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Zebra Mussel (Dreissena polymorpha)

Background

- Zebra mussels are small freshwater mussels that attach to solid underwater surfaces by extending adhesive tufts of fibers called byssal threads. Adults can grow up to two inches long and have D-shaped shells with alternating light and dark yellow or brown bands.
- Native to the Black, Caspian and Azov Seas region of Eurasia, the first account of an established population in North America was in 1988 in Lake St. Clair, a waterbody connecting Lake Huron and Lake Erie. The mussels had been introduced by ballast water from shipping vessels.
- By 1990, zebra mussels had been found in all of the Great Lakes. They have since spread inland to at least 29 states and over 200 Wisconsin waterbodies.
- Zebra mussels are classified as Restricted by Wisconsin Administrative Code NR 40, meaning they are established in the state and are known to cause high environmental or economic impacts. They cannot be transported, transferred, or introduced without a permit.

Ecology

- Zebra mussels feed by filtering microscopic plants, animals, and debris from the water.
- A single female zebra mussel can produce 1 million eggs each season, and colonies with densities greater than 30,000 individuals per square meter have been reported.
- Zebra mussels release eggs and sperm to form zygotes which develop into free-swimming microscopic larvae called veligers. After up to a month in the water column, veligers sink and seek out a firm surface to attach to.
- Once settled, the life span of zebra mussels can range from 3-9 years.

Impacts

- Ecological
    - Zebra mussels are effective filter feeders that can deplete the food supply for larval fish and other organisms and alter food webs.
    - Individuals can filter up to 1 liter of water per day, causing increased water clarity. This allows greater light penetration, which can increase aquatic plant growth.
    - High densities of zebra mussels may increase nutrients on lake bottoms, depleting oxygen levels and potentially creating anoxic environments.
- Economic
    - Zebra mussel colonies can clog pipes such as those used for municipal water treatment plants, hydroelectric power plants, and other industrial facilities. In 2001, Wisconsin Electric Power Company reported that they were spending $1.2 million per year to control zebra mussels on their Lake Michigan power plants. The median estimated economic impact of shipborne invasions in the Great Lakes is $138 million/yr but could be more than $800 million/yr.
    - Reduced fish populations, an increase in algal blooms, excessive plant growth, and fouled swimming areas can reduce property values on affected waterbodies and discourage recreation and tourism.
    - Zebra mussels can colonize docks, breakwalls, boat motors, and boat hulls, causing damage and reduced effectiveness.
- Human health
    - Zebra mussels are selective feeders and do not eat blue-green algae. Without competition from true algae, blue green algae have uninhibited access to available nutrients, often leading to amplified blue-green algae blooms and exposing humans and animals to toxins.
    - The sharp shells of zebra mussels can accumulate along swimming beaches or grow on ladders, swim rafts, and rocks where swimmers can cut their feet.

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Spread

- The primary vector for the inland spread of zebra mussels is recreational boating. Adult mussels are often transported on attached aquatic plants but can also be transported by attaching to boat hulls and equipment.
- Standing water in live wells and bilges, as well as lake water in bait buckets, can pose some risk for introduction since veligers can survive transport in even small amounts of water.

Control

- Once zebra mussels become established in a waterbody, very little can be done to control them.
- In closed systems, chemical treatments can be used to kill adults and veligers. These treatments are often used to reduce impacts of biofouling (*i.e.* clogged water intake pipes).
- The expense, uncertainty of 100% mortality, and potential non-target impacts of these treatments currently make them impractical for whole lake treatments.
- Zequanox
    - Zequanox is registered by DATCP and requires a DNR permit. The DNR is not likely to issue a permit until additional information about the product becomes available.
    - Zequanox is not suitable for whole lake treatment and will not ensure eradication, though spot treatments may be effective for a limited time.
    - Recolonization of treated areas varies and could be higher in previous 'problem' areas.
    - Zequanox may have been effective in killing zebra mussels in an enclosed area of Christmas Lake, MN, which has since been recolonized. The area was also treated with copper and potash, so it is unclear which treatment or combination of treatments is responsible for zebra mussel mortality.
    - Treatments on a pioneer population in another MN lake may have been effective, though post-treatment monitoring is yet to occur.

Prevention

- Zebra mussels can hitch a ride on boats, equipment or aquatic plants moving from one lake to another. Boaters, paddlers and anglers should take these steps to ensure that their actions are not part of the problem, but the solution!
    - INSPECT your boat, trailer, and equipment
    - REMOVE any attached aquatic plants or animals (before launching, after loading, and before transporting on a public highway)
    - DRAIN all water from boats, motors and all equipment
    - NEVER MOVE live fish away from a waterbody
    - DISPOSE of unwanted bait in the trash
    - BUY minnows from a Wisconsin bait dealer. Use leftover minnows only under certain conditions
- During the fall and spring seasons, contractors should take special care to clean their equipment when moving from one waterbody to another to remove and replace piers, boats, and boat lifts.