# New Jersey



Aquatic nuisance species have entered waterways throughout North America as a result of intentional and accidental introductions. Some of these organisms have had a beneficial effect, such as many recreational fishes and aquaculture species, while others have had a detrimental effect, such as the Asian clam (*Corbicula fluminea*) and zebra mussel (*Dreissena polymorpha*), and caused significant economic and environmental damage. Many more potentially harmful species will be intentionally or accidentally released into North American waterways. Nuisance species are also impacting freshwater and coastal waters throughout the United States. Nonindigenous species such as purple loosestrife (*Lythrum salicaria*) and the common reed (*Phragmites australis*) have invaded wetlands, competing with native wetland plants.

Scientists believe that nearly every waterway in North America could be infested by zebra mussels and quagga mussels (*Dreissena bugensis*) within the next 20 years. Zebra mussels are rapidly approaching New Jersey's borders with a population located in the Hudson River (just north of the Tappan Zee Bridge), and are posing a real threat to New Jersey's estuarine and fresh waters.

Zebra mussels (*Dreissena polymorpha*) encrust a rock.

Sea Grant
New Jersey

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**Species of Concern**
Common reed
Purple loosestrife
Quagga mussel
Zebra mussel

NEW JERSEY
MARINE SCIENCES
CONSORTIUM

Because salinity levels are high in most of the bays along New Jersey's coast, these regions have a lower probability of zebra mussel infestation. However, in other parts of the state, zebra mussels have potential to inhabit inland lakes, ponds, and the Delaware River.

## Potential Zebra Mussel Impacts

New Jersey, the most densely populated state and a key industrial center, is situated between the Hudson River estuary (eastern border) and the Delaware River estuary (western border); both have been designated as "National Estuaries" by the U.S. Environmental Protection Agency. These National Estuaries are important marine transportation and industrial centers, and provide habitat to valuable wildlife species, recreational opportunities to millions of boaters and anglers, and a source of water for drinking and industrial purposes.

The Hackensack and Passaic Rivers (Hudson River estuary) parallel the Hudson River as they flow southward into Newark Bay. Depending on water flow, zebra mussels could potentially inhabit the Hackensack River to its mouth, but infestation is more likely up river. The Passaic River is freshwater from the headwaters to as far south as the Dundee Dam and then becomes tidal and brackish to its mouth. Zebra mussels could probably infest the Passaic River to Newark Bay. Since salinity levels are higher in Newark Bay, there is a low probability of zebra mussel infestation in the bay itself. The Arthur Kill flows between Newark and Raritan Bays. Salinity levels are high throughout the Arthur Kill and even higher in Raritan Bay. Therefore, the probability of zebra mussel infestation in these waterways is low.

In the Delaware River estuary area, the Delaware River is tidally influenced from Trenton, NJ to its mouth. The salinity in the river is determined primarily by the rate of freshwater discharge. At times of low freshwater discharge, saltwater will intrude as far north as Philadelphia but only in trace amounts. During normal flow rates, the Delaware River is considered freshwater as far south as Chester, PA. At the mouth of Delaware Bay, salinity levels approach those of ocean water. Zebra mussels are primarily a freshwater mollusk but can tolerate salinity levels from zero to about 10 parts per thousand. Therefore, zebra mussels could potentially inhabit the entire Delaware River proper and northern stretches of Delaware Bay and, depending on river flow rates, could extend into more southern regions of Delaware Bay.

New Jersey has approximately 1,200 lakes and ponds comprising approximately 51,000 acres. Three hundred and eighty-one of these lakes and ponds (24,000 acres) are public waterbodies. In addition, there are approximately 6,450 miles of streams and rivers throughout the state. Various waterbodies, including several reservoirs in the northern and central regions of the state, have the proper conditions to sustain zebra mussel populations. However, as one reaches the pinelands section of south Jersey, many of the waterways have low calcium and pH levels. Hence, many of these waters are at low risk of an invasion by zebra mussels. Salinity levels are high in most of the bays along the Jersey coast. Therefore, these regions have a low probability of zebra mussel infestation.

A zebra mussel cluster.

## Impacts on Industry

The following New Jersey industries could potentially be impacted by an invasion of zebra mussels: power generating facilities, municipal water authorities, petrochemical and pharmaceutical firms, and others. In addition, many agribusinesses, golf courses, marinas, boaters, and even homeowners could also be impacted.

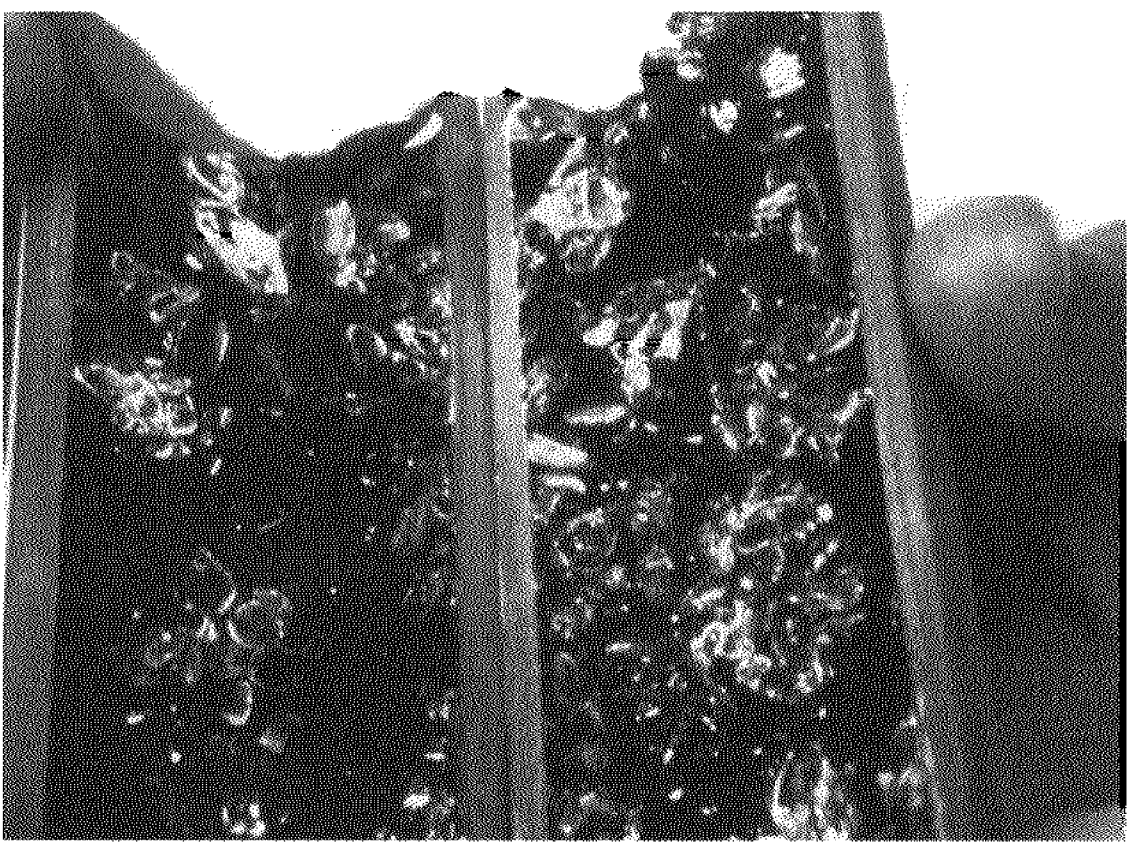
Researchers have shown that some of the primary vectors for spreading zebra mussels are natural dispersion, barge traffic, and recreational anglers/boaters. Many New Jersey boaters travel to the Great Lakes, Hudson River, Finger Lakes and other infested waterways to the north for pleasure boating and fishing, and could potentially introduce the zebra mussel to a New Jersey waterway. Even anglers fishing from banks and wading in zebra mussel infested streams, rivers, and lakes could potentially introduce the zebra mussel to New Jersey. Larvae can be carried in bait bucket water and in the bilge water and engines of boats. Many bass tournaments are held throughout the state and participants could spread the zebra mussel. Bait dealers located throughout New Jersey purchase bait such as minnows from other states. The bait could be shipped in water containing zebra mussel larvae that is then unintentionally dumped into a local waterway.

Commercial ships, especially barges, can be a major vector for spreading zebra mussels. However, the majority of New Jersey's waterways are not used for shipping. In the Delaware River, there is some commercial ship traffic, but vessels only travel as far north as the Philadelphia/Camden area. It is possible that zebra mussels could be introduced into the river from Philadelphia. Ships also travel in Raritan Bay, the Arthur Kill, and Newark Bay, but the salinity is probably too high for zebra mussels to establish a population.

Once the zebra mussel invades New Jersey, it will travel from one waterbody to another via the old canal systems (i.e. Raritan Canal) which link different waterbodies. This natural dispersion mechanism could spread the mussel throughout much of the state.

Other aquatic nuisance species that have been or may be introduced will pose a threat to New Jersey's estuarine and fresh waters. For example, the veined rapa whelk (*Rapana venosa*) was recently discovered in Chesapeake Bay and could make its way to Delaware Bay and seriously impact the Delaware Bay oyster industry.

Industries such as power generating facilities, municipal water authorities and pharmaceutical firms could potentially be impacted by an invasion of zebra mussels.

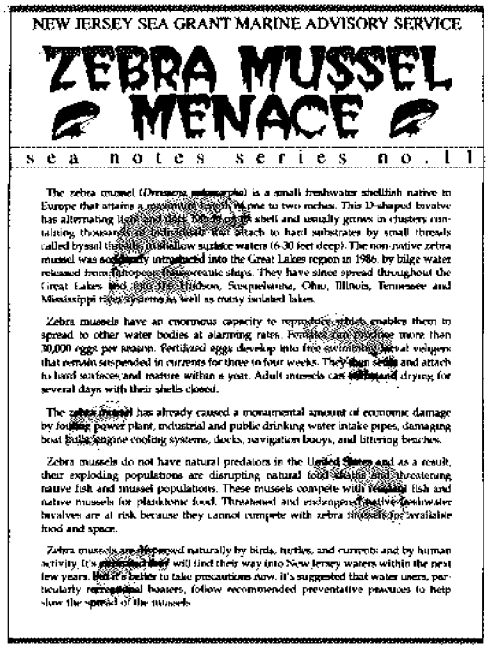


Cross-section of a pipe clogged with zebra mussels.

# Outreach

"The curriculum material allowed the class to investigate the problem on a large and local scale. The curriculum allows the student to use problem solving skills in order to come up with some possible solutions on how to keep the mussel and other exotic animals and plants out of New Jersey and other critical habitats. Teaching and making the problems around us real to the student is a difficult task — this assignment was both informative and fun."

*Frederick J. Szeles, Jr. Bridgewater Raritan High School teacher*


NEW JERSEY SEA GRANT MARINE ADVISORY SERVICE

ZEBRA MUSSEL MENACE

sea notes series no. 11

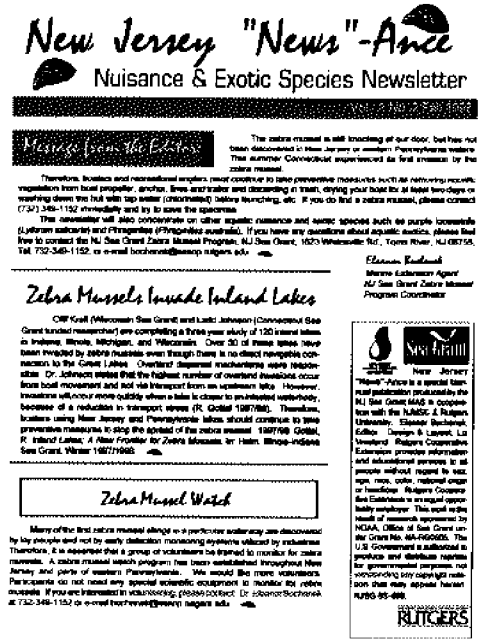
The zebra mussel (*Dreissena polymorpha*) is a small freshwater shellfish native to Europe that attains a maximum length of one to two inches. This D-shaped bivalve has alternating light and dark [illegible] shell and usually grows in clusters containing thousands of individuals that attach to hard substrates by small threads called byssal threads in shallow subtidal waters (6-30 feet deep). The non-native zebra mussel was accidently introduced into the Great Lakes region in 1986 by bilge water released from European transoceanic ships. They have since spread throughout the Great Lakes and into the Hudson, Susquehanna, Ohio, Illinois, Tennessee and Mississippi river systems as well as many isolated lakes.

Zebra mussels have an enormous capacity to reproduce which enables them to spread to other water bodies at alarming rates. Females can produce more than 30,000 eggs per season. Fertilized eggs develop into free swimming larval veligers that remain suspended in currents for three to four weeks. They then settle and attach to hard surfaces and mature within a year. Adult mussels can withstand dryness for several days with their shells closed.

The zebra mussel has already caused a monumental amount of economic damage by fouling power plant, industrial and public drinking water intake pipes, damaging boat hulls, engine cooling systems, docks, navigation buoys, and littering beaches.

Zebra mussels do not have natural predators in the United States and as a result, their exploding populations are disrupting natural food chains and threatening native fish and mussel populations. These mussels compete with [illegible] fish and native mussels for plankonic food. Threatened and endangered freshwater bivalves are at risk because they cannot compete with zebra mussels for available food and space.

Zebra mussels are dispersed naturally by birds, turtles, and currents and by human activity. It's [illegible] will find their way into New Jersey waters within the next few years. But it's better to take precautions now. It's suggested that water users, particularly recreational boaters, follow recommended preventative measures to help slow the spread of the mussels.


New Jersey "News"-Ance

Nuisance & Exotic Species Newsletter

Message from the Editors

The zebra mussel is still knocking at our door, but has not been discovered in New Jersey or western Pennsylvania waters. This summer Connecticut experienced its first invasion by the zebra mussel.

Therefore, boaters and recreational anglers must continue to take preventive measures such as removing weeds, vegetation from boat propeller, anchor, lines and trailer and discarding of trash, drying your boat for at least two days or washing down the hull with tap water (chlorinated) before launching, etc. If you do find a zebra mussel, please contact (732) 349-1152 immediately and try to save the specimen.

This newsletter will also concentrate on other aquatic nuisance and exotic species such as purple loosestrife (*Lythrum salicaria*) and Fitragrellas (*Fitragrellas australis*). If you have any questions about aquatic exotics, please feel free to contact the NJ Sea Grant Zebra Mussel Program, NJ Sea Grant, 1623 Whitesville Rd., Toms River, NJ 08755, Tel. 732-349-1152, or e-mail bochenek@aesop.rutgers.edu

Eleanor Bochenek
Marine Extension Agent/
NJ Sea Grant Zebra Mussel
Program Coordinator

Zebra Mussels Invade Inland Lakes

Cliff Kraft (Wisconsin Sea Grant and Lucki Johnson (Connecticut Sea Grant funded researcher) are completing a three year study of 120 inland lakes in Indiana, Illinois, Michigan, and Wisconsin. Over 30 of these lakes have been invaded by zebra mussels even though there is no direct navigable connection to the Great Lakes. Overland dispersal mechanisms were responsible. Dr. Johnson states that the highest number of overland invasions occur from boat movement and not via transport from an upstream lake. However, invasions will occur more quickly when a lake is closer to an infested waterbody, because of a reduction in transport stress (R. Gollat 1987/88). Therefore, boaters using New Jersey and Pennsylvania lakes should continue to take preventive measures in stop the spread of the zebra mussel. 1987/88 Gollat, R. Inland Lakes: A New Frontier for Zebra Mussels. In: Habs. Illinois-Indiana Sea Grant. Winter 1987/1988.

Zebra Mussel Watch

Many of the first zebra mussel sitings in a particular waterway are discovered by lay people and not by early detection monitoring systems utilized by industries. Therefore, it is essential that a group of volunteers be trained to monitor for zebra mussels. A zebra mussel watch program has been established throughout New Jersey and parts of western Pennsylvania. We would like more volunteers. Participants do not need any special scientific equipment to monitor for zebra mussels. If you are interested in volunteering, please contact Dr. Eleanor Bochenek at 732-349-1152 or e-mail bochenek@aesop.rutgers.edu

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New Jersey Sea Grant is currently focusing ANS outreach programs on zebra mussel education and prevention. Using and adapting curriculum produced by Virginia Sea Grant, the New Jersey program developed a zebra mussel curriculum that targeted students in grades 8 through 12. Included in the curriculum packet is a bibliography of available Sea Grant publications and various fact sheets and reports produced by Sea Grant programs in the Mid-Atlantic, Great Lakes, and New England regions. In 1995, New Jersey Sea Grant gave presentations and disseminated the curriculum to the following audiences: New Jersey Marine Education Association *Teach at the Beach Workshop*, Hackensack Meadowlands *Critical Issues Seminar*, New Jersey Marine Sciences Consortium *Statewide Systemic Initiative Summer Institute*, New Jersey Science Convention annual meeting, 4-H agents and program leaders, and the Association of New Jersey Environmental Educators. To date, over 100 curricula have been distributed in New Jersey and Pennsylvania.

More than 20,000 *Zebra Mussel WATCH* cards, developed by Wisconsin Sea Grant and modified for the Mid-Atlantic Zebra Mussel Network, have been distributed to recreational water users especially boaters and anglers, industries, schools, the general public, government agencies, and natural resource managers and biologists in both New Jersey and Pennsylvania. A Sea Note Series fact sheet, *The Zebra Mussel Menace*, targeting recreational boaters in the region was prepared. The fact sheet is designed to educate recreational boaters and anglers about the zebra mussel and ways to prevent its spread. Over 25,000 fact sheets have been distributed to boaters, anglers, industries, schools, the general public, bait/tackle shops, fishing license vendors, and natural resource managers and biologists in both New Jersey and Pennsylvania.

A citizen's volunteer monitoring program for zebra mussels was organized in the Delaware River watershed, Hudson-Raritan watershed and other waterbodies in New Jersey and Pennsylvania. Participants are drawn from local watershed and lake associations, environmental groups, government agencies, schools, and concerned citizens in both states. Over 250 volunteers from New Jersey and Pennsylvania are monitoring for zebra mussels.

A flier was produced for insertion into the New Jersey Department of Motor Vehicles Boater Registration Packets. One hundred and ninety thousand fliers were placed in boater registration packets that inform boaters about the zebra mussel and how to slow its spread.

New Jersey Sea Grant has also designed educational materials and conducted public presentations about zebra mussels for water resource user groups and public interest groups in New Jersey and Pennsylvania. In addition, articles have been written for local and state newspapers and magazines.

In 1996, a zebra mussel and other aquatic nuisance species newsletter was written and disseminated to over 300 water users and teachers in New Jersey and Pennsylvania. The second issue was produced in fall 1998. The newsletter became a biannual publication in 1999 and concentrates on both zebra mussels and other aquatic nuisance species.

***This update was prepared by Dr. Eleanor Bochenek***
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