastructure such as water intake pipes, filtration equipment, and power generating infrastructure. The annual eradication program for sea lampreys costs between $10 million and $15 million. The spread of the purple loosestrife – an invasive aquatic plant common to the Great Lakes – results in costs of $45 million per year due to forage losses and control costs, according to Cornell University researchers.

Costs are incurred across a whole spectrum of economic activities. These include:

- The municipal, power, and industrial sectors: Facilities must clean intake pipes of mussels and other organisms that impede the flow of water. For example, zebra mussel control efforts can place huge costs on municipalities and industry. One source cites average annual costs for large municipalities at approximately $360,000. The U.S. Geological Survey cited average annual control costs for hydro-electric plants at $83,000, fossil fuel plants at $145,000, and nuclear power plants at $825,000;
- The tourism industry: Beaches are closed due to algal blooms, and recreational fish-stocks are reduced due to competition from aquatic invasive species. Boat engines and steering equipment can become jammed and ruined with non-native plants, such as hydrilla or water

hyacinth, and zebra and quagga mussels can clog engine water intakes. In 1993, the congressional Office of Technology Assessment determined that $100 million per year was spent on invasive aquatic weed control;

- Commercial fisheries: Valuable commercial fisheries, such as the lake whitefish, are declining due to habitat and food supply competition, as well as aquatic invasive species (such as the European ruffe and the round goby) eating their eggs. A 1999 study from Cornell places costs to fisheries from invasive species at $1 billion annually. The fishhook waterflea adds to the costs for the fishing community because it clogs fishing nets;

- Home-owners and communities: Homes adjacent to water bodies are valued substantially higher than those located farther away from water. However, waterfront values can decline if the water body is impaired. For example, water bodies that are choked with aquatic invasive plants, or have had their recreational fishing stocks decimated by aquatic invasive pathogens or competing fish may result in the values of adjacent properties declining;

Finally, state and municipal finances are impacted from the decrease in tax revenues from the impact of aquatic invasive species on activities that are state revenue sources, as well as on expenditures to mitigate the effects of aquatic invasive species (clean-up, eradication, population controls, public education, etc.).

***Public Health Impacts:*** Aquatic invasive species in the Great Lakes can also cause public health impacts. This is very important for residents of the region, as the Great Lakes are the only coastal waters of the United States used for drinking water. These public health impacts include harmful algal blooms, deterioration in drinking water quality, and beach closures.

- **Harmful Algal Blooms:** NOAA Great Lakes Environmental Research Laboratory researchers have found a relationship between the presence of zebra mussels and harmful algal blooms in the Great Lakes. Some harmful algal blooms can jeopardize human health, as well as destroy the ecosystems where they are located by depleting the surrounding water of oxygen. Algal blooms develop when certain conditions, such as high nutrient or light conditions, cause the algae to reproduce rapidly. Some algal blooms are harmless, but some, such as *microsystin*, produce toxins that are harmful to humans, fish, and Great Lakes habitats. These harmful algal blooms can produce neurotoxins, liver toxins, cell toxins, and skin irritants. The symptoms produced by ingestions of these toxins by humans can include nausea, vomiting, acute liver failure, muscle cramps, paralysis, skin irritations, rashes, and respiratory failure.

- **Deterioration in Drinking Water Quality:** NOAA Great Lakes Environmental Research Laboratory researchers have found a relationship between the presence of zebra mussels and harmful algal blooms in the Great Lakes. Algal blooms may cause smell and odor problems in water. In addition, researchers have determined that several virulent micro-organisms develop within toxic blue-green algal blooms. These micro-organisms are included on the U.S. Environmental Protection Agency's Candidate Contaminant List of dangerous micro-organisms and chemicals, required under the Safe Drinking Water Act Amendments of 1996.

- **Beach Closures:** After the dramatic increase in the population of the non-native common alewife in the 1960s, billions of dead alewives began to wash up on shore due to starvation. In order to make the beaches safe for humans, bulldozers were needed in some areas to clean the shoreline of the massive quantities of dead fish. The need to clean Great Lakes beaches have declined in recent years, however, because of declining alewife populations.

- In 2004, 13% of the monitored U.S. Great Lakes beaches were closed 10% of the time. This is an increase from 1998, when only 9% of the beaches were closed at least 10% of the time. The reasons for these beaches closures have varied – but include algal blooms and the presence of bacteria such as *E. coli* or *Enterococci.*

- Finally, communities increasingly find themselves expending resources to clean the shells of dead zebra mussels from local beaches.

## WITNESSES

### PANEL I

Honorable Gary Becker
Mayor
City of Racine
Wisconsin

*Also testifying on behalf of:*
Great Lakes and St. Lawrence Cities Initiative

Ken DeBeaussaert
Director of the Michigan Office of the Great Lakes
State of Michigan

*Also testifying on behalf of:*
Great Lakes Commission

Honorable Frank Ettawageshik
Tribal Chair
Little Traverse Bay Bands of Odawa Indians

Benjamin H. Grumbles
Assistant Administrator for Water
U.S. Environmental Protection Agency

PANEL II

Andy Buchsbaum
Director
Great Lakes Office
National Wildlife Federation

*Also testifying on behalf of:*
Healing Our Waters - Great Lakes Coalition

John Kahabka
Manager of Environmental Operations
New York Power Authority

Dr. David Lodge
Department of Biological Sciences
Notre Dame University

Adolph Ojard
Executive Director
Duluth Seaway Port Authority