AQUATIC NUISANCE SPECIES
by Nobuko Nagata, Legislative Analyst

Introduction

Exotic species have threatened the Great Lakes ever since Europeans settled in the region, according to a number of sources. Since the 1800s, at least 160 exotic organisms of all types, including plants, fish, algae, and mollusks, have become established in the Great Lakes. More than one-third of the organisms has been introduced in the past 30 years, a surge coinciding with the opening of the St. Lawrence Seaway.

Aquatic nuisance species not only alter or disrupt the environment, but also threaten public health through the introduction of disease, concentration of pollutants, contamination of drinking water, and other harmful human health effects. This article briefly explains the background of the aquatic nuisance problem; discusses its environmental, economic, and public health impacts; and reviews actions taken by the Federal and state governments.

Background

Aquatic nuisance species are waterborne, non-native organisms that can threaten the diversity or abundance of native species; damage the ecological stability of affected waters; and jeopardize commercial, agricultural, aquacultural, and recreational activity. These species have the potential to cause significant environmental, economic, and public health problems because they have been introduced to a habitat in which there are no natural controls, such as predators, parasites, pathogens, and competitors. They can crowd out native species, alter habitats, change predator/prey relationships, and transmit foreign disease or parasites. They also can cause such problems as food chain disruption, reduced biodiversity, clogging of water intakes, and increased weed growth. Furthermore, measures to eliminate aquatic nuisances from a system sometimes result in more harm.

Ballast water discharge by ships is the most significant source of unintentional introduction of aquatic nuisance species to the Great Lakes. The opening of the St. Lawrence Seaway in 1959 permitted more and larger vessels to pass between the Great Lakes and ports throughout the world, which in turn has greatly increased the risk of new aquatic nuisance species in the Great Lakes region. Ships take on ballast water for stability when they are not filled with cargo. When drawing in ballast water in one port, ships may pick up live organisms. As the ships are loaded with cargo in the Great Lakes ports, ballast water is discharged, releasing the live organisms into the lakes.

Impacts

Economic and Environmental. Some exotic species have caused significant economic and environmental damage to the Great Lakes region, according to various reports. For example, each sea lamprey kills up to 40 pounds of Great Lakes fish in its 12- to 20-month adult parasitic life, which has had a devastating effect on Great Lakes trout, salmon, steelhead, and whitefish fisheries. According to an article in the *Detroit News* (7-22-00), the annual cost of sea lamprey control is estimated at $13 million.

Another example is the Eurasian ruffe, which apparently was introduced to the Great Lakes from the St. Louis River near Duluth, Minnesota, as the result of a ballast discharge. In Lake Superior, the ruffe feeds on yellow perch, and perch populations evidently have declined an estimated 75% in water bodies where ruffe have become established. Reductions in native fish populations threaten a sport and commercial fishing industry that is valued at almost $4.5 billion annually.

In addition, zebra mussels have caused substantial damage to water intake systems throughout the Great Lakes basin and have substantially altered the aquatic ecosystem in portions of Lake Erie, Lake St. Clair, and the Saginaw Bay. According to a publication by the Great Lakes Panel on Aquatic Nuisance Species, large water users in the Great Lakes region, including municipalities and industries, pay an average of $360,000 per year to

control zebra mussels, with documented cumulative costs of $120 million from 1989 through 1994. According to the Michigan Department of Environmental Quality (DEQ), the U.S. Fish and Wildlife Service estimates the potential economic impact at $5 billion over the next 10 years to U.S. and Canadian factories, water suppliers, power plants, ships, and fisheries within the Great Lakes region. In addition, one severe biological impact since the introduction of zebra mussel into the Great Lakes is the near extinction of native clams and mussels in Lake St. Clair and in the western basin of Lake Erie.

Aquatic nuisance plants species, such as the purple loosestrife, also have significant ecological impacts. The environmental and economic problems caused by the dense growth of these plants, sometimes hundreds of acres in size, include displacement of native vegetation, degradation of water quality and wildlife habitat, limitation of water-based recreation, and lowered property values.

Public Health. Aquatic nuisance species can threaten public health through the introduction of disease, concentration of pollutants, contamination of drinking water, and other harmful human health effects. In November 1991, a South American strain of human cholera bacteria was found in ballast tanks in the port of Mobile, Alabama. Earlier that year, cholera strains were found in oyster and fin-fish samples in Mobile Bay, resulting in a public health advisory to avoid handling and/or eating raw oysters or seafood.

In the mid-1990s, Lake St. Clair experienced record numbers of beach closings as a result of bacterial contamination and the massive accumulation of aquatic vegetation. Many changes in other parts of Lake St. Clair have been attributed to increased water clarity, resulting from the invasion of zebra mussels. The zebra mussels remove significant amounts of phytoplankton from the water, which may increase human and wildlife exposure to organic pollutants. The implications for human health, however, remain unclear.

Prevention and Monitoring

Federal Action. In 1990, the Federal government enacted the Nonindigenous Aquatic Nuisance Prevention and Control Act to prevent and limit the introduction of aquatic nuisance species, promote research and control efforts, develop and implement environmentally sound control methods, and assist the states in a comprehensive research and management program. The Act's ballast water regulations require that vessels bound for the Great Lakes after operating on the waters beyond the Exclusive Economic Zone (an area extending from the baseline of the territorial sea of the United States seaward 200 miles) replace their ballast water before entering the Great Lakes. The regulations, however, do not apply to vessels operating exclusively among the Great Lakes ports. These vessels' tanks might contain residual fresh water and mud, and may spread nuisance species when ballast tanks are alternately filled and emptied as the ships unload and reload at various Great Lakes ports. Therefore, the Act does not provide safeguards against the dispersion of aquatic nuisance species already established in the United States. In addition, the oceangoing vessels' tanks also may contain foreign species even after the water is exchanged. According to the *Detroit News* (2-15-00), 75% to 95% of the ships entering the Great Lakes are not required to conduct a ballast exchange because they have only residual or leftover ballast in their tanks.

The National Invasive Species Act of 1996 reauthorized and amended the Nonindigenous Aquatic Nuisance Prevention and Control Act to require the U.S. Coast Guard to issue mandatory ballast management reporting and voluntary ballast exchange guidelines to all vessels that enter U.S. waters beyond the Exclusive Economic Zone. According to the DEQ, funding for these prevention and control efforts has not been appropriated as authorized under the Act. Enhanced funding is considered critical to fulfill the Act's prevention and control mandate.

Michigan Action. The Michigan Department of Natural Resources (DNR) and the DEQ have a public information program to limit the spread of aquatic nuisance species and to encourage environmentally sound management practices. The DNR has four Great Lakes Research Stations that are involved in monitoring Great Lakes fish stocks. The major thrusts of the studies are to measure changes due to harmful invaders and other external sources.

In addition, Public Act 144 of 2001 requires the DEQ to determine whether vessels operating on the Great Lakes and the St. Lawrence Waterway are complying with ballast water management practices, determine whether oceangoing vessels operating on the Great Lakes are using a ballast water treatment method to prevent the introduction of aquatic nuisance species; compile, maintain, and distribute lists of vessels that comply with the management practices or treatment methods; and post the lists on the DEQ website. Owners of vessels not on the compliance list are not eligible for a grant, loan, or award administered by the DEQ. (A Senate Fiscal Agency analysis of the Act (Enrolled Senate Bill 152) may be found on the Legislature's Internet site (http://www.michiganlegislature.org).)

The Michigan Sea Grant College program has an Aquatic Nuisance Office that publishes a map on zebra mussel sightings in Michigan waters and produces a database of lakes monitored each year. In addition, the office coordinates a program for citizen monitoring of zebra mussels in Michigan's inland lakes.

Other States. Many states have emphasized public education and awareness to limit the expansion of aquatic nuisance species. Boaters are urged to wash boats and trailers before moving to new lakes and rivers and to leave behind unused bait and bait bucket water. Texas and Florida have established check stations to look for zebra mussels attached to boat hulls. California requires ballast exchange for ships en route to its ports from the Pacific Ocean, and levies fees on each ship to pay for salinity tests that monitor compliance. Washington also requires ballast exchange and calls for the development over the next two years of methods to remove as many live organisms as possible from ballast water.

Conclusion

The negative impact of aquatic nuisance species on the health and economy of the Great Lakes is considered by many experts to be the most serious threat to the quality of the Great Lakes ecosystem. Some people contend that the current Federal regulations and enforcement measures are inadequate to regulate ballast water and to stop the introduction of aquatic nuisance species. Although Michigan's recent enactment of Public Act 114 is considered a significant achievement, many believe that immediate and cooperative efforts are needed at Federal, regional, state, and local levels through a multistate agreement or an effective Federal law to avoid mounting environmental and economic costs.

Several projects have been undertaken to explore various methods of treating ballast water, including heat, filtration, and biocides, in an effort to prevent the transportation of aquatic nuisance species into the waters of the Great Lakes. In addition, management authorities and research organizations are investigating the biology and ecology of these organisms and searching for effective management tools that will have minimal detrimental effect on the lakes.