




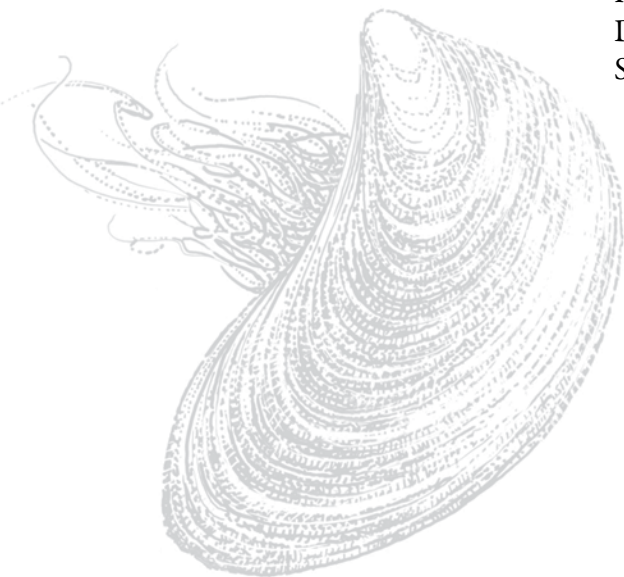


ZEBRA & QUAGGA MUSSELS

MONITORING PROTOCOL



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BACKGROUND/OVERVIEW


Zebra and quagga (Dreissenid) mussels are non-native mussels that can have large impacts on lake ecosystems. They are filter feeders, which mean they feed by drawing water into their bodies and filtering out most of the suspended microscopic plants, animals, and debris in the lake water for food. A single mussel can filter about one quart of water each day. Zebra and quagga mussels primarily feed on phytoplankton (algae in the water column), which may result in increased water clarity, but will result in a depleted food supply for other aquatic organisms. When zebra and quagga mussels become established in a lake they filter plankton from the water column, thus zooplankton and the small fish which feed on plankton have less to eat, and tend to decrease in number. Larger fish which feed on the small fish also decrease in number. Light sensitive fish such as walleye may move to deeper waters.

With increased water clarity, aquatic plant beds may become denser and plants are able to grow at deeper locations. Although denser plant beds may create more habitat for small fish, they can inhibit larger, predatory fish from finding their food. This thicker plant growth can also interfere with boaters, anglers and swimmers. Because quaggas and zebra mussels are prolific water/food filters, they eat up the food source of fish and can change the food web in a lake. They also take in pollutants. Their bodies accumulate these pollutants so the pollutant levels in their bodies are higher than the surrounding area. This can harm wildlife that feed on these mussels.

Zebra and quagga mussels displace native mussels. They can promote the growth of blue-green algae because they avoid consuming this type of algae. Some of the blue-green algae release toxins when they decompose. Zebra and quagga mussels seldom eat filamentous algae, the slimy algae that cause unsightly algal blooms. When large populations of zebra mussels die off, their decomposition consumes dissolved oxygen from the water. This may result in lower dissolved oxygen levels. It is anticipated that the same conditions will occur when quagga mussels die off in large numbers.

Zebra and quagga 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. Decaying mussels often attract birds that feed on the mussels and defecate along the shores. This may result in elevated bacteria levels.

Zebra mussels are native to the Ponto-Caspian region of western Russia. They were accidentally introduced to North America in ballast water from a boat that traveled across the ocean. The first known location of zebra mussels in North America was in Lake St. Claire in 1988. Zebra mussels first arrived in the Wisconsin waters of Lake Michigan in the Racine harbor in 1990. It is believed that zebra mussels are frequently transported from an infested lake to other lakes as mature mussels attached to aquatic plants, which are “hitching rides” on boats and boat trailers. The list of waterbodies in Wisconsin where zebra mussels have been verified can be found at <http://dnr.wi.gov/lakes/invasives/>.



Quagga mussels are from the Caspian Sea drainage area in Eurasia, in particular the Dneiper River drainage of the Ukraine (Eastern Europe). Quagga mussels were found in Lake Erie in 1989. So far, in Wisconsin, the quagga has been found only in Lake Michigan waters - not in any inland lakes. But because they prefer silt- and sand-bottomed lakes, quagga mussels may be able to successfully invade inland lakes including some lakes that do not have good habitat for zebra mussels. The Dreissenid population in Lake Michigan has largely shifted from zebra mussel dominance to quagga mussel dominance from 1989 to 2008. There is concern that quagga mussels will infest lakes already infested with zebra mussels as Lake Michigan has become a “source” lake. If this happens, the inland zebra mussel lakes may be impacted even more. Quagga mussels have also found their way out west. They were discovered in Arizona in 2007.

Zebra mussels tend to do best in warmer waters and quagga mussels tend to best in cooler waters. Zebra mussels can live in the near shore area out to a depth of 110 meters (260 feet), but do best in water depths of 2-12 meters (6-40 feet). Quagga mussels prefer water that is deeper where there is less turbulence, but they can survive in near-shore shallow water areas. Quaggas have been found in waters as deep as 130 meters (426 feet) in the Great Lakes, but do best in water depths of 10-30 meters (32-98 feet). Quagga mussels can inhabit the same rock habitat as zebra mussels, plus they can thrive on silty or sandy areas. Quagga mussel byssal threads tend to be weaker than zebra mussel byssal threads. This may be a reason they prefer the deeper less turbulent areas in lakes. Quaggas are able to tolerate somewhat salty water. Quaggas can out-compete zebra mussels in areas that favor quagga reproductive conditions (deeper water depths and lower temperatures). A quagga mussel feeds all year, even in winter when its cousin the zebra mussel is dormant. Some researchers believe that Lake Erie’s dead zone may be that way because of quaggas’ non-stop feeding, their ability to live in deep water and the excretion of phosphorus with their waste. (Carrick 2002) <http://agsci.psu.edu/international/programs/americas>.



LIFE CYCLE

Zebra mussels reproduce when the water temperature gets above 54 degrees Fahrenheit. Male zebra mussels release a cloud of sperm into the water. Female zebra mussels release a cloud of eggs. A female zebra mussel can produce 30,000 - 1,000,000 eggs in one year. The fertilized eggs quickly develop into microscopic free-swimming larvae called veligers (pronounced VEL-i-jers). Veligers feed on tiny phytoplankton and begin to grow shells. 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. This is when they change from free-swimming larvae to anchored zebra mussels. Luckily, only 2-3% of the veligers survive to this stage (but that is still 6,000 – 30,000 per female mussel). The young zebra mussels reach sexual maturity during their first year and are ready to continue the cycle. Adult zebra mussels are normally small, about $\frac{3}{4}$ to $1\frac{1}{2}$ inch in length, but sometimes grow larger.

Quagga mussels have thinner shells than the zebra mussels. Quagga mussels reproduce when the water temperature gets above 46 degrees Fahrenheit. Like zebra mussels, male

quagga mussels release a cloud of sperm and female zebra mussels release a cloud of eggs into the water. A female quagga mussel can produce 1,000,000 eggs in one year. The fertilized eggs quickly develop into microscopic free-swimming larvae called veligers. Veligers feed on tiny phytoplankton and begin to grow shells. At 3-4 weeks, the veligers' shells weigh enough to cause them to sink. Luckily in this transitional stage, mortality is high and may exceed 99%.

The veligers from zebra mussels or quagga mussels cannot be discerned with microscopic evaluation. When a veliger is observed, we know that we have a Dreissenid species, but adult mussels need to be found to confirm whether it is a zebra mussel or quagga mussel. Quagga mussels can survive on silt, sand or hard substrate. The shells of the quagga mussels are thinner and lighter for those mussels that live on soft substrate and thicker and heavier for those mussels that live on hard inshore substrates. Quagga mussels tend to grow in single layers and produce more patchy distributions than zebra mussels. Zebra mussels attach to each other and forms clumps of mussels.



IDENTIFICATION

In your packet is a Zebra Mussel Watch Card. This card, along with the descriptions below, will help you in the identification of zebra and quagga mussels.

Zebra and quagga mussels have two shells held together by a strong ligament, which make them 'bivalves'. All mussels and clams are bivalve mollusks. In fact, many of the mollusks people call clams are actually mussels.

Zebra mussels, *Dreissena polymorpha* (pronounced dry-SIN-nee-a poly-MOR-fa), and quagga mussels, *Dreissena rostriformis bugensis* (pronounced dry-SIN-nee-a rost-ree-FORM-ez bug-EN-sis), are different from native mussels and clams in that they tend to attach to hard surfaces, such as rocks or man-made structures. They are also unique with their free-swimming larval stage – veligers. If you find a “clam” that is attached to a hard object (including plants), please take it to your local CLMN contact.

Refer to pictures below as well as reference materials in your packet, and characteristics listed on the following page.



Zebra mussels will balance on the hinge when placed on a table; quagga mussels will “roll,” as the hinge area is more rounded. Note the byssal threads at the hinge edge of the shells.

ZEBRA MUSSEL CHARACTERISTICS:

- Mostly white or cream-colored with jagged brown or black stripes across the shell (which is what gives them their 'zebra' name). However, zebra mussels can come in many colors. Some zebra mussels are all-white, all-black, or have stripes going in the other direction.
- Byssal threads are located on the hinge edge of their shell. These byssal threads are

what the zebra mussel uses to attach itself to hard surfaces. Byssal threads are unique to zebra and quagga mussels and are not found on native mussels. The strength of the byssal threads depends upon the substrate to which it is attached.

- Adults range from 1/8 - 2 inches in length.
- Shell is D-shaped. If you place a shell with its hinge edge on a table, the shell will balance on the hinge. The quagga mussel (another non-native you may encounter) will fall over when placed on its hinge. For monitoring purposes, we don't distinguish between these two non-native mussels. They so closely resemble each other that we leave the identification up to the experts.



These zebra mussels are attached to a larger, native mollusk.

QUAGGA MUSSEL CHARACTERISTICS:

- Shell is normally striped, as is that of the zebra mussel, but the quagga shell is paler toward the hinge. There is a wide range in coloration with some shells being pale or even completely white.
- Byssal threads located on the hinge edge of their shell. These byssal threads are what the quagga mussel uses to attach itself to hard surfaces. Byssal threads are unique to quagga and zebra mussels and are not found on native mussels.
- The adult quagga mussels are slightly larger than the zebra mussels. They can be up to 0.8 inches wide and over 2 inches in length.
- Shell is more rounded (fan shaped with pointed edges at either side) on the hinge edge than the zebra mussel shells. If you place a shell with its hinge edge on a table, the shell will "roll" off of the hinge. The zebra mussel (another non-native you may encounter) will balance on the hinge. For monitoring purposes, we don't distinguish between these two non-native mussels. They so closely resemble each other that we leave the identification up to the experts.
- The shells of the quagga mussels are thinner and lighter for those mussels that live on soft substrate and thicker and heavier for those mussels that live on hard inshore substrates.



Photo by Robert Korfh



Zebra and quagga mussels are sometimes confused with another non-native species, the banded mystery snail. The banded mystery snail has a single spiraled shell. The quagga and zebra mussels have two separate shells attached with a hinge.

BANDED MYSTERY SNAIL CHARACTERISTICS:

- Shell is a single shell (zebra and quagga mussels have two shells attached with a hinge).
- Shell has a rounded spiral shape
- Shell has distinct reddish-brown bands. This feature is VERY obvious if you have empty shells, but a little more subtle among living snails.
- No byssal threads
- Can get up to 1.5 inches in length

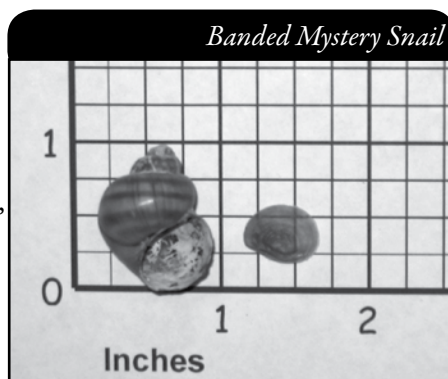


Photo by Laura Herman

Banded mystery snail. Note the rounded shape and lack of byssal threads.



ZEBRA AND QUAGGA MUSSEL MONITORING


TYPES OF MONITORING

The CLMN focuses on the monitoring of adult zebra and quagga mussels. Adult mussel monitoring serves several purposes: (1) to track the spread by collecting data on lakes where zebra mussels have not been reported – as of 2008, quagga mussels have not been found on any Wisconsin inland lakes so quagga monitoring is necessary to verify if quaggas become established in Wisconsin inland lakes; (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. The monitoring for both mussels species is the same.

There are two types of adult zebra and quagga mussel monitoring: prevention monitoring and established population monitoring.

PREVENTION MONITORING

If a lake is not known to have zebra or quagga mussels, citizen lake monitors can play a very important role by regularly monitoring the lake and reporting that nothing has been found or, if these mussels are found, letting DNR staff know so that the lake's landings can be posted to warn lake users about not spreading zebra or quagga mussels to other lakes. Shoreline surveys and regular inspections of structures in the water is the method used



to determine the presence/absence of zebra and quagga mussels. This method is more productive than using a substrate sampler as it covers a larger area on the lake. A single observer can observe many square meters of substrate in a short period of time just by strolling the lake's shorelines and observing the shallow water areas.

ESTABLISHED POPULATION MONITORING

If zebra or quagga mussels have already been found (or are newly found) and population density estimates are wanted, substrate sampler monitoring should be used. (Substrate refers to any substance in the water that these mussels may attach to.) Sometimes this method is used on lakes not known to have zebra or quagga mussels, or when zebra mussels have been found in an upstream waterbody (as of December 2009, quagga mussels have not been found on any Wisconsin inland lake). Contact your local DNR staff (page viii) to see if substrate sampling is an appropriate monitoring technique for your lake. You should contact Jennifer Filbert, Jennifer.Filbert@wisconsin.gov, with the locations where you placed your samplers. Jennifer can map these specific points and link the maps to your SWIMS data.



ADDITIONAL MONITORING OPPORTUNITIES

VELIGER (LARVAE) MONITORING

The CLMN is unable to provide veliger monitoring equipment to individual lake volunteers because the equipment is very expensive. However, DNR staff annually selects water bodies to sample for zebra and quagga mussel veligers, and a CLMN volunteer can often help by providing a boat and assistance to DNR staff. Having a volunteer provide a boat that is already on the lake can eliminate the need for DNR staff to trailer a boat to the lake and disinfect the boat before and after collection. Since the volunteer would be assisting in the monitoring, only one DNR staff person would be needed to do the sampling safely and efficiently. **If you have an interest in learning about the veliger monitoring procedures, contact laura.herman@uwsp.edu for a copy of the protocols. If you are interested in assisting with veliger monitoring, contact your local DNR staff (page ix).**

WHEN TO MONITOR

PREVENTION MONITORING

- Conduct shoreline surveys about once every two weeks from ice out to ice on. More or less frequent observations may be conducted if desired.
- A survey can be conducted while swimming, taking a casual stroll along the shoreline, or fishing.
- 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 or quagga 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.

ESTABLISHED POPULATION MONITORING

Substrate samplers should be placed into the lake in May. One of the two substrate samplers should be removed and checked once each month from May through September. The other substrate sampler should be left in the entire monitoring season and then checked at the end of the monitoring season (September).

WHERE DO I LOOK FOR ZEBRA AND QUAGGA MUSSELS?

PREVENTION MONITORING

- 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.).
- Any solid surface is a suitable substrate to observe zebra or quagga mussels. Divers can monitor in deeper water, or small rocks can be lifted through use of a net. Zebra mussels tend to prefer to attach to hard substrate (rock, wood, and shells). Quagga mussels can live in sand and muck areas as well as areas inhabited by zebra mussels.
- Zebra and quagga 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 and quagga mussels can be attached to plants.

ESTABLISHED SPECIES MONITORING

- Place samplers in areas where zebra or quagga mussels are most likely to be found. Pay special attention to areas in which 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.

HOW TO MONITOR

PREVENTION MONITORING

Prevention monitoring is used to determine the presence/absence of zebra or quagga mussels. It entails shoreline surveys and regular inspections of structures in the water. This method is more productive than using a substrate sampler as it covers a larger area on the lake. A single observer can observe many square meters of substrate in a short period of time just by strolling the lake's shoreline and observing the shallow water areas.

The easiest way to search for zebra or quagga mussels is to walk the shoreline looking for “clams” that are attached to rocks, docks, piers and plants. If you find a “clam” that is attached to a hard object, collect it and take it to your local DNR CLMN contact.

Zebra Mussels attached to plants



Zebra mussels often attach to plants. These zebra mussels are attached to native water-milfoil.

Zebra mussels attached to roots of a plant. This plant was found attached to a boat trailer.

Rub your hands on hard surfaces. Small zebra and quagga mussels will feel like sandpaper. If you think you have found zebra or quagga mussels, gently scrape the surface to collect the mussels. Place the scrapings in a jar of water or rubbing alcohol and take the sample to your local DNR CLMN contact. Your contact will send in the sample to be analyzed.



A plastic paint can mixer (flat plastic rectangular piece) works great to scrape small zebra or quagga mussels from hard objects. You still have to be gentle, but it is easier than trying to pick the mussels off with your hands. If the mussels are found on a small item (for example a small rock) just bring the object with the mussels attached right to your DNR CLMN contact.

ESTABLISHED POPULATION MONITORING

Established population monitoring is used to estimate densities of zebra or quagga mussels.

Placing the Substrate Samplers

- Place samplers in areas where zebra or quagga mussels have been found. Pay special attention to areas in which these 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.
- Place the substrate samplers 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 or buoy, you will need a waterway marker application and permit from the DNR.

- Put two samplers at each location chosen for monitoring. Suspend substrate samplers mid-depth in water. Place the samplers one above the other (one higher in the water column than the other).
 - The top sampler should be removed and analyzed once every four weeks, then placed back into the lake for another four weeks.
 - The second (bottom) sampler should remain in the water for the entire monitoring season (May-September).

Securing the two samplers on the same line with clips makes it easy to remove and replace the top one every four weeks. A small concrete block anchor works to hold the samplers 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 better in order to secure the samplers.

Analyzing the Substrate Samplers

The top substrate sampler should be analyzed once a month to determine if zebra or quagga mussels are present. The bottom substrate sampler should be analyzed at the end of the monitoring season, in September. Substrate sampler monitoring documents the arrival of zebra or quagga mussels, tracks the spread of these mussels, and determines mussel population growth and seasonal abundance. This level of monitoring will provide estimates of population density and help determine when zebra or quagga mussels are settling in an area.

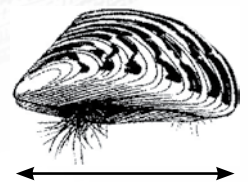
1. Place sampler in a small, white or clear garbage bag as you remove it from the water. This will prevent the mussels from falling off into your boat.
2. At home, disassemble the sampler and examine each plate with a 30x-hand lens. Scan all four plates, top and bottom, looking for zebra or quagga mussels.
3. Recently settled veligers can be very small. If you were to rub your hands along the plate, the surface will feel like sandpaper. If your lake is not known to have zebra or quagga mussels and you believe that you have detected veligers, please hand deliver these to your local DNR CLMN contact (page viii).



A plastic paint can mixer (flat plastic rectangular piece) works great to scrape small zebra or quagga mussels from the plate sampler. You still have to be gentle, but it is easier than trying to pick the mussels off with your hands.

Count the number of mussels found on the top and bottom of each plate and record these numbers separately (use the Zebra and Quagga Mussel Quantitative Report, Form 3200-127. Reporting forms can be found at the end of this section and at <http://dnr.wi.gov/lakes/monitoring/forms.aspx>.

4. If you have a sampler with 1-inch grids, feel free to count the zebra or quagga mussels in several of the 1-inch squares and then estimate the number of mussels per plate instead of counting the mussels on the entire sampler.
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 at right.



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



Sampler plates should be thoroughly scrubbed (using a brush and water), dried, and reassembled. If needed, replace the sampler back into the lake for another four weeks. If it is the end of the sampling season, store the sampler(s) for reuse next year.

EQUIPMENT NEEDED

PREVENTION MONITORING

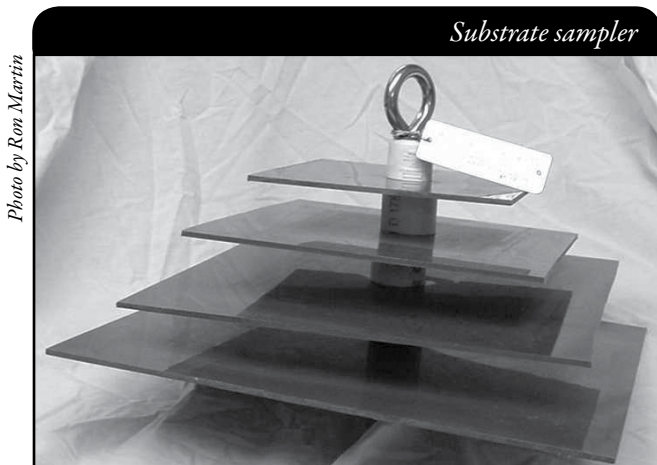
- ☐ Hand lens - 30 magnification (30X)
- ☐ Rubbing alcohol
- ☐ Aquatic Invasives Surveillance Monitoring Report, Form 3200-133 (found at the end of this section and at <http://dnr.wi.gov/lakes/monitoring/forms.aspx>)
- ☐ Aquatic Invasive Animal Incident Report Form 3200-126 (found at the end of this section and at <http://dnr.wi.gov/lakes/monitoring/forms.aspx>)

ESTABLISHED SPECIES MONITORING

- ☐ Substrate samplers (see description and photo below)
- ☐ Rope or chain (rope may get chewed on by muskrats or other animals)
- ☐ Anchor (e.g. concrete block)
- ☐ Hand lens - 30 magnification (30X)
- ☐ Rubbing alcohol
- ☐ Zebra and Quagga Mussel Quantitative Report, Form 3200-127 (found at the end of this section and at <http://dnr.wi.gov/lakes/monitoring/forms.aspx>)

A 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. The substrate samplers are easily disassembled to allow for cleaning between sampling seasons. Some plates have 1-inch grids marked on them. These grids are used to facilitate counting of the mussels on the plate samplers. This is very helpful if a lake has a lot of zebra or quagga mussels and it would be impossible to count the entire plate. If your plate does not have these markings, feel free to mark them with a sharpie or etch the squares onto your plate sampler.



Substrate sampler for zebra and quagga mussel monitoring.

Each sampler has a DNR tag attached that provides a phone number for further information. Samplers will be provided by your local DNR CLMN contact.

If you are interested in building additional samplers, a detailed construction diagram can be found at the end of this section.

SETTING UP A MONITORING TEAM

Often it is easier to “divide” up the work than to rely on one volunteer to monitor an entire lake for invasives. Designate a team leader (and maybe an assistant) who is willing to keep track of what areas are being monitored and who is doing monitoring. The team leader can also be the person who enters the monitoring results on the CLMN website, <http://dnr.wi.gov/lakes/CLMN> and the person to whom other volunteers can bring suspect species. If assistance in identification is needed, the team leader can take the species to DNR, UW-Extension, or the County Land and Water Conservation staff. Remember; do not burn out your team leader!

Consider having a mini-training session for your team. Contact your local CLMN contact to see if an Aquatic Invasive Species training session will be scheduled for your area. These sessions are often set up in conjunction with local lake fairs and conventions. AIS workshops/training sessions are also listed at <http://www.uwsp.edu/cnr/uwexlakes/CLMN/training.asp>.

MAPPING

A map is a very quick and reliable way to assure that everyone knows the place you are talking about when you describe a certain point on your lake. A map will assist you in locating sampling sites, recreational and habitat use areas, and more. At the end of the season, you can map all of the sites visited.

If you have a team of monitors, a map will also assist your team in deciding who will monitor where. Once you have your “team” together, print out a map so that you can mark which areas each volunteer is monitoring. Your team leader should keep the master copy of the map. It may be easiest to have volunteers monitor the areas by their homes or where they spend time on the lake. Assigning smaller (1/2 or 1-mile) stretches of shoreline per volunteer will be less overwhelming than monitoring larger areas of the lake.

You can get maps from your local DNR office, Fishing Hot Spots, fishing map books, etc. Basic lake maps can also be generated through the DNR web site:

<http://dnr.wi.gov/lakes/lakepages/search.aspx>. Type in the name of the lake and choose the county, then click “search.” Click on the lake name (if there are two or more lakes with the same name in the same county, select the lake you are after). This site will give you a plethora of information about your lake, but to find a map, scroll down to the map section

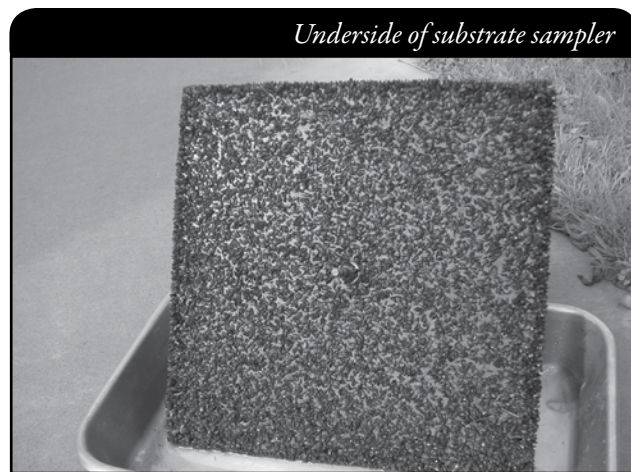



Photo by Mike Priedl

Small zebra mussels attached to the bottom of a plate sampler.

*Zebra/Quagga
Mussels*



and either click on “Contour (Bathymetric) Map” for a printable version, or click on “Interactive Map.” The interactive map (in the Surface Water Viewer) allows you to add in “layers” such as invasive species or monitoring sites.

Use a map source that is most convenient for you. Make sure the following information is on your lake map: lake name, county, sites monitored, date(s), volunteer(s), and any additional observations.

If you have a GPS unit, you may want to mark locations monitored and then load this data into a mapping program and print out locations of areas monitored.

REPORTING

What would all the work that goes into gathering accurate information be worth if others could not read, review and act on it? Reporting is one of the most important parts of monitoring for invasive species. Knowing where species are not, as well as where they are, is extremely important in being able to track and understand their spread. Knowing how often monitors are looking for species and what they are finding is very important information.

The DNR, lake managers, researchers, and others use the data that is reported through the CLMN to study lakes and better understand aquatic invasive species. The information reported by volunteers is also provided to the state legislature, federal, tribal and local agencies/organizations that in turn may use this data to help determine funding for invasive species grants and programs.

You can enter your monitoring results on the CLMN website:

<http://dnr.wi.gov/lakes/CLMN> (click “Enter Data” on the left side bar). If you don’t yet have a user id & password, click ‘Request a Wisconsin User ID and Password’. Then, email Jennifer at jennifer.filbert@wisconsin.gov with your User ID and what monitoring you are involved in. Jennifer will set up your accounts and email you back. Once you receive an email back, you can log in. Once you’re logged in, go to the Submit Data tab and click “Add New” to start entering data. Choose the AIS Monitoring project for your lake in the Project dropdown box.

- For prevention monitoring, report your results using the: Aquatic Invasives Surveillance Monitoring Report, Form 3200-133
- For established population monitoring, report your results using the: Zebra and Quagga Mussel (Quantitative) Report, Form 3200-127
- If you believe you found zebra or quagga mussels and your lake has not been previously known to have zebra or quagga mussels, report the information using the: Aquatic Invasive Animal Incident Report, Form 3200-126.

You can report your results as often as you wish, but be sure to at least report results once a year, at the end of the monitoring season. If you are doing Established Population Monitoring, you will probably want to report your results once a month. Before you analyze the top substrate sampler, print out a paper copy of the reporting form off the website so you can write down the number of mussels you find on each plate, as well as the lengths of the smallest and largest mussels. Then enter these numbers on the CLMN website.



Remember, for tracking the movement of zebra mussel infestations, a report of ‘no zebra or quagga mussels’ at a location is just as important as finding zebra or quagga mussels. One cannot confidently state that zebra or quagga mussels are not present in an area if no one has looked.

WHAT TO DO WITH SUSPECT SPECIMENS

Collect any mussels that you believe are zebra or quagga mussels. Place them in a jar of water or rubbing alcohol. Note the “suspect” mussel location on your map, making sure you can find the spot(s) again. Fill out the Aquatic Invasive Animal Incident Report (Form 3200-126) at <http://dnr.wi.gov/lakes/monitoring/forms.aspx> or fill out the hard copy of the form found at the end of this section and hand deliver it with the suspect zebra or quagga mussel to your team leader or local CLMN contact (page viii). Suspect zebra and quagga mussels need to go to the DNR for vouchering. Do not mail them. It is illegal to ship or mail alcohol.



PREVENTION STARTS WITH US

Whether you are out monitoring, or just boating for fun, be sure to remove all aquatic plants and animals from boating equipment, including your trailer, boat, motor/propeller and anchor before launching and after leaving the water. Small zebra and quagga mussels will attach to plants. By removing aquatic plants and animals from boating equipment and encouraging others to do the same, you can help protect Wisconsin lakes from zebra and quagga mussels.

Photo by Robert Korib



Windrows of zebra mussels wash up on shores of the Great Lakes.



*Zebra/Quagga
Mussels*



ADDITIONAL MATERIALS AND SUPPORTING DOCUMENTATION

ZEBRA AND QUAGGA MUSSEL INFORMATION SOURCES

REPORTING FORMS

AQUATIC INVASIVES SURVEILLANCE MONITORING REPORT

- SINGLE LOCATION, MULTIPLE DATES
- MULTIPLE LOCATIONS, ONE DATE

AQUATIC INVASIVE ANIMAL INCIDENT REPORT

ZEBRA MUSSEL (QUANTITATIVE) REPORT

MUSSEL VELIGER TOW MONITORING REPORT

ZEBRA AND QUAGGA MUSSEL SUBSTRATE SAMPLER

CONSTRUCTION DIAGRAM

*Zebra/Quagga
Mussels*





ZEBRA AND QUAGGA MUSSEL INFORMATION SOURCES

<http://dnr.wi.gov/invasives>

Under “Species Information” click “Aquatic Invasives” then click “Animals” or go directly to:
<http://dnr.wi.gov/topic/invasives/species.asp?filterBy=Aquatic&filterVal=Y&catVal=Animals>

<http://dnr.wi.gov/org/caer/ce/eeek/critter/invert/zebramussel.htm>

<http://nas.er.usgs.gov/queries/FactSheet.asp?speciesID=95>

<http://www.seagrant.psu.edu/publications/fs/zebraquagga2007.pdf>

Aquatic Invasives Surveillance Monitoring End of Season Report

Form 3200-133 (02/10)
~~Previously Form 3200-124~~

This monitoring is designed to help detect new invasive species on your lake, so DNR can be alerted and lake residents and/or professionals can respond appropriately. The purpose of the DNR collecting this data is to let us know what methods trained citizens and professionals use when actively looking for aquatic invasive species. You are often the ones to alert us of new invasives in our waters. Remember for surveillance monitoring, a report of "no invasive" at a location is just as important as finding an invasive. One cannot confidently state that the invasive is not present in an area if no one has looked and reported their findings. Knowing where invasives are not, as well as where they are, is extremely important in being able to track and understand their spread. Knowing how often monitors are looking for species and what they are finding is very important information.

Notice: Information on this voluntary form is collected under ss. 33.02 and 281.11, Wis. Stats. Personally identifiable information collected on this form will be incorporated into the DNR Surface Water Integrated Monitoring System (SWIMS) Database. It is not intended to be used for any other purposes, but may be made available to requesters under Wisconsin's Open Records laws, ss. 19.32 - 19.39, Wis. Stats.

Data Collectors

Primary Data Collector Name	Phone Number	Email
Additional Data Collector Names		
Total Paid Hours Spent (# people x # hours each)	Total Volunteer Hours Spent (# people x # hours each)	

Monitoring Location

Waterbody Name	Township Name	County	Boat Landing (if you only monitor at a boat landing)
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Dates Monitored

Start Date (when you first monitored this season)	End Date (when you last monitored this season)
Did at least some data collectors monitor in... May? June? July? August? (circle all that apply)	

Did you monitor...

All Beaches and Boat Landings? Frequently Some of the Time Not Often/Never	Walk along the shoreline? Frequently Some of the Time Not Often/Never
Perimeter of whole lake? Frequently Some of the Time Not Often/Never	Observe entire shallow water area (up to 3 feet deep)? Frequently Some of the Time Not Often/Never
Docks or piers? Frequently Some of the Time Not Often/Never	Use rake to extract plant samples? Frequently Some of the Time Not Often/Never
Other: _____	Check underwater solid surfaces (boat hulls, dock legs, rocks)? Frequently Some of the Time Not Often/Never Other: _____

Did you find...(even if not a new finding for the lake or stream)

Banded Mystery Snail? Yes No Did not look for	Hydrilla? Yes No Did not look for
Chinese Mystery Snail? Yes No Did not look for	Purple Loosestrife? Yes No Did not look for
Curly-Leaf Pondweed? Yes No Did not look for	Rusty Crayfish? Yes No Did not look for
Eurasian Water Milfoil? Yes No Did not look for	Spiny Waterfleas? Yes No Did not look for
Fishhook Waterfleas? Yes No Did not look for	Zebra Mussels? Yes No Did not look for
Freshwater Jellyfish? Yes No Did not look for	Other?: _____

If you find an aquatic invasive

If you find an aquatic invasive and it is not listed at <http://dnr.wi.gov/lakes/AIS> fill out an incident report for the species. Then bring the form, a voucher specimen if possible, and a map showing where you found it to your regional DNR Citizen Lake Monitoring Coordinator as soon as possible (to facilitate control if control is an option).

If you don't find an aquatic invasive

If you submit your data online, that is all you need to do. Otherwise, please mail a copy to your regional DNR Citizen Lake Monitoring Coordinator. <http://dnr.wi.gov/lakes/contacts>

Aquatic Invasives Surveillance Monitoring Multiple Locations, One Date

Form 3200-130 (R 2/10)

This monitoring is designed to help you detect new invasive species on your lake, so you can then alert the DNR and so lake residents and/or professionals can respond appropriately. The purpose of the DNR collecting this data is to let us know what methods trained citizens and professionals use when actively looking for aquatic invasive species. You are often the ones to alert us of new invasives in our waters. Remember for prevention monitoring, a report of "no invasive" at a location is just as important as finding an invasive. One cannot confidently state that the invasive is not present in an area if no one has looked and reported their findings. Knowing where invasives are not, as well as where they are, is extremely important in being able to track and understand their spread. Knowing how often monitors are looking for species and what they are finding is very important information.

Notice: Information on this voluntary form is collected under ss. 33.02 and 281.11, Wis. Stats. Personally identifiable information collected on this form will be incorporated into the DNR Surface Water Integrated Monitoring System (SWIMS) Database. Personally identifiable information collected on this form will be incorporated into the DNR aquatic invasive species database. It is not intended to be used for any other purposes, but may be made available to requesters under Wisconsin's Open Records laws, ss. 19.32 - 19.39, Wis. Stats.

Data Collectors

Primary Data Collector Name

Phone Number

Email

Additional Data Collectors

Date and Time

Date

Start Time

End Time

Record one of the following: Y=Yes N=No N/A = Didn't Look For		Did you find?																					
Did you monitor?		Did you find?																					
Waterbody	County	Township	Boat Landing (if you only monitor at boat landings)?	All Beaches and Boat Landings?	Perimeter of Whole lake?	Docks or piers?	Walk along the shoreline?	Observe entire shallow water area (up to 3 feet deep)?	Use rake to extract plant samples?	Check underwater solid surfaces (boat hulls, dock legs, rocks)?	Banded Mystery Snail?	Chinese Mystery Snail?	Curly-Leaf Pondweed?	Eurasian Water Milfoil?	Fishhook Waterfleas?	Freshwater Jellyfish?	Hydrilla?	Purple Loosestrife?	Rusty Crayfish?	Spiny Waterfleas?	Zebra Mussels?	Other?:	

If you find an aquatic invasive

If you find an aquatic invasive and it is not listed at <http://dnr.wi.gov/lakes/AIS> fill out an incident report for the species. Then bring the form, a voucher specimen if possible, and a map showing where you found it to your regional DNR Citizen Lake Monitoring Coordinator as soon as possible (to facilitate control if control is an option).

If you don't find an aquatic invasive

If you submit your data online, that is all you need to do. Otherwise, please mail a copy to your regional DNR Citizen Lake Monitoring Coordinator.
<http://dnr.wi.gov/lakes/contacts>

The purpose of this form is to notify DNR of a new species of AIS in a waterbody. Only use if you found an aquatic invasive species on a lake where it hasn't been found previously.

To find where aquatic invasives have already been found, visit: <http://dnr.wi.gov/lakes/ais>.

Notice: Information on this voluntary form is collected under ss. 33.02 and 281.11, Wis. Stats. Personally identifiable information collected on this form will be incorporated into the DNR Surface Water Integrated Monitoring System (SWIMS) Database. It is not intended to be used for any other purposes, but may be made available to requesters under Wisconsin's Open Records laws, ss. 19.32 - 19.39, Wis. Stats.

Primary Data Collector				
Name		Phone Number	Email	
Monitoring Location				
Waterbody Name		Township Name	County	Boat Landing (if you only monitor at a boat landing)
Date and Time of Monitoring or Discovery				
Monitoring Date	Start Time	End Time		
Information on the Aquatic Invasive Animal Found (Fill out one form for each species found.)				
Which aquatic invasive did you find? <input type="checkbox"/> Zebra Mussel <input type="checkbox"/> Quagga Mussel <input type="checkbox"/> Spiny Waterflea <input type="checkbox"/> Freshwater Jellyfish <input type="checkbox"/> New Zealand Mud Snail <input type="checkbox"/> Banded Mystery Snail <input type="checkbox"/> Chinese Mystery Snail <input type="checkbox"/> Rusty Crayfish <input type="checkbox"/> Red Swamp Crayfish				
Where did you find the invasive animal?				
Latitude:		Longitude:		
Measurements from where the invasive was found (optional)				
Water Temperature		Degrees F / Degrees C (circle one)		Dissolved Oxygen (mg/l)
Estimated percent cover in the area where the invasive was found (optional)				
Substrate cobble, %	Substrate muck, %	Substrate boulders, %	Substrate sand, %	Bottom covered with plants, %
If you found Zebra Mussel(s)				
Water depth where Zebra Mussels were found _____			Feet / Meters (circle one)	
Total Number of Zebra Mussels Found _____				
What were the Zebra Mussels attached to?				
<input type="checkbox"/> Dock/pier <input type="checkbox"/> Dam <input type="checkbox"/> Rocks <input type="checkbox"/> Plants <input type="checkbox"/> Boats or Gear <input type="checkbox"/> Plate Sampler(s) <input type="checkbox"/> Logs, acorns, pine cones or other woody structure <input type="checkbox"/> Other: _____				
Size of Largest Zebra Mussel Found		Size of Smallest Zebra Mussel Found (individual measurements on back of page)		
Voucher Sample				
Did you collect a sample (voucher specimen) and bring it to your local DNR office? If so, which office?				
<input type="checkbox"/> Rhinelander <input type="checkbox"/> Spooner <input type="checkbox"/> Green Bay <input type="checkbox"/> Oshkosh <input type="checkbox"/> Did not take sample to a DNR office <input type="checkbox"/> Fitchburg <input type="checkbox"/> Waukesha <input type="checkbox"/> Eau Claire <input type="checkbox"/> Superior <input type="checkbox"/> Other Office: _____				

Please collect up to five specimens and bring a copy of this form, along with the sample and a map showing where you found the suspect invasive species to your regional AIS or Citizen Lake Monitoring Coordinator at the DNR.

While field collecting, specimens can easily be kept alive in a bucket or other container with just about 1/2 inch of water in the bottom. Freeze specimens at the end of the day in a ziploc bag without water. If freezing is not possible for a long period of time preservation in rubbing alcohol (except for Jellyfish - leave fully in water) is sufficient.

For DNR AIS Coordinator to fill out	
AIS Coordinator or qualified field staff who verified the occurrence: _____	
Statewide taxonomic expert who verified the occurrence: _____ (for list see http://dnr.wi.gov/invasives/aquatic/whattodo/staff/AisVerificationExperts.pdf)	
Was the specimen confirmed as the species indicated above?	<input type="checkbox"/> Yes <input type="checkbox"/> No
If no, what was it?	
Museum where specimen is housed:	Museum Specimen ID:
Have you entered the results of the voucher in SWIMS?	<input type="checkbox"/> Yes <input type="checkbox"/> No
AIS Coordinator: Please enter the incident report in SWIMS under the Incident Report project for the county the AIS was found in. Then, keep the paper copy for your records.	

The purpose of this form is to notify DNR of a new species of AIS in a waterbody. Only use if you found an aquatic invasive species on a lake where it hasn't been found previously.

To find where aquatic invasives have already been found, visit: <http://dnr.wi.gov/lakes/ais>.

Notice: Information on this voluntary form is collected under ss. 33.02 and 281.11, Wis. Stats. Personally identifiable information collected on this form will be incorporated into the DNR Surface Water Integrated Monitoring System (SWIMS) Database. It is not intended to be used for any other purposes, but may be made available to requesters under Wisconsin's Open Records laws, ss. 19.32 - 19.39, Wis. Stats.

Primary Data Collector

Name	Phone Number	Email
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Monitoring Location

Waterbody Name	Township Name	County	Boat Landing (if you only monitor at a boat landing)
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Date and Time of Monitoring or Discovery

Monitoring Date	Start Time	End Time
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Information on the Aquatic Invasive Animal Found (Fill out one form for each species found.)

Which aquatic invasive did you find? ☐ Zebra Mussel ☐ Quagga Mussel ☐ Spiny Waterflea ☐ Freshwater Jellyfish
☐ New Zealand Mud Snail ☐ Banded Mystery Snail ☐ Chinese Mystery Snail ☐ Rusty Crayfish ☐ Red Swamp Crayfish

Where did you find the invasive animal?

Latitude:	Longitude:
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Measurements from where the invasive was found (optional)

Water Temperature	Degrees F / Degrees C (circle one)	Dissolved Oxygen (mg/l)
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Estimated percent cover in the area where the invasive was found (optional)

Substrate cobble, %	Substrate muck, %	Substrate boulders, %	Substrate sand, %	Bottom covered with plants, %
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If you found Zebra Mussel(s)

Water depth where Zebra Mussels were found _____ Feet / Meters (circle one)	Total Number of Zebra Mussels Found _____
---	---

What were the Zebra Mussels attached to? _____

Zebra/Quagga Mussel (Quantitative) Report
Requires use of sampler plates
Form 3200-127 (R 02/10)

The purpose of this form is to track the abundance of adult zebra or quagga mussels in lakes where larvae or adults have previously been detected during AIS surveillance monitoring.

A report should be completed for each sampler deployed.

Notice: Information on this voluntary form is collected under ss. 33.02 and 281.11, Wis. Stats. Personally identifiable information collected on this form will be incorporated into the DNR Surface Water Integrated Monitoring System (SWIMS) Database. It is not intended to be used for any other purposes, but may be made available to requesters under Wisconsin's Open Records laws, ss. 19.32 - 19.39, Wis. Stats.

Primary Data Collector				
Name		Phone Number		Email
Monitoring Location				
Waterbody Name		Township Name	County	Station Name
Latitude (If not at an existing SWIMS monitoring station)			Longitude (If not at an existing SWIMS monitoring station)	
Date and Time of Monitoring				
Start Date	Start Time	End Date	End Time	
<i>Start Date = Date sampler deployed or since you last removed mussels from the plate. End Date = Date you pulled up the sampler.</i>				
Vertical Measurements				
Water Depth at Monitoring Location		Feet/ Meters (circle one)	Depth to Top of Zebra Mussel Sampler Feet/ Meters (circle one)	
Measurements from where the invasive was found				
Water Temperature		Degrees F / Degrees C (circle one)		Dissolved Oxygen (mg/l)
Estimated percent cover where sampler plates were located				
Substrate cobble, %	Substrate muck, %	Substrate boulders, %	Substrate sand, %	Bottom covered with plants, %
Information about Mussels Found				
Number of Zebra Mussels on Top Side of Plates			Number of Zebra Mussels on Bottom Side of Plates	
Total Number of Zebra Mussels on Sampler			Size of Largest Zebra Mussel (mm)	Size of Smallest Zebra Mussel (mm)
Note: if more than 20 zebra mussels are found, measure 20 mussels chosen randomly from the sample. If less than 20 mussels are found, measure all mussels. Report results in the table on page 2 of this form.				
Additional Comments				

If you find Zebra Mussels

All initial discoveries should be placed in rubbing alcohol until verification by an expert is obtained. Please collect a sample and bring a copy

Zebra Mussel (Quantitative) Report
Requires use of sampler plates

Form 3200-127 (R 02/08)

Page 2 of 2

Length of Zebra Mussels from Sample

If more than 20 zebra mussels are found, measure 20 mussels chosen randomly from the sample. If less than 20 mussels are

Number	Length (mm)
1	
2	
3	
4	
5	
6	
7	
8	
9	
10	
11	
12	
13	
14	
15	
16	
17	
18	
19	
20	

Note: All initial discoveries should be placed in rubbing alcohol until verification by an expert is obtained.

Mussel Veliger Tow Monitoring Report

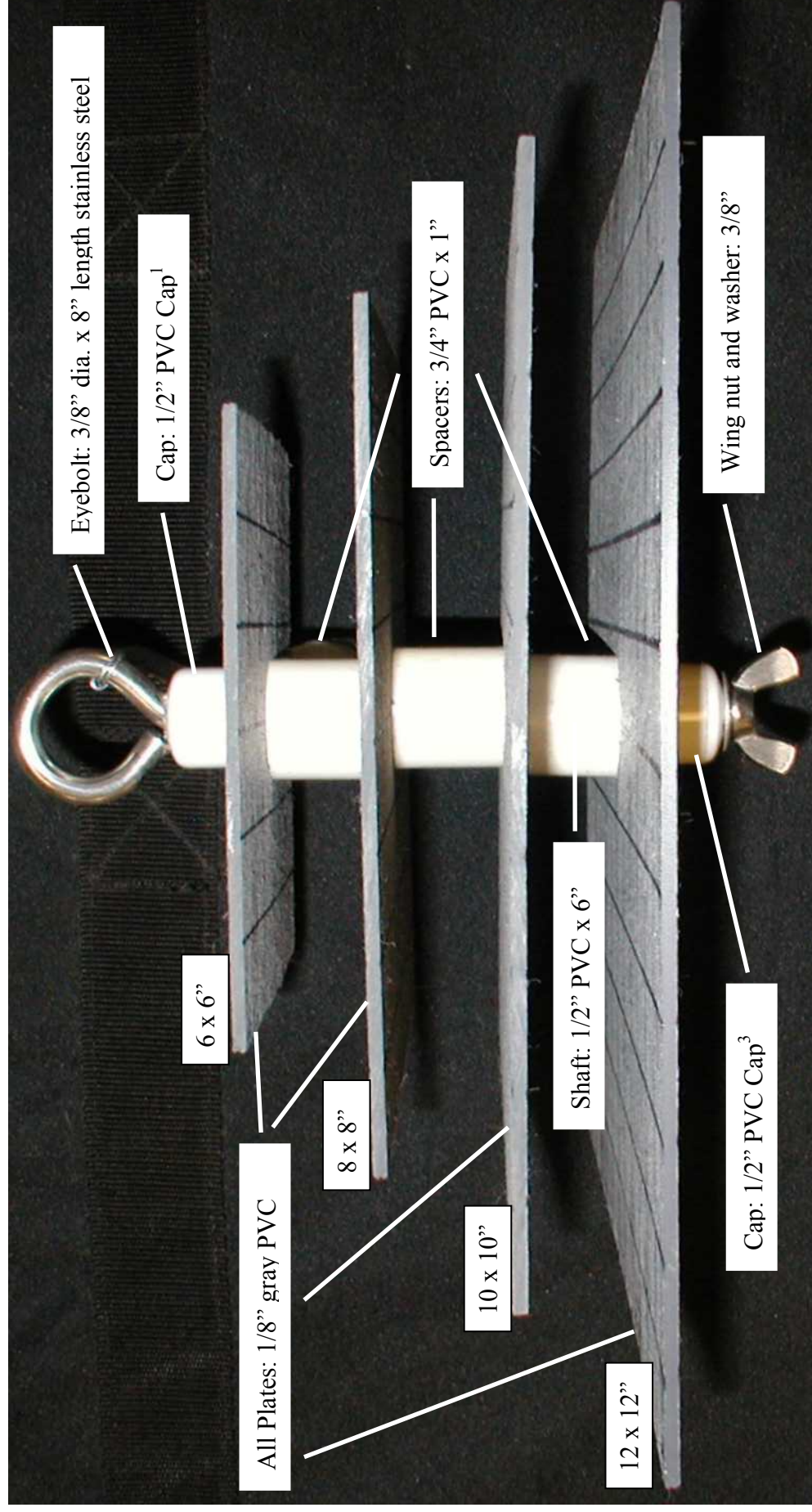
Form 3200-135 (R 02/10)

The purpose of this form is to track the presence/absence of zebra or quagga mussel larvae (veligers) collected using a plankton net during AIS surveillance monitoring.

Notice: Information on this voluntary form is collected under ss. 33.02 and 281.11, Wis. Stats. Personally identifiable information collected on this form will be incorporated into the DNR Surface Water Integrated Monitoring System (SWIMS) Database. Personally identifiable information collected on this form will be incorporated into the DNR aquatic invasive species database. It is not intended to be used for any other purposes, but may be made available to requesters under Wisconsin's Open Records laws, ss. 19.32 - 19.39, Wis. Stats.

Primary Data Collector			
Name		Phone Number	Email
Monitoring Location			
Waterbody Name	WBIC	County	Township Name
Date and Time of Monitoring			
Start Date	Start Time	End Date (= Start Date)	End Time
Monitoring Results			
Guidelines for how many tows to collect: If Secchi depth is >4 m (13 feet) take two 2m deep tows; if Secchi depth is between 2-4 m (6.5-13 feet) take one 2m deep tow; if Secchi depth is <2 m (<6.5 feet) take one 1m tow.			
Diameter of zooplankton net opening 30cm 50cm other _____ (circle one)			
Site 1: Latitude (optional): _____		Longitude (optional): _____	<input type="checkbox"/> Preservative Added
Secchi depth (m) _____		Number of net tows _____	Depth of tows (m) _____
Site 2: Latitude (optional): _____		Longitude (optional): _____	<input type="checkbox"/> Preservative Added
Secchi depth (m) _____		Number of net tows _____	Depth of tows (m) _____
Site 3: Latitude (optional): _____		Longitude (optional): _____	<input type="checkbox"/> Preservative Added
Secchi depth (m) _____		Number of net tows _____	Depth of tows (m) _____
<input type="checkbox"/> Have you consolidated all of your samples into one composite bottle?			
<input type="checkbox"/> Have you sent your samples to the DNR Plymouth Service Center?			
COMMENTS/OBSERVATIONS:			

ZEBRA AND QUAGGA MUSSEL SUBSTRATE SAMPLER INSTRUCTIONS



¹Solvent weld top cap to shaft and drill a 13/32" hole in cap

²Drill 5/8" hole in plates to accept shaft

³Drill a 13/32" hole in bottom cap

