



Great Lakes Science Center

Zebra Mussels Cause Economic and Ecological Problems in the Great Lakes



Zebra Mussels Impacting Native Clam

Economic impact

Adult zebra mussels colonize all types of living and non-living surfaces including boats, water-intake pipes, buoys, docks, piers, plants, and slow moving animals such as native clams, crayfish, and turtles. They even attach to each other, ultimately forming dense layered colonies up to one foot thick. Mussel densities of over 1 million per square meter have been recorded in parts of Lake Erie. In 1989, the town of Monroe, MI lost its water supply for three days due to massive numbers of zebra mussels clogging the city's water-intake pipeline. Since then, water users such as power companies, steel plants, city water suppliers, and golf courses, have had to retool their water-intake systems or apply chemical treatment to prevent zebra mussel related problems. Swimming areas in Lake Erie have had increased costs associated with removing tons of mussel shell that wash up on beaches during storms. The U.S. Fish and Wildlife Service estimates the potential economic impact at \$5 billion over the next ten years to U.S. and Canadian water users within the Great Lakes region alone.

Why are zebra mussels successful as invaders?

The zebra mussel (*Dreissena polymorpha*) is a small, non-native mussel originally found in Russia. In 1988, this animal was transported to North America in the ballast water of a transatlantic freighter and colonized parts of Lake St. Clair. In less than 10 years, zebra mussels spread to all five Great Lakes and into the Mississippi, Tennessee, Hudson, and Ohio River Basins. Many inland waters in Michigan are now infested with zebra mussels. Only one lake was infested in 1992; today there are over 100. Zebra mussels are very successful invaders because they live and feed in many different aquatic habitats, breed prolifically (each female produces 1 million eggs per year), and have both a planktonic larval stage and an attached adult stage. Young zebra mussels are planktonic. They are the size of the diameter of a human hair and are invisible to the naked eye. Because young zebra mussels are so small, they are spread easily by water currents and can drift for miles before settling. Adult zebra mussels are larger (<2 inches in length) and attach to hard objects and remain stationary. They often attach to objects involved in human activities, such as boats and boat trailers, and are inadvertently moved from one water body to another by people.



Zebra Mussels Impacting Water Intake



1999 Zebra Mussel Distribution

Ecological impact

Zebra mussels affect natural ecosystems both directly and indirectly. The greatest direct impact relates to the mussel’s feeding behavior. Zebra mussels are filter feeders and process up to 1 gallon of water per day/mussel. During this process, every particle in the water column is removed and either eaten by the mussels or wrapped in mucus and spit out. This feeding ability, in combination with high population densities, rapidly clears the water of even the largest lakes. Since zebra mussels became established in Lake Erie, water clarity has increased from 6 inches to 30 feet in some areas. Unfortunately, the material removed from the water consists of other live animals and algae that supply food for larval fish and other invertebrates. In response to this changing food supply, populations of some animals have begun to decline.

As the lakes clear, the brighter light levels cause aquatic plants to increase in number and size. This increased plant growth can be beneficial to some fish such as northern pike and to yellow perch. However, the plants do cause problems for recreational boaters and swimming beaches, and can increase taste-and-odor problems in drinking water supplies, and can block water-intake pipes during storm events.

One drastic impact of the zebra mussel invasion is the near extinction of native American unionid clams in Lake St. Clair and in the western basin of Lake Erie. Zebra mussels attach and build colonies on the clams, reducing their ability to move, feed, and breed, eventually leading to the death of the clams within a couple of years.

Zebra mussels have had positive impacts on parts of the Great Lakes ecosystems. Many native fish, birds, and other animals eat young and adult zebra mussels. Migratory ducks have changed their flight patterns in response to zebra mussel colonies. Lake sturgeon feed heavily on zebra mussels, as do yellow perch, freshwater drum, catfish, and all the sunfish. The increase in aquatic plants provides excellent nursery areas for young fish and other animals, leading to increases in smallmouth bass populations in Lake St. Clair and the Huron River.

Can we control zebra mussels?

Once zebra mussels become established in a water body, they are impossible to eradicate with the technology available today. Many chemicals kill zebra mussels, but these exotics are so tolerant and tough that everything in the water would have to be poisoned to destroy the mussel. Most commercial water users rely on chemicals such as chlorine, filters, or mechanical scraping to remove mussels from their intake pipes and facilities.

The issue of biological control has frequently been raised as a natural means to destroy zebra mussels. To date, no biological control methodology is available, although efforts are underway by various researchers to develop such a species-specific control agent. Release of predators such as black carp that would eat zebra mussels has often been recommended but would be ineffective. Many native animals already in the Great Lakes eat zebra mussels and in some areas are reducing mussel numbers. The problem is one of scale. The lakes are so large and zebra mussels so prolific that, like cockroaches, zebra mussel continue to survive. Zebra mussels may ultimately suffer population loss through loss of food. Massive amounts of food are required to support high population densities of zebra mussels, and planktonic food supplies have declined over the last decade.

Prevention is more effective than control.

Although removing zebra mussels from a lake or river is almost impossible, preventing their spread into new areas is not. Human activities have spread zebra mussels into many inland lakes and streams, usually through recreational boating, fishing, and diving practices. Simple steps such as draining live wells, cleaning vegetation off boat trailers, removing attached zebra mussels from boat hulls, and not dumping bait into lakes or rivers can prevent the spread of zebra mussels and other exotics into non-infested waters.