VOLUNTEER MONITORING STRATEGY

GENERAL VOLUNTEER COLLECTION METHODS

How to sign up for a survey:

Identify a location on interest (stream, county, or region) and contact the Program Coordinator to set up your assignment. It is recommended you take a mussel monitoring training before any fieldwork takes place. However, trainings are not always suitable with schedules or located within reasonable driving distances. Therefore, concessions are provided to those who'd still like to participate in the WMMP. Also, if you don't feel comfortable conducting a survey by yourself work with the Program Coordinator to find others in your area willing to team up. Having more people participate in a survey can be more enjoyable and can improve the likelihood that mussels are located.

What to bring:

Certain equipment will be necessary to conduct a successful mussel survey. Things you will need to bring on each survey:

1. Mussel monitoring reporting forms. You may also report observations on the program's iNaturalist project.
2. Clipboard and pencils
3. Camera (or smartphone)
4. GPS unit (or smartphone)
5. Bathyscope (or mask & snorkel)
6. Freshwater mussel field guides to help identify species
7. Waders (or clothes you don't mind getting wet)
8. Water, sunscreen, hat, towel, extra set of clothes, cell phone

Other things to consider:

Preparatory research: In some cases, finding mussels will not be easy. Often, mussels will be buried into the substrate, individuals will appear cryptic, or populations are small and easily overlooked. It's important, then, to do a little research prior to your survey. It may be necessary to see what species have been recorded near the target area and learn about the life histories of the possible species that may occur at your site. Some mussel species prefer fast moving waters with a coarse substrate, while some can be found in silty, slow moving pool habitats. Some species spend much of their lives at the substrate surface, filtering large amounts of water, while others may be completely buried and only observed if excavated. If you don't find any live or dead mussels during your survey, that's ok! This kind of information is just as important as finding populations. The important thing is that you are confident that you didn't find mussels because they are not there, not because you were underprepared, or overlooked individuals.

Handling mussels: Although mussels can tolerate a wide variety of short-term environmental conditions, they can be stressed by physical handling. Handling errors, such as roughly removing animals from the substrate, leaving animals out of water during hot and sunny days, or in warm and stagnant water, are minimized by the use of prepared volunteers. During identification, keep attained mussels cool and moist minimizing the amount of time spent out of the water. Once photographed or identified, return mussels to the same area where found. Place individual mussels on its side along the river bottom. Mussels can extend their foot well beyond the margins of the valves, so even if the mussel is accidently placed upside-down, the individual will most likely reposition itself to a suitable position on the river bottom.

Disinfection: Cleaning should be performed every time equipment is moved between waters to avoid transporting invasive species and/or pathogens. Disinfect your equipment and gear by applying one of the following:

- Store dry for 5 consecutive days after cleaning with soap and water and/or high-pressure water;
- Washing with ~212º F water (steam) or ≥140 º F water;
- Applying a 500 ppm Chlorine (sodium hypochlorite) solution for 10-minute contact time (household bleach is generally 5.25% sodium hypochlorite) so mix 1.22oz or 2.44 tablespoons per gallon water.

Safety: Use common sense and judgment for your own personal safety. If you are going into the field alone tell someone at home of your plans before you leave. Remind those you are with to keep safety in mind and report potential unsafe conditions or practices to avoid accidents and injuries. If possible, bring a cell phone with you and have the number of the local county sheriff's department on hand. These can be found on each county's website.

DATA COLLECTION GUIDELINES

Please use the most current monitoring forms (see page 23). You can also use iNaturalist (inaturalist.org) to record and submit data. See page 26 for more details. Also, please respond to every question. Write 'unknown' or use provided fields for NA or 'Don't know' if not known.

GENERAL PROCEDURED

Our mussel sampling guidelines were designed for permanent wadable (most areas < 1.2 m deep) streams. Mussel sampling in wadable streams should optimally be conducted during mid to late summer (mid June - late September) when stream levels are near base flows and water temperatures are near maximums. Sampling during this time period when mussels are active will allow mussels disturbed during sampling to re-establish themselves in the substrate. Sampling outside of this optimum period may be necessary, but water temperature should be at least 40oF, to minimize thermal stress to mussels. In addition, summer sampling during peak water temps is more comfortable for collectors snorkeling or diving, allowing for longer sampling periods.

DATA SHEET FIELDS

Date: (mm/dd/yyyy) Fill in the date when the mussel data were collected for the station.
Collectors: Person or persons collecting mussel data, list primary investigator first.
E-mail: Electronic address to be used for online communications.

Waterbody: The name of the stream as shown on the most recent USGS 7.5' topographic map. Make sure the spelling of the name is accurate and includes all parts of the stream name (e.g., "West Branch", "Middle Fork", "River", "Creek", etc.) to avoid confusion. Other commonly used names for the stream can be written here in parentheses.

Monitoring Site: Provided name of survey site on waterbody. Commonly named to nearest road or access point to starting location.
County: The name of the county in which the monitoring site is located.
State: The name of the state in which the monitoring site is located (Wisconsin).
Latitude & Longitude: GPS Latitude and Longitude of station downstream end starting location. If using hand held GPS units use decimal degrees (e.g. N045.79330; W091.96815). It is important that geographic coordinates of the start of the station are recorded. If using iNaturalist to upload data, Latitude & Longitude are automatically uploaded when Location Services is turned "On" in your smartphone settings. If you do not have a GPS or smartphone device at the monitoring site, you can estimate the Latitude & Longitude using Google Maps.
Did you enter into iNaturalist? (Yes or No). If you checked yes, and entered all collected survey data into iNaturalist instead of using the paper datasheet, you do not need to fill out and send the paper copy.
Are juveniles mussel present? (Yes or No). A mussel less than 4 years old is considered a juvenile. Count the number of growth rings (annuli) on the shell properly age an individual. If you are note sure, take a photo, note the observation on the data sheet (or iNaturalist) and send to Program Coordinator.
Search Method: (Bathyscope, Mask & Snorkel, Hand or Visual, or Other). Did you use a viewing aid or did you look for mussels using visual or tactical searches?
Collection Method: (Casual Observation or Timed Survey). Casual observation does not follow a specific survey strategy. Timed surveys follow specified survey protocols, requiring a minimum of a two-hours search per site (page 21).

Average Water Depth: Record average depth within the entire search area, preferably in centimeters (1 in = 2.54 cm).

Water Depth Range: Record the minimum and maximize water depths you've experienced during searches, preferably in centimeters (1 in = 2.54 cm)

Substrate % Cover: Record the amount of substrate type present within the monitoring site. Substrate is recorded as a percentage (nearest 5%). Substrate types should be recorded as follows:

- Detritus: Partially decayed organic matter such as leaves, sticks, dead macrophytes, etc.
- Clay: Very fine inorganic material; individual particles barely or not visible to the naked eye. Either dark brown or gray color. Feels gummy and sticky, slippery when underfoot.
- Silt: Fine inorganic material, typically dark brown in color. Feels greasy and muddy in hands. Loose; does not retain shape when compacted into a ball.
- Sand: Inorganic material smaller than fine gravel but coarser than silt. The material found on a beach. Maximum length of 0.062 mm - 1.9 mm.
- Gravel: Rocks with a maximum length of 2 mm - 6.4 cm (0.08 in - 2.5 in).
- Cobble: Rocks with a maximum length of 6.5 cm - 26 cm (2.51 in - 10 in).
- Boulder: Rocks with a maximum length of 26.1 cm - 4 m.
- Bedrock: Solid, uniform rock bottom.
- Vegetation: Visually estimate the % cover of emergent and submergent plants

CASUAL OBSERVATION

A casual observation search is conducted to determine the presence of a mussel at a particular location. Initial searches have no survey strategy. Instead, we ask volunteers to document any living or dead mussels at any location. Searchers may walk along shorelines looking for shells or stranded live mussels, or look in shallow waters use waders, visual, or snorkeling strategy. Streambanks may also be examined to look for dead shells or midden piles, species not found alive, may be represented by dead shells.

TIMED SURVEY

Qualitative (timed) searches are conducted to establish species lists, abundance, and richness estimates for mussels present at a site. The probability of detecting a mussel species during a timed search varies greatly depending upon mussel species, field conditions, collector experience, and length of time spent searching. Therefore, the WDNR requires an increased survey effort with increasing stream size. Qualitative searches are given for a given amount of sampling effort (person-hours). Search times are 1 hour for 2 searchers (2 person/hrs) for stream areas less than 15 meters in width and 2 hours for 2 searchers (4 person/hrs) on stream areas 15 meters in width or greater. The increase in sampling effort with stream size corresponds to the likelihood of more diverse mussel communities in larger rivers.

Areas of mixed loose gravel should be fanned occasionally to detect mussels hidden between the substrate. Record start time on Timed Search data sheet and begin looking for mussels. Mussels not identified should be clearly photographed or a voucher specimen collected for positive identification by a malacologist familiar with regional fauna.

TIMED SURVEY PROTOCOL

Timed surveys are a useful way to gauge the current health of a mussel population at a site. Data collected here will be used to estimate species richness, abundances, and provide data for long-term monitoring to determine population change through time. The following procedures should be followed for timed mussel sampling:

1) Establish site start location. A suggested site will be provided by the Program Coordinator. Upon arrival to the field site, choose a starting location representative of the stream habitat and mark the location (Latitude & Longitude using GPS, smartphone, or mark on a map).
2) Estimate the stream width to determine how much time is necessary for a complete sample.
    a. Search times are 1 hour for 2 searches (2 person/hrs) for streams less than 15 meters stream width and 2 hours for 2 searchers (4 person/hrs) on streams 15 meters and greater stream width.
    b. If surveyors would like to complete a 2-hour timed search along a section of a large stream (example: Chippewa River or Rock River), contain your search to a width of 15 meters from the shoreline. Surveyors should provide an estimated area of the surveyed site.
3) Once in position, start the clock for the first 15-minute search.
    a. Ideally, two persons each equipped with a bathyscope or mask-and-snorkel will search from downstream to upstream by walking back and forth across the survey area, beginning at the marked starting point.
4) Stop all searches when clock reaches 15 minutes.
5) At the end of each 15-minute search, count and record all live and dead mussels found, noting any mussels less than 4 years old.
    a. Mussels can be aged by counting the lines on its shell, just like you can count tree rings on a tree.
6) Separate mussels by species, line-up, and take one group photo at the end of each 15-minute search to post onto iNaturalist or e-mail to the Program Coordinator.
        - Photograph individual species if uncertain about the identification. Photograph the entire mussel (see page 25).
        - Dead shells can be kept or sent-in for identification.
7) The survey is completed when the time limit has been reached (2 or 4 hours)
8) Record general habitat information for the surveyed site on the survey data sheet. Estimate and record length and width of river searched in meters. Estimate substrate (silt, sand, gravel, cobble, boulder, bedrock) by percentages (such as 10% sand, 40% gravel, 50% cobble), estimate amount of vegetation in the stream by percentage, and water depths. Note any unique habitat conditions (downed trees, islands, riffles) at the site and briefly sketch a map of the survey area. Datasheets are provided in the training manual (page 23) on the program website.

Sampling Locations

1. Shallow-water areas
2. Exposed sand and gravel bars
3. River and lake bottoms during low-water periods (droughts, drawdowns, etc.) too deep to wade otherwise
4. Islands and streambanks for middens

Sampling Methods – wading

1. Casual collection of specimens (no measure of time, area, or effort)
2. Timed Surveys (number per person-hour – e.g. 2 people searching for one hour = 2 person-hours)

Without proper authorization from Wisconsin DNR, volunteers should never use scuba or hookah diving, snorkeling, or other sampling gear like brails to obtain Wisconsin Mussel data. In special cases, these methods may be permissible, but only after review of the personnel involved and sites to be sampled.

Data Collected

1. Species (if you have received the appropriate training to identify Wisconsin mussels)
2. Number (or number/time, number/area, number/effort)
3. Specimen condition (living, recently dead, etc., see other descriptions herein)
4. Invasive bivalve data (Asian clam presence, Zebra or Quagga mussel presence)
5. Other data (data sheets have a space for site-specific data as available). For example, data sheets have a space for water temperature. This is often useful data to have. If it is known, record it, but do not pass up an opportunity to collect data on mussels present because a thermometer was not available.

Specimens Retained or Shipped to the Wisconsin Mussel Monitoring Program

Specimens being mailed to the Wisconsin Mussel Monitoring Program should be rinsed or washed free of soft tissues or other organic material and mud that may produce objectionable odors. Specimens should be sealed in plastic bags that are waterproof (note: most sandwich bags are not watertight, but ziplocks work well). Mussels from each site should be kept separate and the data sheet should be placed in another plastic bag inside the specimen bag. Following these directions will ensure that the data will not get damp or damaged due to water and that it will remain with the bagged specimens.

E-mail completed data sheet to: Jesse Weinzinger, Wisconsin DNR - NHC, Jesse.Weinzinger@wisconsin.gov

Conversion chart

Standard Units	**Metric Units**
1 inch	2.54 centimeters
1 foot	30.5 centimeters or 0.30 meter
1 yard	0.91 meter