

# AQUATIC INVADERS

WHAT ARE MUSSELS, HOW DO THEY SPREAD, AND WHAT DO THEY THREATEN?

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**Z**EBRA AND QUAGGA MUSSELS ARE miniscule aquatic organisms that invade ecosystems and rapidly reproduce, causing deleterious effects that harm native ecosystems and commercial, agricultural and recreational activities.

### ORIGINS

Zebra mussels originated in the Black and Caspian sea drainages between Europe and Asia and were first reported in the U.S. in the mid-1980s after ships from Europe incidentally transferred the species in ballast water into the Hudson River in New York. Quagga mussels came from Ukraine and first invaded the U.S. in 1988, when they were discovered in Lake St. Clair between Ontario and Michigan. By 2014, they have infested rivers and lakes in 29 states, primarily by clinging to recreational boats and traveling through connected river systems.

### LIFESPAN

Typically up to 5 years. Mussels can survive out of water for up to 10 days in ideal conditions.

### REPRODUCTIVE POTENTIAL

Mussels can reproduce all year but most often spawn in spring and fall. In a five-year lifetime, a single quagga or zebra mussel will produce about five million eggs, 100,000 of which reach adulthood. The offspring of a single mussel will in turn produce a total of half a billion adult offspring.



FLATHEAD LAKE, DERAGUN FILE PHOTO

ZEBRA MUSSEL, SHUTTERSTOCK PHOTO

### HOW DO THEY SPREAD?

Adult mussels attach to recreational boats and equipment, such as anchors and bait buckets, and attach to new subsurfaces, such as docks, rocks and aquatic objects before creating a colony. Boats that are moored or held in a slip are much more likely to harbor zebra and quagga mussels than day boats. Larvae flow downstream and can also be trans-

ported in water carried by recreational boats, trailers and other equipment. Zebra mussel larvae can be carried in boat bilge water, live wells, bait buckets, and engine cooling water systems even if the boat has been in infested water for only a short time. Since the first adult mussels were discovered in the Lake St. Clair in 1988, there are now an estimated 10 trillion mussels throughout all of the Great Lakes.

## ECONOMIC

Mussels are having devastating economic effects on municipal and residential drinking water delivery systems, power plant intakes, and industrial facilities that use raw surface water across the U.S. The U.S. Fish and Wildlife Service estimates that if mussels invade the Columbia River, they could cost hydroelectric facilities alone up to \$250-300 million annually. This does not include costs associated with environmental damages or increased operating expenses to hatcheries and water diversions.

- According to research conducted in 2014 by the University of Montana, Flathead Lake's pristine identity had an estimated \$6-8 billion impact on shoreline property values and is worth roughly \$1.6 billion in "nature-based tourism" in Flathead and Lake counties.
- Mussels quickly clog pipes, ruin boat motors and damage aquatic recreational equipment. They also cover boat docks and rocky beaches, creating hazardous conditions for swimmers, boaters and other users.
- Irrigation systems are quickly clogged by mussel infestation
- Management costs are enormous, particularly for industrial raw water users like power stations and water supply agencies.

## THE INFESTATION OF MUSSELS IN THE GREAT LAKES HAS AN ECONOMIC VALUE OF ROUGHLY \$100 MILLION ANNUALLY

- Due to their filtration activities, mussels may not leave enough particulate matter to provide effective coagulation at water treatment plants. This may require the plant to change its treatment technology, increasing operating costs. In addition, as zebra mussels selectively feed on green algae, an increased portion of blue-green algae is present. This may cause water to have a foul taste and odor, also increasing treatment costs.
- The infestation of mussels in the Great Lakes has an economic value of roughly \$100 million annually in terms of negative impacts to sport and commercial fishing, water treatment, power generation, industrial facilities using surface water, and tourism, according to a state economic analysis in 2012.



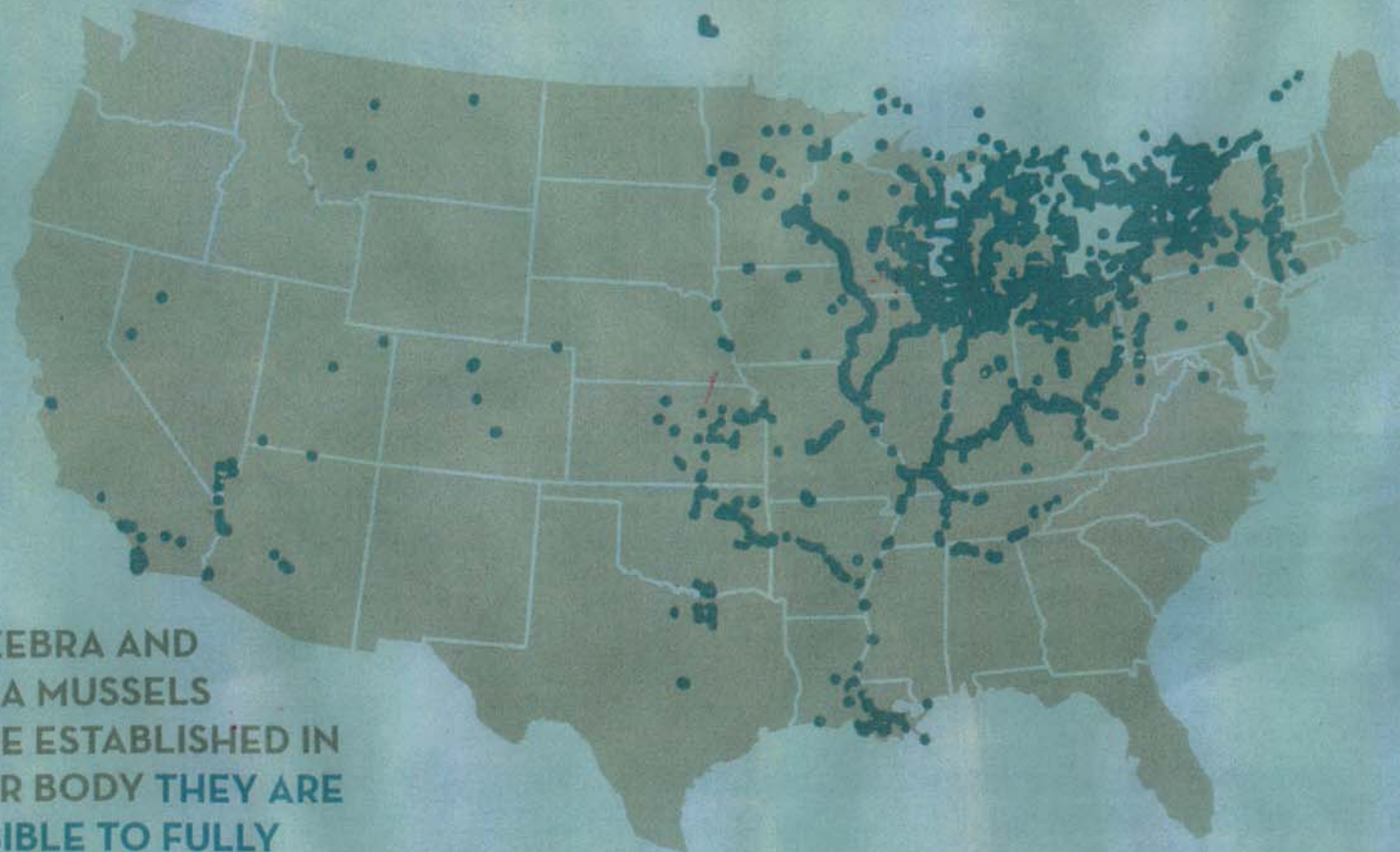
**CLOCKWISE FROM TOP** DEB TIRMENSTEIN, WITH THE FLATHEAD BASIN COMMISSION, AND HER DOG ISMAY SEARCH A BOAT FOR AQUATIC INVASIVE SPECIES AT AN FWP WATERCRAFT INSPECTION STATION IN RAVALLI. BEACON FILE PHOTO

ZEBRA MUSSELS, AN INVASIVE SPECIES OF FRESH WATER MUSSELS, ON THE PROPELLER AND SHAFT OF A SAILING YACHT ON LAKE ERIE. SHUTTERSTOCK PHOTO

A SIGN POSTED NEAR THE SOMERS BOAT RAMP WARNS BOATERS ABOUT THE DANGERS OF ZEBRA MUSSELS. BEACON FILE PHOTO



## SPREAD OF ZEBRA & QUAGGA MUSSELS



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SOURCE: U.S. GEOLOGICAL SURVEY, NONINDIGENOUS AQUATIC SPECIES DATABASE

## DIET

Mussels feed on small organisms called plankton that drift in the water. Phytoplankton and zooplankton form the base of the aquatic food web, providing a key nutritional source for fish. For example, since mussels were discovered in the Hudson, microzooplankton have declined by 70 percent and phytoplankton have decreased by 80 percent.

## ERADICATION

Once zebra and quagga mussels become established in a water body they are impossible to fully eradicate.

## PREVENTION

Education is key. Convincing recreational boaters to

sufficiently clean their boats and equipment before transporting them to new waters is essential, according to experts. Boaters should remove all aquatic plants, animals, and mud from everything that came in contact with water; drain all water, including bilges, live-wells, cooling water from the motor; clean and dry everything that came in contact with water; dispose of any live bait. If mussels are seen attached to a boat or other recreational equipment, it must be decontaminated using more stringent guidelines. Preventing downstream invasions is practically impossible.

## THREATS ECOLOGICAL

• As filter feeders, mussels remove food and nutrients from the water column very efficiently, leaving little or nothing

for native aquatic species, including fish. They devastate native species by stripping the food web of plankton, which has a cascading effect throughout the ecosystem. Lack of food has caused populations of salmon, whitefish and other species to plummet.

• Zebra and quagga mussels promote water clarity by filter feeding. The clearer water allows sunlight to penetrate to the lake bottom, creating ideal conditions for algae to grow. In this way, zebra and quagga mussels have promoted the growth and spread of deadly algae blooms. Algae foul beaches and cause botulism outbreaks that have killed countless fish and more than 70,000 aquatic birds across the U.S. in the last 10 years, according to the U.S. Fish and Wildlife Service.