

Section 6

Zebra Mussel Monitoring Protocol

Citizen Lake Monitoring Network



Zebra Mussel Background

Zebra mussels are native to the Ponto-Caspian region of western Russia. The Zebra mussels were first found in Lake St. Claire in 1988. They were accidentally introduced to North America in ballast water from a boat that traveled across the ocean. Zebra mussels first arrived in the Wisconsin waters of Lake Michigan in the Racine harbor in 1990. Since that time they have “hitched rides” on boats and become established in more than 70 inland waters. Zebra mussels are most frequently transported from an infested lake to other lakes as mature mussels attached to aquatic plants. Be sure to remove all aquatic plants from boating equipment, including your trailer, boat, motor/propeller and anchor before launching and after leaving the water. By removing aquatic plants from boating equipment and encouraging others to do the same, you can help protect Wisconsin lakes from zebra mussels.

Zebra mussels come in many colors. Most are white or cream-colored with jagged brown or black stripes. However, some individual mussels have been found that are all-white, all-black, or have stripes going the other direction. Mussels and clams are bivalve mollusks. Bivalves have two shells that are held together by a strong ligament. Many of the mollusks we call clams are in fact mussels.

Zebra mussels reproduce when the water temperature gets above 54 degrees Fahrenheit. Male zebras release a cloud of sperm into the water. Female zebras release a cloud of eggs. A female zebra mussel can produce 30,000 to 1,000,000 eggs in one year. The fertilized eggs quickly develop into microscopic free-swimming larvae called veligers (VEL-i-jers). Veligers feed on tiny phytoplankton and begin to grow shells. The water currents can cause veligers to travel great distances. At 3 - 5 weeks, the veligers' shells weigh enough to cause them to sink. They must find something to attach to or they will die. Some of the veligers attach to hard surfaces with their sticky byssal threads. Hard surfaces include rocks, wood, glass, metal, native mussels, aquatic plants, and each other. They now change from free-swimming larvae to anchored mussels. Luckily, only 2-3% of the veligers survive to this stage (that is still 6,000 – 30,000 per female mussel, so that is a lot). Zebra mussels form dense clusters that attach to hard surfaces. The young zebra mussels reach sexual maturity during their first year and are ready to continue the cycle. These mussels are normally small, about 1 ½ inches in length, but sometimes grow larger (2 inches).

When zebra mussels feed on plankton, they remove incredible amounts of food from the water. Zebra mussels take in water; filter food from it and expel excess water and unwanted particles such as blue-green algae. A single mussel can filter about 1 quart of water each day. They leave the water clear, sometimes too clear. With plankton removed from the water, more sunshine reaches the bottom. Plants living here grow rapidly. Light sensitive fish such as walleye may move to deeper waters. Zooplankton and small fish which feed on plankton have less to eat. Their numbers decrease. Larger fish which feed on the small fish decrease in number. The zebra mussels take food, space, and oxygen, causing the death of native mussels. Zebra mussels do not eat filamentous algae or blue-green algae, thus these slimy algal populations will increase. This will cause unsightly algal blooms. Some of the blue-green algae become toxic when they die off.

In addition, zebra mussels can clog the intakes on boat engines, and intake pipes for utilities and industrial facilities; and their sharp shells can cut the feet of beach walkers. When they die they

wash up on the shore and begin to decay. These shells pile up on beaches, in some cases there will be “windrows” several feet thick of these shells.

Refer to appendix 9 for a list of lakes with zebra mussels.

Zebra Mussel Monitoring

Veliger Monitoring

DNR staff annually selects water bodies to sample for zebra mussel veligers (larvae). The veliger monitoring equipment is too expensive to distribute to individual lake volunteers, thus the goal of our network is to have the volunteers provide a boat and assistance to DNR staff. Since the volunteer’s boat stays on the lake, the DNR staff does not have to disinfect boats before and after the collection and they do not have to trailer boats to the lakes they are monitoring. Since the volunteer would be assisting in the monitoring, only one DNR staff would be required to do the sampling safely and efficiently. If you have an interest in assisting with veliger monitoring, contact your local DNR staff (page vii).

Adult Mussel Monitoring

Adult zebra mussel monitoring serves several purposes: (1) to track the spread by collecting additional data on lakes where veliger monitoring is not being conducted, (2) to verify a reproducing population if veligers have been identified as being present in a water sample, and (3) to determine the population densities of mussels after an infestation has occurred.

Adult zebra mussel monitoring on inland waters is accomplished using one of two methods:

- A. Shoreline surveys and regular inspections of structures in the water to determine the presence/absence of zebra mussels. This method is normally used on lakes that are not known to have zebra mussels. This method is more productive than using a substrate sampler as it covers a larger area on the lake.
- B. Substrate sampler monitoring (substrate refers to any substance in the water that zebra mussels may attach to) to estimate population densities. This method is most often used when zebra mussels have been found on a lake and DNR is trying to determine the densities of the mussels.

Method A: Shoreline Surveys

Sampling Equipment:

Rubbing alcohol
Zebra mussel data sheets
Hand lens 30X

Shoreline surveys and inspections of structures in the water are conducted to identify the presence or absence of adult zebra mussels. A single observer can monitor thousands of square meters of substrate at a given location in a short period of time – covering a larger surface area than a set of substrate samplers (see Method B).

Shoreline survey:

- Conduct shoreline surveys about once every two weeks from ice out to ice on. More or less frequent observations may be conducted if desired.
- Target areas around public boat ramps or areas that are likely to have a lot of boating traffic in the vicinity (for example, fishing hot spots, resorts, campgrounds, etc.).
- A survey may be conducted while swimming, taking a casual stroll along the shoreline, or fishing.
- Any solid surface is a suitable substrate to observe. Rub your hands along some of the submerged surfaces. Zebra mussels on the surface will feel like sandpaper. Divers can monitor in deeper water, or small rock (from deeper water) can be lifted through use of a net.
- In the fall, check your dock, piers, buoys and boats when you are removing them from the lake. Some residents prefer to do this monitoring in the spring prior to placing their equipment back in the water. In spring, the algae will have dried, leaving just the zebra mussels behind. Also, residents are often rushed when the equipment is pulled out in the fall. There may be more time to check in the spring.
- Zebra mussels do not like direct sunlight and are more often found on the underside of rocks and in cracks and crevices of rocks and structures. Small zebra mussels can be attached to plants as well.

Zebra mussels attached to native water-milfoil.



Reporting Zebra Mussel Monitoring Results:

A negative report can be as important as finding zebra mussels at a location. It is important to know where people are looking for zebra mussels in order to make decisions about whether zebra mussels are present at a given location. One cannot confidently state that zebra mussels are not present in an area if no one has looked. All monitoring efforts should be reported on the zebra mussel datasheets and submitted to your local Citizen Lake Monitoring Network (page vii) or Ron Martin at 101 South Webster St., Madison, WI 53707. Complete the zebra mussels reporting form Method A, electronically available as form 3200-122 A at <http://intranet.dnr.state.wi.us/itworks/forms/eforms.asp> or a paper copy in appendix 5.

Collect any mussels that you believe are zebra mussels. Place them in rubbing alcohol and deliver them to your local CLMN contact (page vii). **It is illegal to mail alcohol through the Postal Service.**

Method B: Substrate Sampler Monitoring

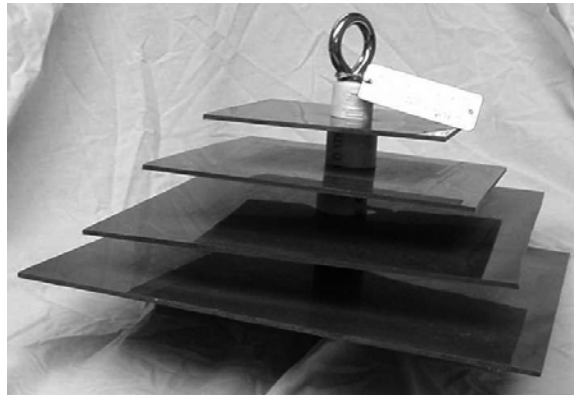
This method is often used once zebra mussels have been found on a waterbody or upstream waterbody. Some DNR regions also use this method on lakes not known to have zebra mussels. Contact your local CLMN contact (page vii) to see if substrate sampling is an appropriate monitoring technique for your lake. Plate samplers and hand lens will be provided to you by this staff.

Sampling Equipment:

Substrate samplers (figure 2 and appendix 4)
Rope or chain (rope may get chewed on by muskrats etc.)
Anchor (e.g. concrete block)
Rubbing alcohol
Zebra mussel data sheets
Hand lens 30X

The substrate sampler is a series of four square-plates that are 6, 8, 10 and 12 inches in size, pyramiding from smaller plates at the top down to larger plates at the bottom. The plates are made of 1/8 inch grey plastic PVC stock with 3/4-inch PVC pipe for spacers (1-inch sections) between the plates. The sampler is held together with an 8 inch long 3/8 inch diameter stainless steel eyebolt, plus washers and a wing nut. Each sampler has a DNR tag attached that provides a phone number for further information. Samplers will be provided by your local CLMN contact. Detailed directions to build a substrate sampler are found in appendix 4. Note - the substrate samplers are easily disassembled and cleaned for the next sampling season.

Substrate sampler for zebra mussel monitoring.



Substrate samplers are analyzed on a regular basis to determine if zebra mussels are present. Substrate sampler monitoring documents the arrival of zebra mussels, tracks the spread of zebra mussels, and determines zebra mussel population growth and seasonal abundance. Using a 30x-hand lens, mussels should be counted and the lengths recorded. This level of monitoring will provide estimates of population density and help determine when zebra mussels are settling in an area.

Placement of Substrate Samplers

- Place the substrate sampler in an area where there will be little chance of vandalism.
- Hang the substrate sampler from a dock, pier or other structure found in the water. An existing float or buoy may be used to suspend the sampler in the water column. If you plan to use a new float / buoy, a waterway marker application and permit form is necessary.
- Place samplers in areas where zebra mussels are most likely to be found. Pay special attention to areas in which zebra mussels may have been transported from infested waterways (for example, public and private boat landings, water access sites, fishing hot spots, resorts, campgrounds, etc.).
- Avoid placing substrate samplers in areas where there is strong current.
- Put two samplers at each location chosen for monitoring. Place the samplers one above the other (one higher in the water column than the other). The top sampler is removed and analyzed every four weeks, then placed back into the lake for the next sampling period. The second (bottom) sampler remains in the water for the entire monitoring season (May-September). Securing the two samplers on the same line with clips makes it easy to replace the top one every four weeks. A small concrete block anchor works to hold the sampler(s) in place (and provides an additional substrate sampler to examine). Rope can be used to suspend the sampler, but sometimes wildlife will sever the rope. Chains work well to better secure the samplers in those locations.
- Suspend substrate samplers at mid-depth in water.

Analysis of Samples for Quantitative Monitoring of Adults

1. Place samplers in small, white or clear garbage bags before removing it from the water.
2. At home, disassemble the sampler and examine each plate with a 30x-hand lens. Scan all four plates, top and bottom, looking for zebra mussels.
3. Recently settled post-veligers can be very small. If you were to rub your hands along the plate, the surface will feel like sandpaper. If you believe that you have detected post-veligers, please hand deliver these to your local CLMN contact (page vii).
4. Count the number of zebra mussels found on the top and bottom of each plate and record these numbers separately (use zebra mussel Method B forms, appendix 5).
5. Report the lengths of the smallest and largest mussels on the plate to the nearest millimeter (1/16-inch). Measure the longest axis of the shell. See diagram below.



6. For an initial discovery, all zebra mussels collected should be placed in rubbing alcohol for expert verification. Complete the zebra mussel reporting form and hand deliver the form and the specimens to your CLMN contact. **It is illegal to mail alcohol through the Postal Service.**

7. Note: Sampler plates can be thoroughly scrubbed, dried, reassembled and reused next year.

Reporting

Complete the zebra mussels reporting form Method B, electronically available as form 3200-122 B at <http://intranet.dnr.state.wi.us/itworks/forms/eforms.asp> or a paper copy in appendix 5 below. Send the completed form to your local CLMN contact (page vii) or Ron Martin, 101 South Webster Street, Madison, WI, 53707.

Samples should be clearly labeled with all requested information. Both field staff and volunteers that monitor for adults use the same data sheets. For tracking the movement of zebra mussel infestations, a negative report is as important as finding zebra mussels at a location. All monitoring efforts should be reported on the zebra mussel reporting form and submitted to DNR.

Volunteers should also provide DNR with a lake map showing the location of the monitoring sites. The zebra mussel monitoring sites, along with the names and addresses of the monitors, are maintained and updated periodically. Maps showing all the sampling locations (for adults and veligers) are recorded on the GIS network and are available on the DNR web page: <http://dnr.wi.gov/org/water/wm/GLWSP/exotics/zebra.html>.