



Zebra Mussels Pose a Threat to Virginia's Waters

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Introducing the Newest Invader of the Nation's Waters

The zebra mussel, a small freshwater shellfish native to Europe, is one of the newest invaders of U.S. waters. They are D-shaped in outline and average one-half inch in length-the size of your fingernail-but can grow to two inches during their five year lifespan. The conspicuous, dark brown or green bands alternate in a "zebra-like" striped pattern with white to cream-colored background bands. This coloration identifies the invader from our native mussels.

In 1986, a European cargo ship emptied its ballast water containing the zebra mussel into Lake Erie. This alien mussel found the temperature and environment of the Great Lakes similar to that of its European homeland and has spread rapidly. Now, it poses an environmental and economic threat to the U.S.

Most authorities consider the spread of zebra mussels across North America to be almost a certainty. Zebra mussels usually grow in clusters containing numerous individuals and generally are found attached to rocks or other hard surfaces in shallow (6-30 feet deep), algae-rich water. The broad region having favorable environmental conditions for zebra mussels could extend from the East Coast to the West Coast and from Canada to our southernmost states.

Economic Consequences

Unfortunately, zebra mussels attach to water intake pipes as well as natural structures and can become so numerous that they clog intakes of power generating plants, waterworks, and other facilities. Preventing mussels from attaching and removing attached colonies

increase industries' costs of providing electricity, drinking water, and other commodities. Increased operating costs will be reflected in higher charges to consumers.

Try to imagine the problems that will occur when large mats of zebra mussels clog cooling water systems for coal and nuclear power plants or plug fire protection (sprinkler) systems in factories and offices. Costs of keeping waterworks, power plants, and industrial facilities operating after mussel colonization are staggering: Canada's Ontario Hydro spent \$10 million in 1990 for chlorination and dechlorination equipment to prevent mussel larvae from settling and attaching. The coal fueled Monroe Power Plant on western Lake Erie has spent over one-half million dollars for cleaning zebra mussels from its cooling system and expects to spend an additional \$50 million for remedial work and pipe replacement.

Additional economic consequences of the spread of these mussels into freshwaters of the U.S. include fouling submerged pumps, boats, nets, marine engines, navigation buoys, and other underwater equipment. These mussels can have a disastrous impact on our commercial and sport fisheries. Since this species has few natural predators in the U.S., its populations are exploding rapidly, disrupting natural food chains, and threatening native fish and mussel populations.

Zebra mussels are voracious feeders. and each individual can filter over one quart of water daily. They compete with small fish and native mussels for tiny suspended food particles (planktonic food). High densities of zebra mussels can quickly deplete the food resources that are essential to the survival of native fishes and other aquatic animals. Increased competition for food and space from these mussels further jeopardize our native threatened and endangered freshwater mussel species, which are already under severe stress from water pollution, habitat loss, and reproductive failure. In only one of the Great Lakes-Lake Erie-U.S. Fish and Wildlife Service officials estimate that during the next decade, more than \$2 billion will be lost to commercial interests that rely on water from Lake Erie, and an additional \$2 billion loss will occur to the total fishery.

Will Virginia Inherit the Great Lakes' Problem?

Zebra mussels have not yet been found in Virginia's waters, but they have colonized all of the Great Lakes and range west to Duluth, Minnesota, and east to New York, New York. Recent reports indicate that they are knocking on Virginia's door-individuals have been collected from the Tennessee River and the Susquehanna River near the New York-Pennsylvania border. Their tremendous numerical increases and rapid expansion in geographic range are a result of their prolific breeding potential and capacity to travel undetected on watercraft. Huge dieoffs, causing taste and odor problems in the water, may follow population explosions, and during dieoffs, substances that the mussels have bioconcentrated will be released into the water. Unless Virginians make a special effort to prevent their entry, our waters will be invaded by this foreign mussel, now or in the future.

To protect our water supplies and native plants and animals, the introduction of the zebra mussel and other non-native species into the United States must be stopped and further geographic expansion of this introduced nuisance species must be restricted. The spread of these invading mussels which often hitchhike on boats from contaminated areas or are collected and transported as aquarium pets can be prevented by alert citizens. You can help by learning how to:

- recognize these exotics,
- avoid transporting and relocating them,
- discourage their further colonization of U.S. waters.

Our Individual Actions May Be the Key to Prevention: What You Can Do

Zebra mussels are now well established in the Great Lakes, and once introduced, these hardy invaders will become successfully established in most U.S. freshwaters. They may be able to survive in low salinity waters (4 to 5 parts per thousand) typical of the northern and central parts of the Chesapeake Bay. Adult zebra mussels can live out of water for several days in moist, shady places, and they may survive for more than a week in bilges, live wells, and inside boat trailer frames. The only solution for protecting Virginia's freshwaters for drinking and industrial uses as well as for aquatic plants and animals is to prevent the introduction of the zebra mussel into our state.

To help ensure that zebra mussels do not find their way into Virginia's rivers and reservoirs, please take some of the following simple precautions:

- Be able to identify a zebra mussel.
- Collect shell samples (preserve in alcohol or place in a bag in the freezer) of suspected zebra mussels and report all sightings of suspected zebra mussels to the Virginia Department of Game and Inland Fisheries.
- Check your boat, motor, live wells, and boat trailer for hitch-hiking mussels.
- Always drain bilges, live wells and motor wells before leaving mussel - infested waters.
- Do not transfer your boat from waters infested with zebra mussels into uninfested waters without inspecting it and removing all mussels by scraping and washing in hot water (140°F or hotter).
- Boats and trailers should dry in the sun for at least two to four days before being transported from infested to uninfested waters. Boats should be dry docked for two weeks, if at all possible.
- Flush your engine with uncontaminated water to remove mussel larvae.
- Inspect bait buckets and containers for tiny mussels and rinse these with uncontaminated, very hot water.

- Because of the possibility of contamination, leftover bait should not be transported from infested to uninfested waters. Give unused bait to another angler or place it in a garbage container at the launch site.
- Do not transport water, mussels or plants from the Ohio, Mississippi, Susquehanna, or Tennessee rivers, the Great Lakes, or other infested waters into Virginia.
- Before buying animals and plants for your aquarium, check with your local pet store to make sure it is not unintentionally selling zebra mussels.

Before Leaving an Infested Area:

	Inspect	Drain	Wash
Trailer Frames	X	--	X
Boat Hulls	X	--	X
Outdrive Units	X	X	X
Trim Plates	X	--	X
Trolling Plates	X	--	X
Props and prop guards	X	--	X
Transducers	X	--	--
Anchor rope and chain	X	--	X
All bilge water	--	X	X
Live wells (and their pumping systems)	X	X	X
Bait buckets	--	X	X
Raw water engine cooling systems	--	X	X
Other boat parts and accessories that get wet	X	X	X

Should Virginian's Be Concerned?

Yes! A biologist with the Great Lakes Fishery Commission predicts that within 20 years the zebra mussel will likely have taken over the entire East Coast of the U.S. Billions of dollars of zebra mussel impacts would be expected to occur over the next 20 years. Virginians will face the same economic problems experienced by people in the Great Lakes states if the zebra mussel invades our waters. Higher costs of electricity, water, and other commodities are an inevitable consequence of zebra mussels clogging the water intakes, filters, and condensers of power generating plants, drinking water facilities, and

other industrial water users. In addition to plugging water withdrawal and release systems, reduced fish populations and slower fish growth rates will result. Also, colonies of zebra mussels compete for space and food with native sport fish. Mussels that foul nets and boat motors and hulls mean increased maintenance costs, reduced catches, and lower profits for commercial fishermen.

Understanding Its Lifestyle: General Life Cycle of the Zebra Mussel

A mature female zebra mussel can produce 30,000 to 50,000 eggs which hatch throughout the spring and summer months at water temperatures above 54°F. The eggs are released into the water and fertilized outside of the female's body cavity (external fertilization). Fertilized eggs develop into freeswimming larvae (veligers) that drift in water for 10 to 30 days before attaching to a suitable hard surface. Strong, sticky glue secreted at the tips of their fine string-like fibers (byssal threads) is used for attachment to nearly any submerged object, including rocks, boat hulls, and docks. Dense colonies (zebra mussel beds) containing as many as 70,000 mussels per square yard have been found on the bottom of Lake Erie. Adult zebra mussels generally spend their entire life at one site, clinging to suitable bottom surfaces.

Can They Be Controlled?

Municipal water suppliers, power generating plants, and other industries have tried numerous approaches for controlling mussels in water intake structures—chlorination, heating, electrical shock, and sonic vibration. Chemical treatments with chlorine, ozone, and potassium permanganate have proved effective but are toxic to other aquatic organisms. A patent has been awarded on a method for installing chemical feed pipes inside water intakes at utilities. However, at present, no practical chemical control is available that can safely be used to treat mussels in lakes or streams. Some natural predation from ducks, fish, muskrats, and other native species may help to reduce zebra mussel populations, although little is known about the effectiveness of natural predators.

Who's Working on the Zebra Mussel Problem?

Congress has directed several federal agencies to work together to control the zebra mussel and prevent the introductions of other exotics. These organizations include the State Department, the Army Corps of Engineers, the National Sea Grant Program under the National Oceanic and Atmospheric Administration, the U.S. Fish & Wildlife Service, the National Academy of Science, the Tennessee Valley Authority, and the Environmental Protection Agency. However, Congress has provided less than 10 percent of the authorized funds to the program. Despite this lack of funding, the Great Lakes Sea Grant Network (comprised of Illinois, Indiana, Michigan, Minnesota, New York, Ohio and Wisconsin) has been actively disseminating information on this invader.

Several state and federal organizations are cooperating to provide information to Virginia citizens on zebra mussels. To report sightings of the zebra mussel, receive additional information, or find out more about what you can do, please contact:

- Lisie Kitchel, Virginia Department of Game and Inland Fisheries (804) 367-8747
- Sue Bruenderman, Virginia Department of Game and Inland Fisheries (804) 798-3677
- Louis A. Helfrich, Department of Fisheries and Wildlife, Virginia Polytechnic Institute and State University (540) 231-5059
- Richard Neves, Department of Fisheries and Wildlife, Virginia Polytechnic Institute and State University (540) 231-5927
- William DuPaul, Sea Grant Marine Advisory Program, Virginia Institute of Marine Science (804) 642-7164

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