



**Aquatic
Invasive
Species**

MONITORING PROCEDURES

ACKNOWLEDGEMENTS

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This manual is a work in progress. Statewide aquatic invasive species monitoring began in 2006. We (UWEX and WDNR) evaluate our training sessions and we incorporate comments/changes that we receive at the training sessions. We update the protocols as we learn more about the aquatic invasives being monitored and will add in new sections as new invasives move into Wisconsin.

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Aquatic Invasive Species Monitoring Procedures is a guide for Citizens who are interested in monitoring for aquatic invasive species in the lakes they live on and on the lakes they recreate on. The Citizen Lake Monitoring Network is sponsored and promoted by the Wisconsin Department of Natural Resources, UW-Extension and Wisconsin Association of Lakes.

Visit <http://www.uwsp.edu/cnr/uwexlakes/CLMN> to get the most current monitoring protocols.



College
of Natural Resources

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CLMN REGIONAL COORDINATORS

Wisconsin Department of Natural Resources - Citizen Lake Monitoring Network

These folks are your primary contacts for the Citizen Lake Monitoring Network. The coordinators provide assistance with:

- Education on lake issues
- Supplies, reporting forms, mailings and awards
- Data entry into the Surface Water Integrated Monitoring System (SWIMS)
- Equipment repairs and replacement
- Vouchering of Aquatic Invasive Species
- Trainings

NORTHERN

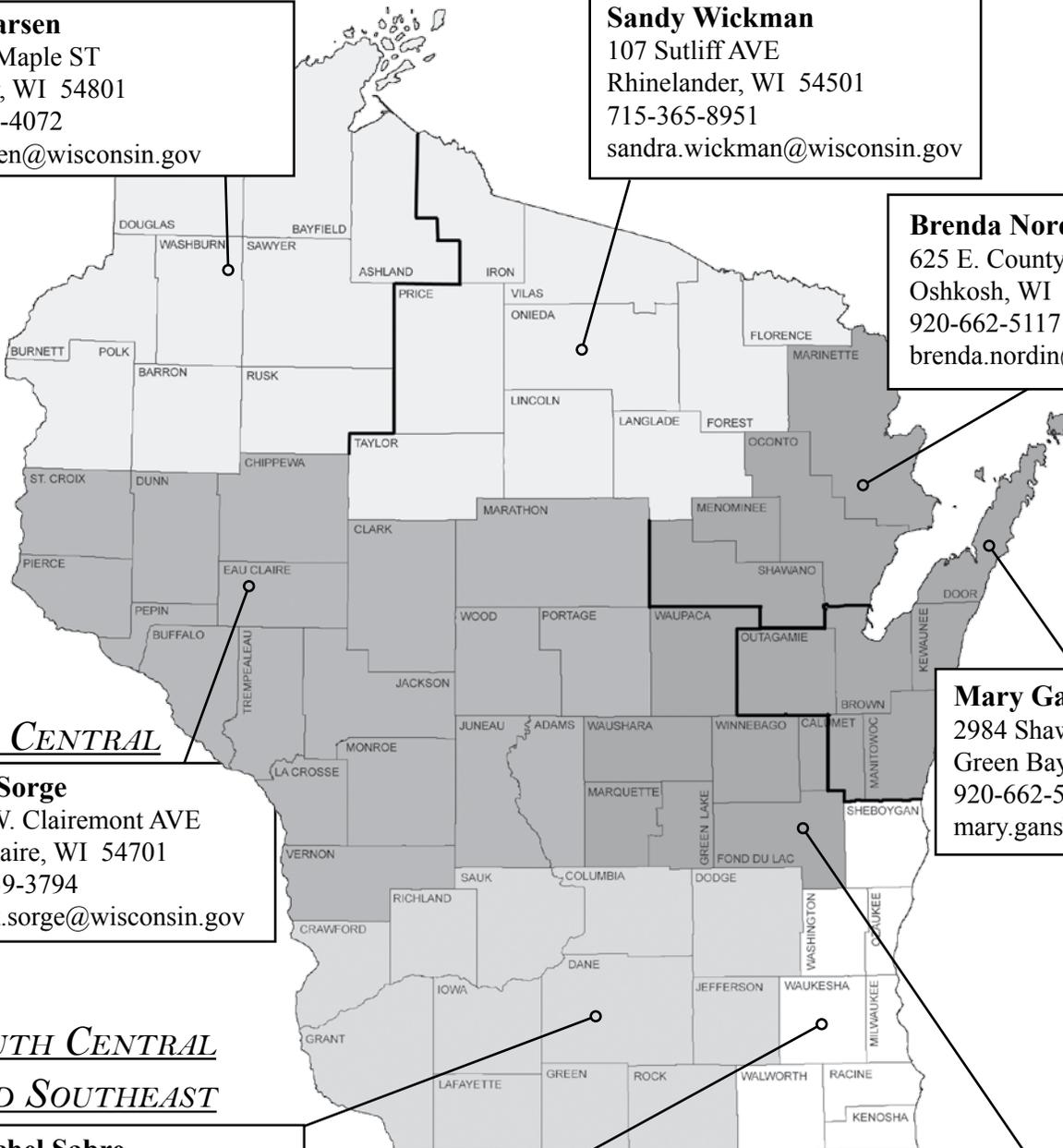
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LAKE & APM COORDINATORS

Wisconsin Department of Natural Resources

These folks have responsibility for administering the DNR's lake programs. Lake coordinators can help provide assistance with:

- Lake management education, technical and information assistance
- Grants: Lake Planning, Aquatic Invasive Species, Lake Protection & Classification, and other project funding
- Clean Boats, Clean Waters Watercraft Inspection
- Citizen Lake Monitoring Network
- Aquatic Plant Management (APM)

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A GLOSSARY OF SOME COMMON TERMS USED AROUND LAKES

ALGAE — Small aquatic plants containing chlorophyll and without roots that occur as single cells or multi-celled colonies. Algae form the base of the food chain in aquatic environments.

ALGAL BLOOM — A heavy growth of algae in and on a body of water as a result of high nutrient concentrations.

ALKALINITY — The acid combining capacity of a (carbonate) solution, also describes its buffering capacity.

AQUATIC INVASIVE SPECIES (AIS) — Refers to species of plants or animals that are not native to a particular region into which they have moved or invaded. Zebra mussels and Eurasian water-milfoil are examples of AIS. Wisconsin has laws preventing the spread on boats and trailers.

AQUATIC PLANT SURVEY — a systematic mapping of types and location of aquatic plants in a water body, usually conducted by means of a boat. Survey information is presented on an aquatic plant map.

BMP's (BEST MANAGEMENT PRACTICES) — practices or methods used to prevent or reduce amounts of nutrients, sediments, chemicals or other pollutants from entering water bodies from human activities. BMP's have been developed for agricultural, forestry, construction, and urban activities.

BATHYMETRIC MAP — a map showing depth contours in a water body. Bottom contours are usually presented as lines of equal depth, in meters or feet. Often called a hydrographic map or lake map.

BENTHAL (BENTHIC) – Concerning the bottom area of the lake (Gr. benthos depth).

BIOCONTROL — management using biological organisms, such as fish, insects or micro-organisms like fungus.

BIOMASS — The total organic matter present (Gr. bios life).

BOTTOM BARRIERS — synthetic or natural fiber sheets of material used to cover and kill plants growing on the bottom of a water body; also called sediment covers.

CHLOROPHYLL — The green pigments of plants (Gr. chloros green, phyllon leaf).

CONSUMERS — Organisms that nourish themselves on particulate organic matter (Lat. *consumere* to take wholly).

CONTACT HERBICIDE — An herbicide that causes localized injury or death to plant tissues with which it contacts. Contact herbicides do not kill the entire plant. (Compare systemic herbicide)

DECOMPOSERS — Organisms, mostly bacteria or fungi, that break down complex organic material into its inorganic constituents.

DETRITUS — Settleable material suspended in the water: organic detritus, from the decomposition of the broken down remains of organisms; inorganic detritus, settleable mineral materials.

DISSOLVED OXYGEN — A measure of the amount of oxygen gas dissolved in water and available for use by all organisms including microorganisms and fish. Dissolved oxygen is produced by aquatic plants and algae as a part of their photosynthetic process.

DRAINAGE BASIN — The area drained by, or contributing to, a stream, lake, or other water body (see watershed).

DRAWDOWN — Decreasing the level of standing water in a water body to expose bottom sediments and rooted plants. Water level drawdown can be accomplished by physically releasing a volume of water through a controlled outlet structure or by preventing recharge of a system from a primary external source.

DREDGING — A physical method of digging into the bottom of a water body to remove sediment, plants or other material. Dredging can be performed using mechanical or hydraulic equipment.

ECOLOGY — A scientific study of relationships between organisms and their surroundings (environment).

ECOSYSTEMS — Any complex of living organisms together with all the other biotic and abiotic (non-living) factors which affect them.

EMERGENT PLANTS — Aquatic plants that are rooted or anchored in the sediment around shorelines, but have stems and leaves extending well above the water surface. Cattails and bulrushes are examples of emergent plants.

ENDOTHALL — The active chemical ingredient of the aquatic contact herbicide Aquathol®.

EPILIMNION — The uppermost, warm, well-mixed layer of a lake (Gr. *epi* on, *limne* lake).

ERADICATION — Complete removal of a specific organism from a specified location, usually refers to a noxious, invasive species. Under most circumstances, eradication of a population is very difficult to achieve.

EUPHOTIC ZONE — That part of a water body where light penetration is sufficient to maintain photosynthesis. Euphotic zone is sometimes called the photic zone.

EUTROPHIC — Waters with a good supply of nutrients and hence a rich organic production (Gr. eu well, trophein to nourish).

EXOTIC — Refers to species of plants or animals that are not native to a particular region into which they have moved or invaded. Eurasian water-milfoil is an exotic plant invader.

FLOATING-LEAFED PLANT — Plants with oval or circular leaves floating on the water surface, but are rooted or attached to sediments by long, flexible stems. Waterlilies are examples of rooted floating-leafed plants.

FLURIDONE — The active chemical ingredient of the systemic aquatic herbicide SONAR®.

FLUSHING RATE — Term describing rate of water volume replacement of a water body, usually expressed as basin volume per unit time needed to replace the water body volume with inflowing water. The inverse of the flushing rate is the (hydraulic) retention time. A lake with a flushing rate of 1 lake volume per year has a retention time of 1 year.

FREELY-FLOATING PLANTS — Plants that float on or under the water surface, unattached by roots to the bottom. Some have small root systems that simply hang beneath the plant. Water hyacinth and tiny duckweed are examples of freely-floating plants.

GLYPHOSATE — The active chemical ingredient of the systemic herbicide RODEO®.

GRASS CARP — Also known as white amur, a grass carp is a large, vegetation-eating member of the minnow family (*Ctenopharyngodon idella*). Originally from Russia and China, these plant grazers are sometimes used as biological agents to control growth of certain aquatic plants. It is illegal to have grass carp in Wisconsin.

HERBICIDE — A chemical used to suppress the growth of or kill plants.

HABITAT — The physical place where an organism lives.

HYDRAULIC RETENTION TIME — The period of retention of water in a basin. The inverse of retention time is flushing rate. A lake with a retention time of one year has a flushing rate of 1 lake volume per year.

HYPOLIMNION — The cold, deepest layer of a lake that is removed from surface influences (Gr. hypo under, limne lake).

LIMITING NUTRIENT — Essential nutrient needed for growth of plant organism which is the scarcest in the environment. Oftentimes, in freshwater systems, either phosphorus or nitrogen may be the limiting nutrient for plant growth.

LIMNOLOGY — The study of fresh water systems including the plants and animals associated with these systems (Gr. limne lake).

LITTORAL — The region of a body of water extending from shoreline outward to the greatest depth occupied by rooted aquatic plants.

MACRO-ALGAE — Large, easily seen (macroscopic) algae. The macro-algae *Nitella* sp. sometimes forms dense plant beds and can be a conspicuous member of the aquatic plant community.

MACROPHYTE — Large, rooted or floating aquatic plants that may bear flowers and seeds. Some plants, like duckweed and coontail, are free-floating and are not attached to the bottom. Occasionally, algae like *Nitella* sp. can form large, extensive populations and be an important member of the aquatic macrophyte community.

MITIGATION — Actions taken to replace or restore animals or plants that may have been damaged or removed by certain prior activities.

Morphometry — Study of shape, configuration or form (Gr. *morphe* form, *logos* discourse).

NICHE — The position or role of an organism within its community and ecosystem.

NITROGEN — A chemical constituent (nutrient) essential for life. Nitrogen is a primary nutrient necessary for plant growth.

NON POINT (POLLUTANT) SOURCE — A diffuse source of water pollution that does not discharge through a pipe or other readily identifiable structure. Non point pollution typically originates from activities on land and the water. Examples of non point sources are agricultural areas, forests, construction sites, marinas, urban streets and properties.

NON-TARGET SPECIES — A species not intentionally targeted for control by a pesticide or herbicide.

NOXIOUS WEED — A non-native plant species that, because of aggressive growth habits, can threaten native plant communities, wetlands or agricultural lands.

NUTRIENT — Any chemical element, ion, or compound required by an organism for the continuation of growth, reproduction, and other life processes.

OLIGOTROPHIC — Waters that are nutrient poor and have little organic production (Gr. *oligos* small, *trophein* to nourish).

OXIDATION — A chemical process that can occur in the uptake of oxygen.

pH — The negative logarithm of the hydrogen ion activity. pH values range from 1-14 (low pH values are acidic and high pH levels are alkaline).

PHOSPHORUS — A chemical constituent (nutrient) essential for life. Phosphorus is a primary nutrient necessary for plant growth.

PHOTOSYNTHESIS — Production of organic matter (carbohydrate) from inorganic carbon and water in the presence of light (Gr. *phos*, photos light, *synthesis* placing together).

PHYTOPLANKTON — Free floating microscopic plants (algae) (Gr. phyton plant).

POINT (POLLUTANT) SOURCE — A source of pollutants or contaminants that discharges through a pipe or culvert. Point sources, such as an industrial or sewage outfall, are usually readily identified.

POLLUTANT — A contaminant, a substance that is not naturally present in water or occurs in unnatural amounts that can degrade the physical, chemical, or biological properties of the water. Pollutants can be chemicals, disease-producing organisms, silt, toxic metals, oxygen-demanding materials, to name a few.

PRIMARY PRODUCTION — The rate of formation of organic matter or sugars in plant cells from light, water and carbon dioxide (Lat. primus first, producere to bring forward). Algae and plants are primary producers.

PROBLEM STATEMENT — A written description of important uses of a water body that are being affected by the presence of problem aquatic plants. See Chapter 3.

PRODUCERS — Organisms that are able to build up their body substance from inorganic materials (Lat. producere to bring forward).

PUBLIC TRUST DOCTRINE — A body of law (Programs) having roots in Roman law, English common law and the North West Ordinance of 1787. It grants authority to the state to regulate its waters. It establishes public rights of use and defines state property rights in navigable waters.

RESIDENCE TIME — The average length of time that water or a chemical constituent remains in a lake.

ROTOVATION — A mechanical control method of tilling lake or river sediments to physically dislodge rooted plants. Also known as bottom tillage or derooting.

SECCHI DISC — A 20-cm (8-inch) diameter disc painted white and black in alternating quadrants. It is used to measure light transparency in lakes and the visual clarity of the water column.

SEDIMENT — Solid material deposited in the bottom of a basin.

SENSITIVE AREAS — Critical areas in the landscape, such as wetlands, aquifer recharge areas, and fish and wildlife habitat conservation areas, that are protected by state law (Growth Management Act of 1990).

STANDING CROP — The biomass present in a body of water at a particular time.

STEERING COMMITTEE — A small group of people organized to represent the larger community of individuals, businesses and organizations who have an interest in management of a particular water body. The steering committee is responsible for following the planning steps outlined in this manual.

STRATIFICATION — Horizontal layering of water in a lake caused by temperature-related differences in density. A thermally stratified lake is generally divided into the epilimnion (uppermost, warm, mixed layer), metalimnion (middle layer of rapid change in temperature and density) and hypolimnion (lowest, cool, least mixed layer).

SUBMERSED PLANT — An aquatic plant that grows with all or most of its stems and leaves below the water surface. Submersed plants usually grow rooted in the bottom and have thin, flexible stems supported by the water. Common submersed plants are water-milfoil and pondweeds.

SUSCEPTIBILITY — The sensitivity or level of injury demonstrated by a plant to effects of an herbicide.

SYSTEMIC HERBICIDE — An herbicide in which the active chemicals are absorbed and translocated within the entire plant system, including roots. Depending on the active ingredient, systemic herbicides affect certain biochemical reactions in the plant that can cause plant death. SONAR® and RODEO® are systemic herbicides. (Compare contact herbicide)

THERMAL STRATIFICATION — Horizontal layering of water in a lake caused by temperature-related differences in density. A thermally stratified lake is generally divided into the epilimnion (uppermost, warm, mixed layer), metalimnion (middle layer of rapid change in temperature and density) and hypolimnion (lowest, cool, least mixed layer).

THERMOCLINE — (Gr. therme heat, klinein to slope.) Zone (horizontal layer) in water body in which there is a rapid rate of temperature decrease with depth. Also called metalimnion, it lies below the epilimnion.

TOPOGRAPHIC MAP — A map showing elevation of the landscape in contours of equal height (elevation) above sea level. This can be used to identify boundaries of a watershed.

TRANSECT LINES — Straight lines extending across an area to be surveyed.

TRIBUTARIES — Rivers, streams or other channels that flow into a water body.

TRICLOPYR — A selective systemic herbicide used for control of woody and broadleaf plants.

TRIPLOID — A genetic term referring to non-reproducing (sterile) forms of grass carp induced by manipulating reproductive genes. Reproducing grass carp have two pairs of chromosomes and are termed diploid. Triploid fish have three sets of chromosomes.

TROPHIC STATE — Term used to describe the productivity of the lake ecosystem and classify it as oligotrophic (low productivity, “good” water quality), mesotrophic (moderate productivity), or eutrophic (high productivity; “poor” water quality).

TURION – A specialized bud which consists of condensed leaves and stems. This structure is most often an “over-wintering” structure, but in the case of curly-leaf pondweed is an “over-summering” structure. When the appropriate water conditions are reached, the turion will sprout a new plant.

VASCULAR PLANT— A vascular plant possesses specialized cells that conduct fluids and nutrients throughout the plant. The xylem conducts water and the phloem transports food.

WATER BODY USAGE MAP — A map of a water body showing important human use areas or zones (such as swimming, boating, fishing) and habitat areas for fish, wildlife and waterfowl.

WATERSHED — The entire surface landscape that contributes water to a lake or river. See drainage area.

WATERSHED MANAGEMENT — The management of the natural resources of a drainage basin for the production and protection of water supplies and water-based resources.

WETLAND — A generalized term for a broad group of wet habitats. Wetlands are areas of vegetation that are transitional between land and water bodies and range from being permanently wet to intermittently water covered.

ZOOPLANKTON — Microscopic animal plankton in water (Gr. zoion animal). Daphnia sp. or water fleas are freshwater zooplankton.

From Washington State Department of Ecology; Maribeth Gibbons Jr.
<http://www.ecy.wa.gov/programs/wq/plants/management/manual/>

Modified by WI DNR and UWEX staff in 2007.

Photo by Robert Korih



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AQUATIC INVASIVE SPECIES MONITORING



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WELCOME TO THE AQUATIC INVASIVE SPECIES PORTION OF THE CITIZEN LAKE MONITORING NETWORK.

Aquatic Invasive Species (AIS) are one of the newer threats to Wisconsin lakes. Wisconsin residents spend several million dollars each year trying to control AIS, and these costs are increasing every year. For most species, early detection means earlier control which equates to reduced control costs. Each year that many of the AIS are left unchecked, they may continue to spread and get a stronger hold on the lake. This could make control more difficult and expensive.

Aquatic Invasive Species are a concern as they can displace native plant and animal species. When control is even an option, the costs of control are high and it can take years of control efforts to knock back populations. Often when AIS becomes established in a lake, there is no chance of eradication and residents just control the invasive so that they can recreate on their lake. The Citizen Lake Monitoring Network is working with volunteers to find AIS when the populations are small so that control costs will be less and the impacts to the environment and to recreation will be minimized. Refer to <http://dnr.wi.gov/lakes/invasives/> to find out which lakes have been documented as having AIS.

Wisconsin's 15,081 lakes are fortunate to have volunteers who monitor water clarity, water chemistry, native aquatic plants and AIS. Since 1986, these volunteers have been the eyes and ears for the lake biologists. They have provided data to local and state agencies on what is happening on their lakes. They have learned about lakes, shared information with neighbors, lake groups, the community, and used the information to help make decisions. Without the volunteers, we would not have lake data which is necessary to help make decisions to protect the health of our lakes.

Through the CLMN, volunteers are trained to monitor in and around the whole lake for Eurasian water-milfoil, curly-leaf pondweed, purple loosestrife, rusty crayfish, adult zebra and quagga mussels, Chinese and banded mystery snails, spiny and fishhook waterfleas and freshwater jellyfish. In 2009, UWEX and DNR will pilot CLMN Hydrilla and New Zealand mudsnail monitoring programs. These monitoring protocols may change as we learn more about monitoring for these organisms. If new AIS enter Wisconsin, the volunteers may be asked to help monitor for these AIS. Volunteers can select which invasive to monitor for or they can monitor for all AIS. Volunteers will also learn how to assist the DNR staff in monitoring for the veliger stage of zebra and quagga mussels as well as water-fleas. If a lake is known to have an invasive species, volunteers can help track the spread and the densities/populations of this invasive as well as be on the lookout for other AIS. If control is taking place, volunteers can track the success of the control method.

CITIZEN LAKE MONITORING NETWORK AND AQUATIC INVASIVE SPECIES MONITORING

The Citizen Lake Monitoring Network (CLMN) aquatic invasive species monitoring protocol will help you design a monitoring plan for your lake and set up a monitoring schedule.

You do not need to know how to identify invasive species when you join the program. Training sessions will be held periodically. 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>. To help you with the identification terminology, please refer to the glossary (pages x-xvi) for a list of common terms used at training sessions and around the lake.

Goals of the Citizen Lake Monitoring Network aquatic invasive species monitoring are to:

- Help you become familiar with some of the more common native aquatic plants and animals in your lake.
- Help you monitor for the more common aquatic invasive species.
- Help you to communicate information to others.

We will discuss each invasive species separately. You may select the species you would like to monitor for. Since each lake is unique, you can tailor the monitoring to fit your individual lake. Your regional CLMN Coordinator can offer assistance.

Some volunteers in the CLMN will:

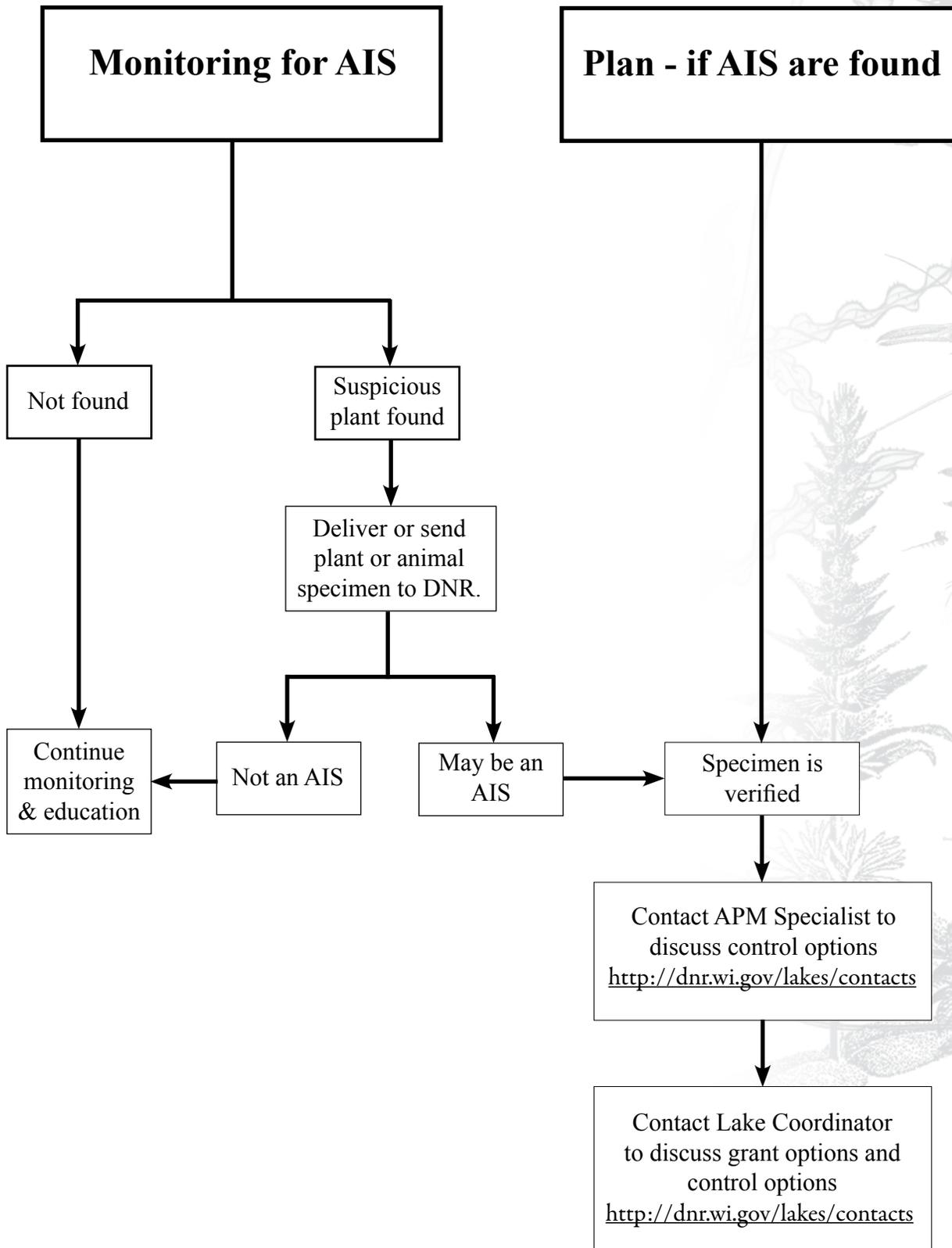
- Collect “suspect” aquatic invasive plants and animals from their lake. They will be looking for presence or absence of the AIS.
- Collect “suspect” aquatic invasive plants and animals from their lake. If an invasive is found, map and/or track the spread of the invasive. This will help determine the extent of the lake’s surface area covered by this invasive.
- Collect “suspect” aquatic invasive plants and animals from their lake. If an invasive is found, map and/or track the spread of the invasive through use of GPS. This will help you to determine the extent of the lake’s surface area effected by this invasive. By using the GPS information, you can more accurately track the spread and better display the data.
- Monitor the plant bed or animal densities to determine if control methods are working.

Please refer to the flow chart on page 5 for information on what steps to take

1. if no AIS are found,
2. if you suspect that you have an aquatic invasive species, and
3. if an aquatic invasive species is verified on your lake.

You should consider contacting the DNR Aquatic Plant Management and Protection Coordinator to see if there is background aquatic plant data on your lake. Aquatic

plant surveys may have already taken place on your lake. This data may help you in the identification of the plants that you find as well as give you background data on what plant species were present in the past. To determine your aquatic plant contact, go to <http://dnr.wi.gov/lakes/contacts> and click on the county of interest.



WHY MONITOR FOR AQUATIC INVASIVE SPECIES?

Monitoring for and mapping of aquatic invasive species is essential to the future of our inland lakes. Early detection of non-native plants followed up by prompt control efforts can help to reduce management costs. If you detect the invasives early enough, you may be able to prevent them from spreading throughout your lake system. It is cheaper to control small patches of invasives than to pay to control invasives that have taken over an entire lake system. Once invasives are established in your lake, they may be impossible to eradicate.

Volunteers can watch for changes in native species diversity or changes in abundance of native species and not just for the presence or absence of exotics. A decrease in diversity or an increase of one particular species may be an early-warning sign of changing water quality and habitat. Studies have shown that if a habitat is opened up, some plant or animal will fill that niche. Often it is an aquatic invasive species that moves in. Shoreline and lake bottom disturbances that remove native plants make it easier for non-native species, such as Eurasian water-milfoil to become established. Excess nutrients carried to a lake by runoff can lead to algal blooms and overgrowth of some plant species and can result in a decrease of recreational and aesthetic value. By spotting negative changes early, residents can take action to reverse these impacts and allow the lake community to return to a more healthy state. Preserving the natural aquatic plant and animal community helps maintain a balance that ultimately protects the lake.

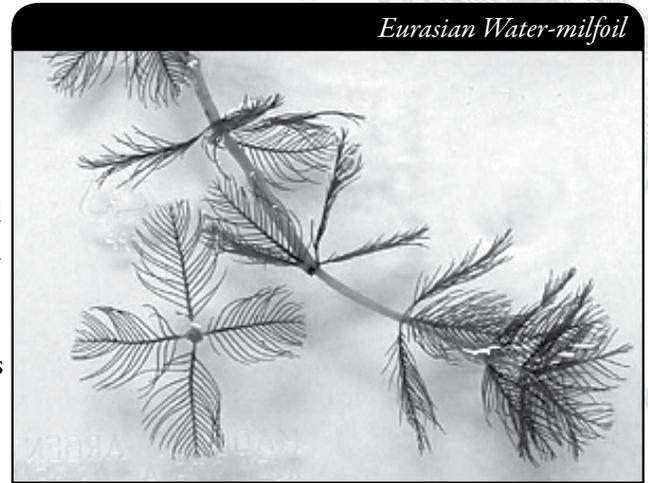
A lake's water quality and sediment characteristics may affect the establishment and spread of some invasive species. Research staff at the DNR believes this is happening on some lakes with Eurasian water-milfoil and curly-leaf pondweed. Research staff have been looking at Eurasian water-milfoil densities to see if there is a correlation with management activities or if maybe the densities are based upon lake characteristics (water quality and nutrient levels). Other lake research folks (consultants and other agencies) have been looking at nutrient and metal levels in the sediment levels to see if these factors impact curly-leaf pondweed bed densities. These studies will continue. On some lakes low water hardness and calcium content may limit zebra mussel invasions. The Center for Limnology and University staff have indicated that rusty crayfish populations do not seem to thrive on lakes with muck bottoms. By locating lakes with AIS, these lakes can be further studied by research scientists to see if there are correlations between the environmental conditions and AIS populations.

WHAT CAN YOU MONITOR?

AN OVERVIEW OF THE SPECIES OF CONCERN AND WHAT PROBLEMS THEY CAUSE

EURASIAN WATER-MILFOIL

Eurasian water-milfoil is an invasive aquatic plant that was brought to the US from Europe and Asia. One of the ways it out-competes native plants is by starting to grow in the early spring, before the native plants begin growing. It often reaches nuisance levels in late June and remains at these levels until fall. On some lakes, Eurasian water-milfoil has displaced the native aquatic plants and taken over hundreds of acres of the shallow water areas. In some cases it can become so dense that it makes swimming, boating and fishing almost impossible. At these levels, it can also cause an imbalance in the lake's fish community. When Eurasian water-milfoil gets so thick, it hinders feeding of larger fish. Small fish are able to "hide" in the Eurasian water-milfoil and the larger fish cannot swim through it easily. Many groups will monitor for Eurasian water-milfoil several times a season from May – October as Eurasian water-milfoil begins growing early and keeps growing late into the fall. For lakes with known Eurasian water-milfoil this allows you to look for new beds so that these beds can be treated (scuba diving, hand pulling, chemical, etc.) while the beds are still small. Chemical treatment is usually conducted in the spring, so beds need to be located early. An aquatic plant management plan is often required as a part of a permit for chemical treatment of Eurasian water-milfoil. Your monitoring efforts may be used as a component of these plans.

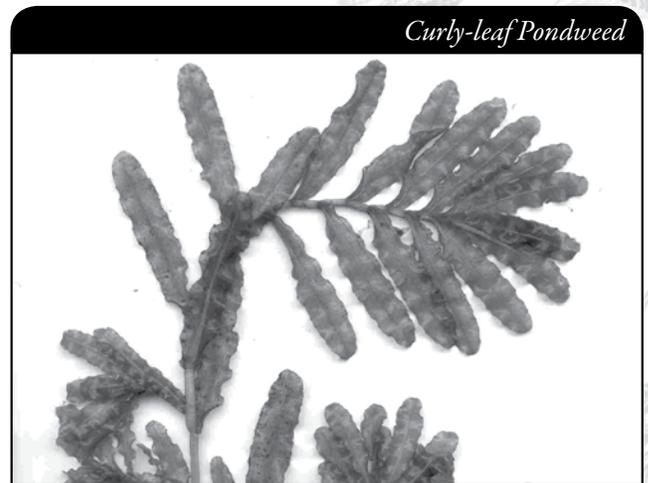


Eurasian Water-milfoil

Photo by Sara Schmidt

CURLY-LEAF PONDWEED

Curly-leaf pondweed is an invasive plant that came to the US from Europe. It is adapted to cool temperatures. Curly-leaf pondweed grows under the ice while most native plants are dormant. Curly-leaf pondweed reaches nuisance levels by May and June. Curly-leaf pondweed dies back in mid-July when other native aquatic plants are just reaching peak growth. This mid-summer die-off creates a sudden loss of habitat and releases nutrients into the water column that can trigger algal blooms and create turbid water conditions. There is still a lot of uncertainty about curly-leaf pondweed. Some lakes have had curly-leaf pondweed for decades, without it ever reaching nuisance levels. In these lakes, curly-leaf pondweed is essentially becoming a part of a "balanced" aquatic plant community. In other lakes, curly-leaf pondweed reaches nuisance levels every year or every few years. The reasons for the plant density differences are still unknown. Monitoring should be conducted in May or June when the plants are at their greatest densities. An aquatic plant management plan is often required as a part of a permit for chemical treatment of Curly-leaf pondweed. Your monitoring efforts may be used as a component of these plans.



Curly-leaf Pondweed

Photo by Susan Knight

PURPLE LOOSESTRIFE

Purple loosestrife is a beautiful, but aggressive, plant that can grow in upland, wetland and shallow water areas. Each plant has the capability to produce over 2 million seeds each year, making it easy for this plant to take over disturbed areas. Seeds can be moved by wind, water, animals and humans. If excavation is taking place in a purple loosestrife bed, the seeds can be unknowingly spread over a large area. Purple Loosestrife monitoring takes place mid-July through August when the plants are in bloom.

Purple Loosestrife

Photo provided by WTDNR

RUSTY CRAYFISH

Rusty crayfish were introduced from the Ohio River Basin. They are considered opportunistic feeders. They feed on aquatic plants, insects, snails, leeches, clams and fish eggs. Rusty crayfish have a higher metabolic rate and grow larger than native crayfish. Some studies show that they can consume more than four times the food of a native crayfish, thus they do more damage to a plant community than native crayfish. Rusty crayfish are messy eaters. They often cut a plant off, nibble on the plant and then let the rest of the plant float away. This can spread plants such as Eurasian water-milfoil. Rusty crayfish monitoring normally begins in June and ends in August.

Rusty Crayfish

Photo by Paul Skawinski

ZEBRA MUSSELS AND QUAGGA MUSSELS

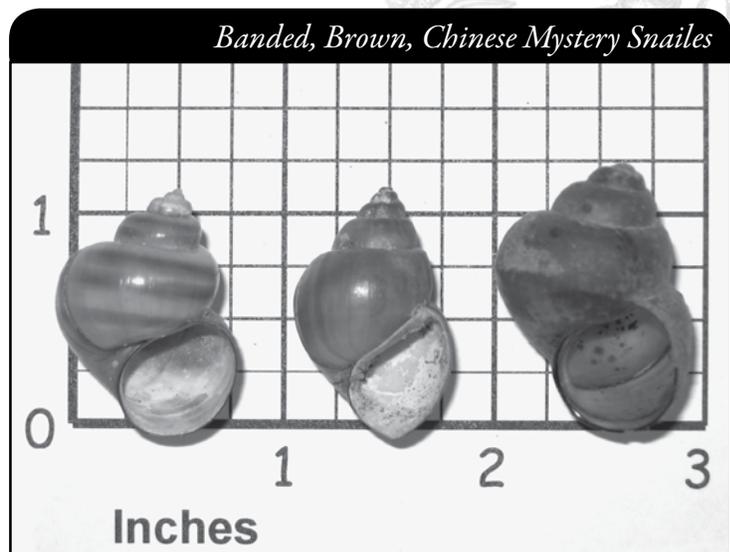
Zebra mussels are native to the Ponto-Caspian region of western Russia. Quagga mussels are from the Caspian Sea drainage area in Eurasia in particular the Dneiper River drainage of the Ukraine (Eastern Europe). Zebra mussels have been found in some Wisconsin lakes while the quagga mussels have only been found in the Great Lakes (2009 data). Zebra mussels tend to do best in waters that are less than 180 feet. Quagga mussels can live in the same areas as zebra mussels, plus they can live in deeper waters (425 feet) such as the Great Lakes. Quaggas tend to prefer deeper water where there is less turbulence (wave action). This gives them an advantage over zebra mussels as they have more areas to inhabit. The spread and abundance of both of these mussels can be linked to their reproductive cycle. A mature female can lay up to 1 million eggs per year. Of these, roughly 20,000 – 40,000 make it to adulthood within 1 year. Both zebra and quagga mussels have a tuft of fibers called byssal threads which allows them to attach to aquatic plants, rocks, docks, native clams, native mussels, snails, or any hard surface although quaggas also do well in silty or sandy areas. An adult mussel is capable of filtering more than one liter of water a day,

feeding on the phytoplankton (algae) and small zooplankton. Phytoplankton is normally eaten by zooplankton which, in turn, is eaten by small fish. It is speculated that the zebra and quagga mussels can impact a lake's fishery by reducing the available food for forage fish. While zebra and quagga mussels eat green algae in the water column, they seldom eat blue-green algae, so lakes with zebra mussels often have slimy masses of blue-green algae attached to plants and other hard surfaces. There is a concern with blue-green algae increases, because as the blue-green algae die off, they can produce toxins. Zebra and quagga mussel monitoring can be done from ice out to ice on. One of the best times to look for these mussels is when you pull out your dock or even in the spring when you put your dock back in. These mussels can be seen or felt on the pipes – they feel like sandpaper. Consider placing an article in your newsletter asking all of your residents to look for zebra or quagga mussels. Think of the shoreline area you can cover by having everyone check their docks and piers for zebra and quagga mussels.



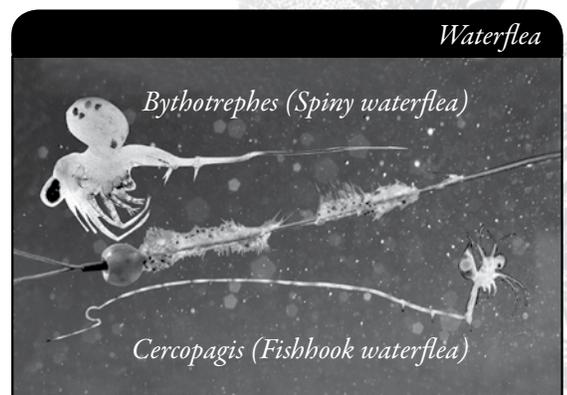
CHINESE AND BANDED MYSTERY SNAILS

The Chinese mystery snail is native to Asia. The banded mystery snail is native to the southeastern US. One of the main identification features of the mystery snails is their size. Adult snails are often over 1 ½ inches in length. Both mystery snails as well as the native brown mystery snail have opercula (singular operculum) which are “trap doors” that cover their shell's opening when the operculum is closed. The opercula are darkly colored, solid in consistency with concentric rings. Other than the brown mystery snail, most native snails in Wisconsin do not have opercula. Mystery snails thrive in silt and mud areas although they can be found in lesser numbers in areas with sand or rock substrates. They are found in lakes, ponds, irrigation ditches, and slower portions of streams and rivers. They are tolerant of pollution and often thrive in stagnant water areas. Chinese and Banded Mystery snail monitoring can take place anytime from ice out to ice on.



SPINY AND FISHHOOK WATERFLEA

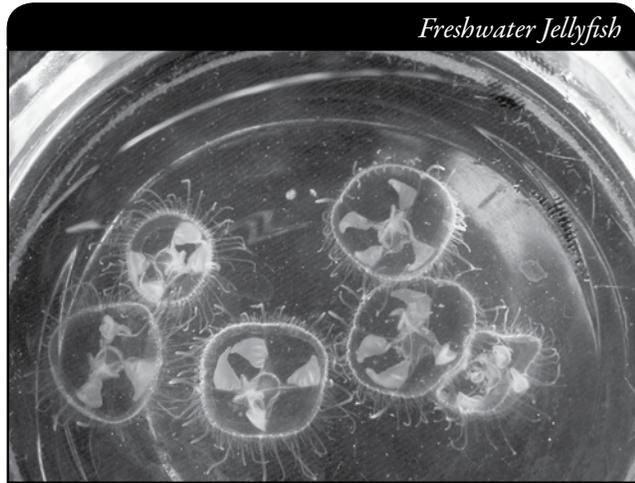
There are two types of non-native waterfleas, the spiny waterflea and fishhook waterflea. Both may impact the fisheries of the body of water where these waterfleas are found. The waterfleas are up to ¾ inch in length. Both the spiny and the fishhook waterfleas have sharp spines on their tails. Some small fish have difficulty swallowing these waterfleas. Both waterfleas eat small zooplankton, which normally would have been consumed by native zooplankton and fish. Impacts on fisheries are expected, but not well documented. Waterflea monitoring normally takes place June through September.



FRESHWATER JELLYFISH

The freshwater jellyfish found in Wisconsin are one of several species of *Craspedacusta* native to China. In some years, especially hot summers in Wisconsin, you will see the medusa form of the jellyfish. The medusa has a nearly transparent body, often called a bell, which dangles long, hair-like tentacles commonly associated with saltwater jellyfish. The medusa form of the jellyfish is about the size of a quarter.

Jellyfish eat zooplankton and even small fish. Not a lot is known about the life history of jellyfish in Wisconsin lakes. Freshwater jellyfish monitoring normally takes place early August – mid September.



Freshwater Jellyfish

Photo by Sharon Milstead

HYDRILLA

In 2007 hydrilla was discovered in a man-made pond in Wisconsin in Marinette County. It is the only known occurrence of the plant in Wisconsin.

The introduction is thought to have been by nursery stock that was introduced into the pond. It is believed that the hydrilla was eradicated from this pond, but we need to monitor lakes in the area to ensure it has not spread. Hydrilla has very effective methods of reproducing. It produces seeds and can sprout new plants from root fragments or stem fragments containing as few as two whorls of leaves. Hydrilla also produces structures called turions and tubers. Mature plants can be up to 30 feet in length. Hydrilla

looks like our native Elodea, so close inspection and identification is essential. It is believed that hydrilla will be a greater problem than Eurasian water-milfoil if hydrilla gets established in Wisconsin. Monitor several times a year from May through October.



Hydrilla

Photo by Vic Kamy, University of Florida

New Zealand Mudsnaails

NEW ZEALAND MUDSNAIL

The New Zealand mudsnail has been found in Lake Superior in the Duluth-Superior Harbor area and south of the Waukegan Harbor in Lake Michigan. As of December 2009 they have not been documented in inland waters in Wisconsin. Volunteers play an integral part in learning to recognize the New Zealand Mudsnaail and checking local lakes, streams and rivers for the presence of this snail. Early identification of the mudsnail makes containment easier, and can help prevent the spread into other waterbodies. The New Zealand mudsnail is small (less than ¼ inches tall).



Photo by Dan Gustafson

What it lacks in size, it makes up for in densities. Densities of 500,000 snails per square meter have been found. The New Zealand mudsnails are nearly impossible to contain once they have invaded an aquatic ecosystem. Highly resilient, the snails can survive several days out of water and can withstand a wide range of temperatures. The snails have been found to pass through the fish's digestive system alive and intact. Asexual females develop eggs that can grow without fertilization and produce cloned genetically identical offspring. Therefore, one female is sufficient to initiate a new population. Monitoring can take place anytime from ice out to ice on.

THE FUTURE

We know that more than 180 non-native plants and animals have a foot-hold in the Great Lakes. The aquatic invasive species monitored through the Citizen Lake Monitoring Network may be only the first of many species that will impact Wisconsin lakes. Getting a plan in place for monitoring will help to prepare for lakeshore residents and lake users of the future.

HOW TO SET 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. Some volunteers may want to monitor for specific invasives while others may want to monitor specific areas of the lake. The first thing to do is find volunteers to assist you in your monitoring effort and find out what their interests and constraints are. Some may not have access to boats, but are willing to look for AIS at beaches or boat landings or some may only have a few hours a month to give – these folks would work great for Eurasian water-milfoil monitoring along shorelines. Others will have more time and boats available – these folks can map plant beds and/or monitor for rusty crayfish. Some may only be on the lake weekends or holidays. Ask these folks to look for zebra mussels when they pull in their docks. Just remember, the more people who know about aquatic invasive species, the better your chances of finding the invasives early in the infestation cycle.

Designate a team leader (and maybe an assistant) who is willing to keep track of what areas are being monitored and who is 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 for vouchering. By having the team leader take in suspect specimens, you will not have the confusion of every team member taking in plants and/or animals and you will be able to keep a list of what has been taken in and identified. Some groups have asked bait dealers or other businesses to “hold” suspect plants bought in by residents. Then the team leader can collect the plants from the bait dealers and take them in for identification when necessary. By the end of the summer, your team leader should be quite familiar with the native plants and critters in your lake. Be creative and most importantly, do not burn out your team leaders!

Consider having a mini-training session for your team. The Citizen Lake Monitoring Network Coordinator or the Aquatic Plant Management Coordinator (refer front of manual and <http://dnr.wi.gov/lakes/contacts> for your area may be able to assist you with

a training session. If not, 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 plant communities, 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 fish. 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 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 are monitoring existing beds of Eurasian water-milfoil or curly-leaf pondweed and you have a GPS unit, you may want to mark in the edges of the beds, and then load this data into a mapping program and print out maps of the beds. You can refer back to these maps to see if control methods are working. If you are mapping purple loosestrife beds where beetles have been added, you can track the beetle impact (smaller less dense loosestrife beds). You may also want to mark other locations monitored.

WHEN TO MONITOR

- For those conducting native aquatic plant monitoring, **native aquatic plant** monitoring normally takes place **mid-June through the end of August** with the earlier months used in the southern part of the state and the later months used in the northern part of the state. These dates are impacted by ice out dates and how hot the spring and summer are.
- Many groups will monitor for **Eurasian water-milfoil** several times a season from **May–October** as Eurasian water-milfoil begins growing early and keeps growing late into the fall. For lakes with known Eurasian water-milfoil this allows you to look for new beds so that these beds can be treated (scuba diving, hand pulling, chemical, etc.) while the beds are still small. Chemical treatment is usually conducted in the spring, so beds need to be located early. An aquatic plant management plan is often required as a part of a permit for chemical treatment of Eurasian water-milfoil.
- **Curly-leaf pondweed** is often at peak densities in May and June and begins to die back in late June to July. You would want to conduct your monitoring in **May or June**. An aquatic plant management plan is often required as a part of a permit for chemical treatment of Curly-leaf pondweed.
- **Purple loosestrife** monitoring takes place **mid-July through August** when the plants are in bloom.
- **Rusty crayfish** monitoring normally **begins in June and ends in August**.
- **Zebra and quagga mussel** monitoring can be done from **ice out to ice on**. One of the best times to look for zebra mussels is when you pull out your dock or even in the spring when you put your dock back in. The zebra mussels can be seen or felt on the pipes – they feel like sandpaper. Consider placing an article in your newsletter asking all of your residents to look for zebra and quagga mussels. Think of the shoreline area you can cover by having everyone check their docks and piers for mussels.
- **Chinese and banded mystery snail** monitoring can take place anytime from **ice out to ice on**.
- **Waterflea** monitoring normally takes place **June through September**.
- **Freshwater jellyfish** monitoring normally takes place **early August through mid-September**.
- **Hydrilla** monitoring normally takes place **May through October**.
- **New Zealand mudsnail** monitoring can take place anytime from **ice out to ice on**.

Refer to each specific aquatic invasive species section for more detailed information on monitoring.

Aquatic Invasive Species – A Guide for Proactive and Reactive Management is an excellent resource for planning what to do before an invasive is found in your lake. It also is an excellent guide on what to do if an invasive species is found. This publication can be downloaded at <http://www.uwsp.edu/cnr/uwexplakes/CLMN/publications.asp>.

If an invasive plant or animal is suspected or found, you should get in touch with your local DNR CLMN contact. Your lake organization may want to consider control efforts for these invasives. Your contact will refer you to the proper contacts if management is an option. Your DNR Lake Coordinator can review grant options with you.



EURASIAN WATER-MILFOIL

2

MONITORING PROTOCOL



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BACKGROUND/OVERVIEW

Eurasian water-milfoil (EWM) is a submerged aquatic plant that poses a serious threat to a lake's native aquatic plants and the animals that depend on these diverse ecosystems. Since it is not native to Wisconsin or the United States, it has very few natural predators. EWM can form thick underwater stands of tangled stems and vast mats of vegetation at the water's surface. It can crowd out native plants and become so thick that the larger fish cannot swim through the tangled mats. When EWM mats get well established, channels are needed to allow access from the shoreline out into deeper water areas. EWM is now one of the most troublesome submerged aquatic plants in Wisconsin.

There are 11 native water-milfoil species in North America. Of these 11 native species, seven are native to Wisconsin. The native water-milfoils are not as aggressive as the exotic water-milfoil and they have natural predators. Some Wisconsin species of water-milfoil are quite rare and are on the Wisconsin Threatened and Endangered species list.

EWM is native to Europe, Asia and northern Africa. It may have been brought in to the United States via aquaculture and the aquarium trade. The first authenticated record of EWM in the United States was in 1942 in a Washington D.C. pond. In 2007 it was found in 48 of the 50 states. EWM was first documented in Wisconsin in the 1960's. The list of waterbodies in Wisconsin where EWM has been verified can be found at <http://dnr.wi.gov/lakes/invasives/>.

Volunteers play an integral part in learning to recognize the plant and checking local lakes for the presence of EWM. Early identification of the plant makes control much easier, and can help prevent the spread into other waterbodies. If you detect the invasives early enough, you may be able to prevent them from spreading throughout your lake system. It is cheaper to control small patches of invasives than to control invasives that have taken over an entire lake system. Once invasives are established in a lake, they are nearly impossible to eradicate.



LIFE CYCLE

EWM is an evergreen plant. The plant remains alive over the winter and starts growing when water temperatures reach 50° F (Bode, J. et al. 1992). EWM begins growing earlier in the season than the native water-milfoils. This makes early spring chemical treatment an option for control of EWM as it is more selective for EWM than late spring or summer treatments. In spring and summer, EWM can grow up to two inches a day. If EWM plant growth reaches the surface of the lake, the plant will continue to grow and can form a canopy over the surface of the lake often making the area nearly impassable with a motor boat. This canopy can also shade out native plants. Excessive growth affects recreational use by interfering with swimming, fishing, and boating and reducing the aesthetics of the lake. EWM grows in water depths ranging from less than one-foot to over 20-feet. Thick beds can form in water depths from 3 to 20 feet deep (Smith, C and J. Barko, 1990), but most commonly reach nuisance levels in water depths of 6-15 feet. EWM is tolerant of

disturbance and can grow in most water conditions. One way to protect your lake from EWM or other invasives is to maintain native aquatic plant beds.

EWM produces seeds and runners, but the main method of spread is through plant fragmentation (vegetative propagation) by boats and wave action. In the late summer and early fall, auto fragmentation may occur. Auto fragmentation is when the plant “breaks itself into smaller pieces”. Plant cells at leaf nodes and side-branch connections become weak, die and break off. These newly formed fragments float to new locations where they fall to the substrate, root and establish new beds of EWM.



IDENTIFICATION

In your packet is a card with a picture of EWM (*Myriophyllum spicatum*, pronounced MIR-ee-ah-FILL-um spi-KAY-tum) on one side and northern water-milfoil (*Myriophyllum sibiricum*, pronounced MIR-ee-ah-FILL-um si-BIR-I-cum) on the other side. Northern water-milfoil is the Wisconsin native that is sometimes confused with EWM. In your packet, you will also find a laminated example of EWM, as well as a fact sheet on water-milfoil turions (overwintering buds). Several of the native water-milfoil species produce turions. EWM does not produce turions, so if you see turions in the fall, or turion leaves in the spring, you do not have EWM.

EWM has been known to hybridize with northern water-milfoil. The hybrids cannot be distinguished by visual characteristics, but rather have to be identified through DNA analysis. If you suspect that you have the hybrid, please contact your local Aquatic Plant Management staff <http://dnr.wi.gov/lakes/contacts> for assistance.

Refer to pictures on next page, as well as reference materials in your packet, to see the characteristics listed below:

EURASIAN WATER-MILFOIL (EWM) CHARACTERISTICS:

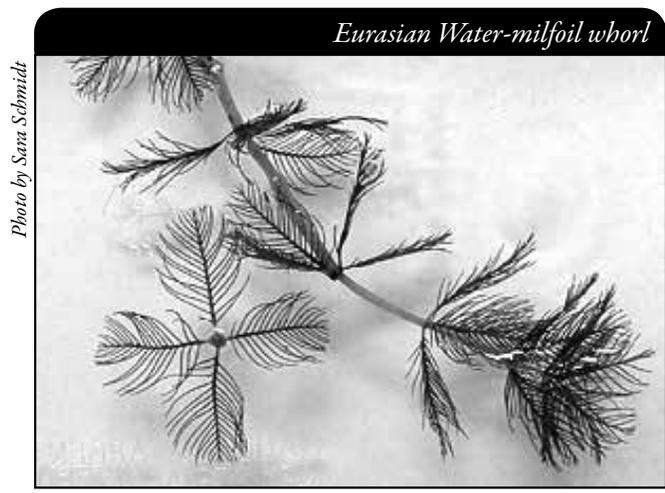
- Delicate feather-like leaves
- Leaves are arranged in whorls (circles), 3 to 5 leaves around the stem
- Usually 12-21 leaflet pairs per leaf
- Lower leaflets pairs are about the same length as upper leaflet pairs
- Leaves are fairly limp when pulled out of the water
- In the summer, the plants can be 20 feet tall
- In the summer, the distance between the leaf whorls can be several inches
- Upper part of the plant stem often has a pink or reddish color. (Some native species of water-milfoils may also have pink stems.)
- EWM does not produce turions (overwintering buds)
- Adventitious roots (roots growing along the stem) develop on EWM in late summer to early fall

NORTHERN WATER-MILFOIL CHARACTERISTICS:

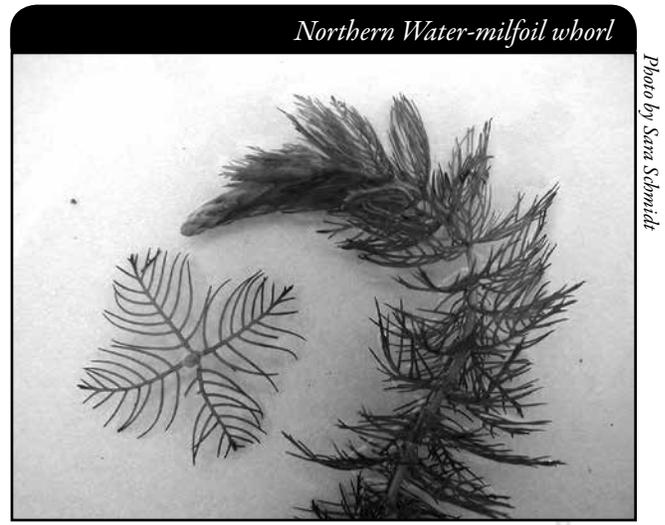
This is the native water-milfoil that is most often confused with EWM.

- Rigid feather-like leaves
- Leaves are arranged in whorls (circles), 4-6 leaves around the stem

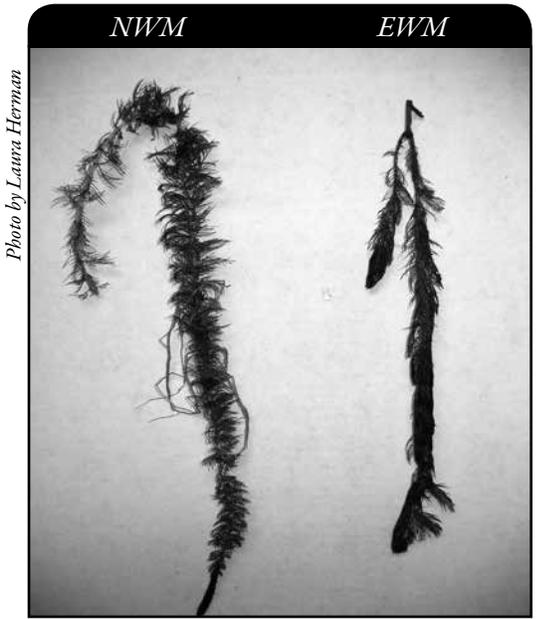
- Usually 7-10 leaflet pairs per leaf
- Lower leaflet pairs are longer than upper ones, creating a Christmas tree shape
- Leaves are usually stiff when pulled out of the water
- In the summer, the plants can reach 10-12 feet in height
- In the summer, the distance between the leaf whorls is quite short
- Stems are often whitish or whitish-green in color
- Most native water-milfoils produce turions (overwintering buds), EWM does not
- Adventitious roots (roots growing along the stem) develop on Northern water-milfoil in late summer to early fall



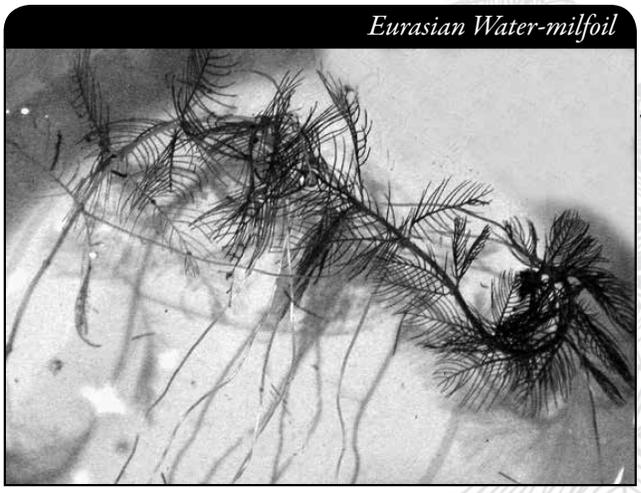
EWM whorl showing four leaves with leaflets. On each leaf, lower leaflet pairs are about the same length as upper leaflet pairs.



Northern water-milfoil whorl showing four leaves with leaflets. On each leaf, lower leaflet pairs are longer than upper leaflet pairs, creating a Christmas tree shape.



Northern water-milfoil on the left. EWM on the right. Northern water-milfoil leaves are stiff when pulled out of water. EWM leaves are limp when pulled out of water.



EWM often develops adventitious roots along its stem.

Shown below are turions on whorled water-milfoil and northern water-milfoil.
EWM **does not** form turions.

Eurasian
Water-milfoil

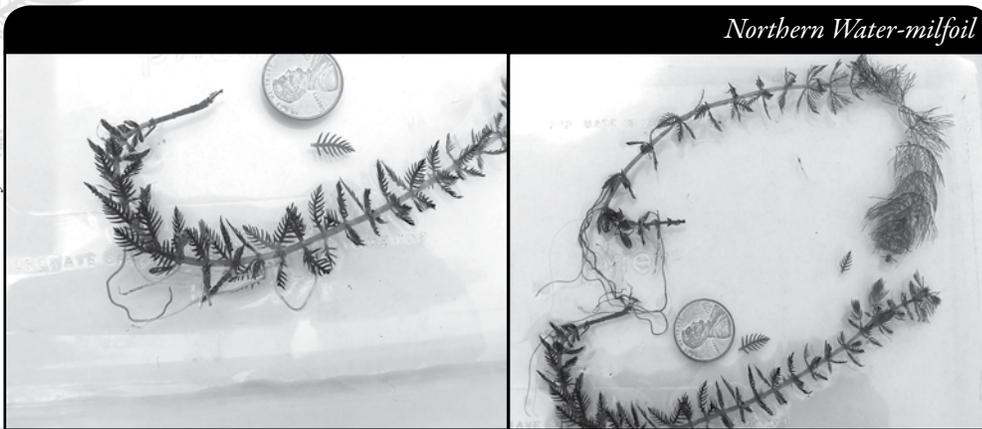
Photo by Susan Knight



Photo by Laura Herman

Several native species of water-milfoil form turions (winter buds).

Photos by Laura Herman



Northern water-milfoil turion leaves.

In the spring the winter turion will “expand” revealing the turion leaves. New summer leaves will start growing from the top of the turion. The summer leaves have a different look than the winter turion leaves. EWM does not produce turions.



EWM MONITORING

TYPES OF MONITORING

There are two types of monitoring for EWM - Prevention Monitoring and Established Population Monitoring.

PREVENTION MONITORING

If a lake is not known to have EWM, citizen lake monitors can play a very important role by regularly monitoring the lake for EWM and reporting if EWM is found or that nothing has been found. The “negative” information is important as it lets the lake managers know when EWM is not in a lake so they can better focus their work efforts. If EWM is found at an early stage, there may be hope of knocking it back. Several lakes that found EWM at an early stage have been able to keep it “in check” with minimal cost and efforts.

ESTABLISHED POPULATION MONITORING

If a lake is already known to have EWM, citizen lake monitors can help track its spread. If treatment options are being used to control EWM, citizen lake monitors can track the effectiveness of the management options by monitoring the spread or decline of EWM.

Even if your lake group is controlling EWM, you still want to monitor for EWM. You want to know if they have spread to any new locations, so that you can begin control of these new beds ASAP. The earlier you find a new invasive, the easier it will be to control.

WHEN TO MONITOR

PREVENTION MONITORING

Volunteers should try to monitor once a month from ice-off to mid-September, as EWM begins growing early and keeps growing late into the fall. The first half of the summer is especially important to keep up steady (monthly) monitoring because EWM biomass is at its greatest during this time of the season, and if EWM is found early enough, there may be adequate time to plan and implement a first response yet that season. If a previously undiscovered bed is found later in the season, it can be planned into management for the following season. Given the lag time from discovery to a first response, monthly monitoring is very prudent. In drought years you will want to start monitoring earlier because spring drought conditions can cause high EWM growth early in the growing season.

When checking the shorelines, it is especially important to check piles of plants and debris **after storms and high boat traffic times**, as this is when plant fragments will be the heaviest.

ESTABLISHED POPULATION MONITORING

If you or your lake group have found new beds of EWM, volunteers will probably want to monitor more carefully and more often than once a month. If treatment options are being used, it is very helpful to have volunteers monitor before and after treatment, especially around the treatment beds. In cases where treatment is occurring, more monitoring is better, especially if the plant may still be in an expanding stage within the lake. This allows the lake community to see if management options are working to meet their goals. The more involved lake residents are in monitoring, the more likely they will understand the process and support actions they see as reasonable and worthwhile.

Regular monitoring of a lake with EWM allows you to locate new beds so they can be treated (by hand-pulling, chemical treatments, or other means) while the beds are still small. Since chemical treatment is usually conducted in the spring, and since EWM starts growing in cool water, beds need to be located early. An aquatic plant management plan (often required as a part of a permit for chemical treatment) may prescribe a monitoring schedule. For example, you may be requested to follow the Pre- and Post-Treatment Evaluation of Aquatic Plant Community, DNR, 2008 (<http://dnr.wi.gov/org/water/fhp/lakes/PrePostEvaluation.pdf>).

WHERE DO I LOOK FOR EWM?

If EWM gets established, it probably has the capability to survive in all lakes in Wisconsin. It can tolerate a wide range of conditions. EWM can grow in water depths ranging from less than 1-foot to over 20-feet. In Wisconsin, EWM gets the most dense in water depths of 6-15 feet, but can reach nuisance levels in as little as 2 feet. EWM can grow in the clearest of lakes to some of the most turbid lakes, but it does best in moderate to fertile lakes. EWM can grow in rocky areas, sandy areas, and mucky areas, but does best in areas with silt. EWM even has the ability to survive in wetland areas, although it will not grow to be dense in these areas. Please remember, EWM will grow throughout the entire lake where water depths are less than 20 feet, so do not just rely on monitoring “prime habitat” areas.

PREVENTION MONITORING

When looking for floating plant fragments, think about your lake. Which way does the wind blow from and where does the wind blow the plants and floating debris? Go to areas where you have seen the piles of plants and debris, especially after storms and high boat traffic times, as this is when plant fragments will be the heaviest. Check **beach areas, inlets, boat launches, high use areas and the perimeter of the lake**. In mid-summer, EWM may start to break up into smaller pieces and these pieces often wash up along shorelines. These smaller fragments may establish new populations.

When looking for rooted plants, look for EWM in both sandy and mucky areas.

ESTABLISHED POPULATION MONITORING

If EWM has been verified in your lake, you will probably want to monitor the existing beds as well as checking the rest of the lake to locate any new beds (especially if the plant may still be in an expanding stage within the lake). In cases where treatment is occurring, you will probably want to monitor in and around the treatment beds, as well as new areas around the lake to locate new plants if they have spread.



Photo by Robert Korth

HOW TO MONITOR

PREVENTION MONITORING

Shorelines

Even before looking for beds of EWM, you will want to look for floating plant fragments. Look in shallow water areas and in piles of washed up plant fragments along the shoreline to see if you can find any EWM plant fragments. It is especially important to visit these areas after storms and high boat traffic times, as this is when plant fragments will be the heaviest. If you find any EWM fragments, you know the invasive is in your lake.

Shallow-water Areas

Boat or walk around the shoreline of your lake and look for EWM in the shallow water areas.

Deeper-water Areas

Once you have monitored a variety of near shore areas, go out in your boat and begin to collect plants in the deeper water areas. It will be easiest to see the plants if you are wearing polarized sunglasses and/or using an Aqua-View Scope. Make sure the weather will allow for successful and safe sampling. Clear, calm weather is the best for sampling. Sunny skies make it easier to see into the water.

Later in the season there tends to be more suspended algae in the water column and it may be more difficult to see the plants, thus you may need to adjust your monitoring depth.

Use a long-handled rake to collect plants that are hard to reach or difficult to identify. In deeper areas, you can lower the rake to the bottom of the lake and drag the rake along. Pull the rope so that the rake pulls across several feet of the lake bed. This makes for relatively easy monitoring of deep water areas. This method will also help you pull up roots and collect plants that are not readily visible from the lake's surface. Be sure to monitor over sand as well as muck areas.

If you find beds of EWM, you may want to determine how dense the beds are. This information will be very useful when determining the proper control method for your invasive.



Please do not throw plants that you collect back into the lake. Instead, dispose of them on shore or take them for mulch or compost for your garden. If you toss back plants, you may inadvertently spread plants to different locations on the lake. Since it's sometimes difficult to know which plants are native and which are non-native, it is best not to throw any plants back into the lake.



ESTABLISHED POPULATION MONITORING

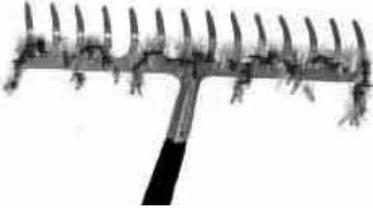
In cases where treatment is occurring, more monitoring is better, especially if the plant may still be in an expanding stage within the lake. This allows the lake community to see if management options are working to meet their goals. The more involved lake residents are in monitoring, the more likely they will understand the process and support actions they see as reasonable and worthwhile.

Look for EWM plants in and around existing beds using polarized sunglasses and/or an Aqua-View Scope. Make sure the weather will allow for successful and safe sampling. Clear, calm weather is the best for sampling. Sunny skies make it easier to see into the water.

Use a rake to pull up and record the plant density of EWM beds. In deeper areas, you can lower the rake to the bottom of the lake and drag the rake along. Pull the rope so that the rake pulls across several feet of the lake bed. This makes for relatively easy monitoring of deep water areas. This method will also help you pull up roots and collect plants that are not readily visible from the lake's surface.

On the Plant Bed Density Report Form (3200-132) (found at the end of this section and at <http://dnr.wi.gov/lakes/monitoring/forms.aspx>) use the following numbers to denote the plant density for each invasive aquatic plant bed found:

Rake fullness ratings are given from 1-3. Conditions of the ratings are described below:

RATING	COVERAGE	DESCRIPTION
1		A few plants on rake head
2		Rake head is about ½ full Can easily see top of rake head
3		Overflowing Cannot see top of rake head



Please do not throw plants that you collect back into the water. Instead, dispose of them in the trash or take them for mulch or compost for your garden.

OTHER INFORMATION YOU MAY WANT TO COLLECT

Sample Location

Record the sample GPS position.

Depth

Measure depth at each sampling site regardless of whether vegetation is present. A variety of options exist for taking depth measurements, including SONAR guns, depth finders that attach to the boat, or an anchor attached to a line with depth increments.

Dominant Sediment Type

Record sediment type (based on how the rake feels when in contact with the bottom) at each site where plants are sampled as: (a) mucky, (b) sandy, or (c) rocky.

If you are checking the rest of the lake to locate potential new beds of EWM, follow the instructions in the Prevention Monitoring section above.

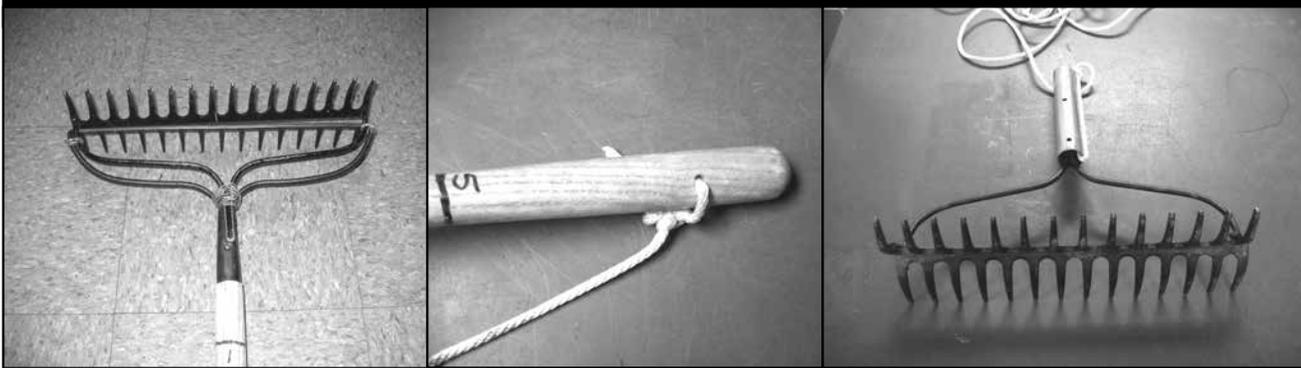
EQUIPMENT NEEDED

- Boat (canoe, kayak, fishing boat, paddle boat, etc.)
- Personal Floatation Device (PFD)
- Long handled rake with attached rope (see description and pictures on the next page)
- Lake map for marking suspect EWM beds and keeping track of where you have been.
- Pencil for marking on map
- Clip board or other hard surface for writing
- Ziploc bags
- Waterproof sharpie pen (to write on Ziploc bags)
- Cooler to keep plants in
- GPS unit (optional)
- Polarized sunglasses (optional)
- Aqua-View Scope (optional). To build your own Aqua-View Scope, see construction directions at the end of this section (page 43-44).
- A copy of appropriate report form(s) (found at the end of this section and at <http://dnr.wi.gov/lakes/monitoring/forms.aspx>) depending on the type of monitoring you are doing:
 - ▶ Aquatic Invasives Surveillance Monitoring Report, Form 3200-133
 - ▶ Aquatic Invasive Plant Incident Report Form, 3200-125
 - ▶ Plant Bed Density Reporting Form, 3200-132



PLANT RAKES

Since it is sometimes difficult to identify plants under water, volunteers use rakes to sample plants. When the rake is thrown into the water, it settles to the bottom of the lake. When the rake is hauled back into the boat, aquatic plants come with it making for easier identification. A thatching rake can be used, or you can make a “2-headed” garden rake by purchasing 2 garden rakes (try looking at garage sales). Disconnect the head from one rake and wire or weld the rake heads together (teeth facing out). To monitor in deeper water, drill a hole in the end of the handle and tie a rope to it. With the two heads, no matter which way the rake falls to the lake bed, the teeth will catch the roots of the plants making plant collection a lot easier. If you need to make the rake heavier, you can use cable ties to attach duck decoy weights, a small brick or other weights. Some volunteers do not like to deal with a rake handle in deeper water, so they cut off the rake handle and attach the rope directly to the rake heads. If you use this type of rake, it is essential that you weigh the rake by using the decoy weights, a small brick, hand weights, etc. No matter which rake is used, please be sure to tie the loose end of the rope to the boat. This way you will not lose your sampling rake.



A rope is tied to the handle of this “2-headed” garden rake, so it can be used in deep water.

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 for vouchering. By having the team leader take in suspect plants, you will not have the confusion of every team member taking in plants and you will be able to keep a list of what plants have been taken in and identified. Some groups have asked bait dealers or other businesses to “hold” suspect plants bought in by residents. Then the team leader can collect the plants from the bait dealers and take them in for identification when necessary. By the end of the summer, your team leader should be quite familiar with the native plants in your lake. If you are mapping native plants as part of your CLMN monitoring, you will probably not have to submit all your plants to be vouchered. Be creative and most importantly, do not burn out your team leaders!

Consider having a mini-plant training session for your team. The Citizen Lake Monitoring Network Coordinator or the Aquatic Plant Management Coordinator (refer to front of manual and <http://dnr.wi.gov/lakes/contacts>) in your area may be able to assist you with a training session. If not, 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 and 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 plant communities, 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 fish. 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 Surface Water Viewer: <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 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 are monitoring existing beds of EWM and you have a GPS unit, you may want to mark in the edges of the beds, and then load this data into a mapping program and print out maps of the beds. You may also want to mark other locations 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 information that is reported through the Citizen Lake Monitoring Network 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 and 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 a confirmation email, 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* drop down box.

- For prevention monitoring, report your results using the: Aquatic Invasives Surveillance Monitoring Report, Form 3200-133.
- If you find EWM for the first time on your lake, report your results using the: Aquatic Invasive Plant Incident Report, Form 3200-125.
- For established population monitoring, report your results using the Plant Bed Density Report, Form 3200-132. At this time, there is no computer data entry option for this form. Online data forms will be created as time allows. The data collected with this form will be very useful in tracking the spread of EWM throughout the lake if EWM does spread and is necessary in tracking success of your management option. Keep hard copies for your reference and/or submit them to your local DNR Aquatic Plant Management Coordinator.

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 more often. If you have any questions about reporting, contact your local DNR CLMN contact (page viii).



Remember, for prevention monitoring, a report of ‘no EWM’ at a location is just as important as finding EWM. One cannot confidently state that EWM is not present in an area if no one has looked.

WHAT TO DO WITH SUSPECT PLANTS

Note the “suspect” plant’s location on your map, making sure you can find the spot(s) again. Fill out the Aquatic Invasive Plant Incident Report (Form 3200-125) (found at the end of this section, and at <http://dnr.wi.gov/lakes/monitoring/forms.aspx/>), and deliver it with the suspect plant to your team leader or local DNR CLMN contact. Suspect plants need to go to a herbarium for vouchering. DNR staff can transport plants to the herbarium for the lake group.

To collect a specimen of the plant:

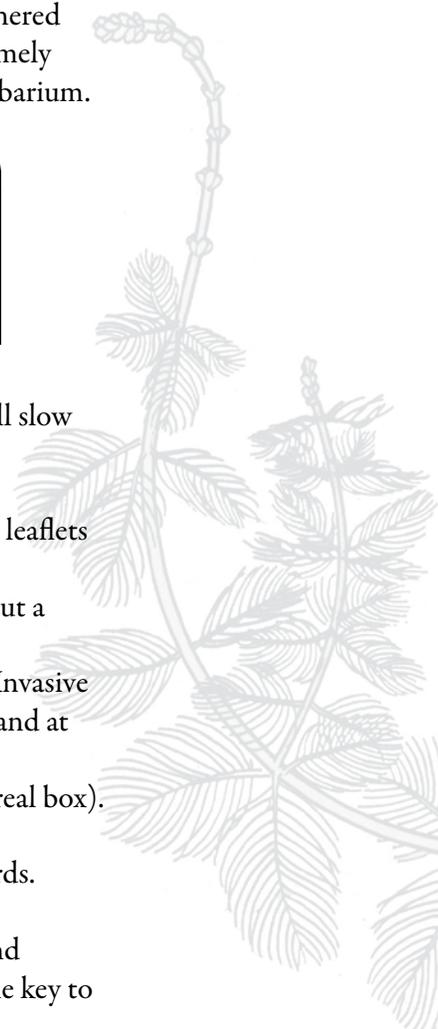
- Gently pull the plant from the lake bottom. Be sure to collect as much of the plant as possible, paying special attention to getting the leafy and flowering portion, if present. Try not to break up or rip the plant as the pieces of the plant can float away and start new plants.
- Use a permanent marker and record the following information on a plastic bag:
 - a. Date
 - b. Water body
 - c. Description of where the sample was found.
- Put the sample in the plastic bag and keep it in a cool place (a cooler in your car or refrigerator at home). Take the specimen to your team leader, your local CLMN contact, your local Land and Water Conservation Department, UW-Extension office or the local DNR contact for identification. If you found EWM in a lake where it has not been verified before, it is important to get the plants verified and vouchered (usually by an herbarium botanist) ASAP, so that control can take place in a timely manner. Your local CLMN contact will get the plant to the DNR or local herbarium.



If your lake has been verified to have EWM, samples do not need to go to the DNR for vouchering – you can just take the plants to your team leader.

- If you cannot bring the plant in to your team leader or other contact:
 - ▶ Rinse the plant under running tap water or in a large pan of water. This will slow the rotting process.
 - ▶ Blot the plant dry with a paper towel.
 - ▶ Spread the plant out on a dry paper towel or newspaper. Try to spread the leaflets apart to help with identification.
 - ▶ Cover with a dry paper towel and press in a catalog or phone book for about a week.
 - ▶ Complete a label (see example at the end of this section) and the Aquatic Invasive Plant Incident Report (Form 3200-125) (found at the end of this section and at http://dnr.wi.gov/lakes/monitoring/forms.aspx).
 - ▶ When the plant is dry, place it between sheets of thin cardboard (like a cereal box). Mail the plant, map and the reporting form to your local CLMN contact.
 - ▶ Remember to make a copy of your map and reporting forms for your records.

Remember if you find “something,” don’t give up; there are a variety of control and management options to address invasive species on your lake. Early detection is the key to controlling the situation!





PREVENTION STARTS WITH US

Whether you are out monitoring, or just boating for fun, 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 Eurasian water-milfoil.



Photo by Tiffany Lyden

*Eurasian
Water-milfoil*



ADDITIONAL MATERIALS AND SUPPORTING DOCUMENTATION

PLANT IDENTIFICATION SOURCES

REFERENCES

REPORTING FORMS

AQUATIC INVASIVES SURVEILLANCE MONITORING REPORT

- **SINGLE LOCATION, MULTIPLE DATES**

- **MULTIPLE LOCATIONS, ONE DATE**

AQUATIC INVASIVE PLANT INCIDENT REPORT

PLANT BED DENSITY REPORT

PLANT LABELS

AQUA-VIEW SCOPE CONSTRUCTION DIRECTIONS



PLANT IDENTIFICATION SOURCES

Through the Looking Glass. 1997. Susan Borman, Robert Korth, Jo Temte. Wisconsin Lakes Partnership. DNR publication # FH-207-97.

Common Aquatic Plants of Wisconsin list prepared by Stan Nichols, Wisconsin Geological and Natural History Survey, Madison, WI. (This is not a true key, but it is easy for all to use.)

Aquatic and Wetland Plants of Northeastern North America. Garrett E. Crow and C. Barre Hellquist. University of Wisconsin Press.

A Manual of Aquatic Plants. 1957. Norman C. Fassett. University of Wisconsin Press.

Aquatic Plants of Illinois. 1966. Glen S. Winterringer and Alvin C. Lopinot. Department of Registration and Education, Illinois State Museum Division and the Department of Conservation, Division of Fisheries.

Michigan Flora. 1985. Edward G. Voss. University of Michigan Press.

REFERENCES

Smith, C.S. and J.W. Barko. 1990. *Ecology of Eurasian watermilfoil*. J. Aquat. Plant Manage. 28:55-64.

Bode, J. et al. 1992. *Eurasian Water Milfoil in Wisconsin: A Report to the Legislature*.

DNR. 2008. *Pre and Post Treatment Evaluation of Aquatic Plant Community*.

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)

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...	Did you...
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
Curly-Leaf Pondweed?	Yes	No	Did not look for	Purple Loosestrife?	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
Freshwater Jellyfish?	Yes	No	Did not look for	Zebra Mussels?	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>

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 plant 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 Plant Found (Fill out one form for each species found.)

Which aquatic invasive plant did you find?: Curly-leaf Pondweed Eurasian Water-milfoil Purple Loosestrife
 Brittle Naiad Hydrilla Brazilian Waterweed Yellow Floating Heart

Where did you find the invasive plant?

Latitude:	Longitude:
-----------	------------

Approximately how large an area do the plants occupy?

A Few Plants One or a few beds Many beds A Whole Bay or Portion of Lake
 Widespread, covering most shallow areas of lake Don't know (e.g. didn't check the whole lake)

Was the plant floating or rooted?

Floating Rooted

Estimated percent cover in the area where the invasive was found (optional)

Substrate cobble, %	Substrate muck, %	Substrate boulders, %	Substrate sand, %	Bottom covered with plants, %
---------------------	-------------------	-----------------------	-------------------	-------------------------------

Voucher Sample

Did you collect a sample of the plant (a voucher specimen) and bring it to your local DNR office? If so, which office?

Rhinelander Spooner Green Bay Oshkosh Did not take plant sample to a DNR office
 Fitchburg Waukesha Eau Claire Superior Other Office _____

Please collect up to 5-10 intact specimens. Try to get the root system, all leaves as well as seed heads and flowers when present. Place in ziplock bag with no water. Place on ice and transport to refrigerator. Bring samples, a copy of this form, along with a map showing where you found the suspect plants to your regional AIS or Citizen Lake Monitoring Coordinator at the DNR.

For DNR AIS Coordinator to fill out

AIS Coordinator(s) 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?
--	--	---------------------

Herbarium where specimen is housed: _____	Herbarium 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.

PLANT LABELS



Project Name: Citizen Lake Monitoring Network

(Scientific Name & authority)

Common Name:
Lake Name:
Water Body ID code#:
County:
Collected by:
Date:
Depth:
Location and Habitat:



Project Name: Citizen Lake Monitoring Network

(Scientific Name & authority)

Common Name:
Lake Name:
Water Body ID code#:
County:
Collected by:
Date:
Depth:
Location and Habitat:



Project Name: Citizen Lake Monitoring Network

(Scientific Name & authority)

Common Name:
Lake Name:
Water Body ID code#:
County:
Collected by:
Date:
Depth:
Location and Habitat:



*Eurasian
Water-milfoil*



AQUA-VIEW SCOPE CONSTRUCTION DIRECTIONS

- 1 - 3 foot section of 4" diameter plastic pipe. We use ABS pipe because it is black and because it is lighter than PVC pipe. If you are unable to find ABS pipe, PVC pipe will work just fine. Your hardware store may have a short piece of pipe they will sell you. We bought a 10-foot piece of pipe and cut it.
- 1 or 2 - 5 ½" pull handles (we used one, it was easier to hold and guide)
- Screws if not supplied with handle
- 1 - 4" ABS coupler
- 1 - 4 3/8" diameter lexan disk – Lexan is non-breakable plexiglass that we had cut at our local glass repair shop. You can use plexiglass for the disk but it is difficult to cut the plexiglass in a circle.
- Clear silicone rubber sealant
- Drill and screw driver
- Weatherstripping for around the top of the aqua-view scope. Marine and automotive weatherstrip tape works well.

HOW TO MAKE AN AQUA-VIEW SCOPE (picture on next page)

Cut a 3 foot section of 4" diameter ABS or PVC pipe. The cut must be straight and square to the pipe. If you can't find pipe with a black interior, you can paint the inside a flat black. If the pipe is shiny on the inside, rough it up using sandpaper or steel wool so that there won't be any glare inside the tube. **If you are going to rough it up on the inside, make sure to do that before you attach the screws so you don't scratch your hand!**

Attach one or two handles on either side of the pipe about four inches from one end. ABS pipe is fairly soft, you can use a screw driver to put the screws in or you can drill pilot holes and put the screws in. If you are using a drill, make sure to make the hole smaller than the screw so the screw will hold. If using PVC pipe, you will need to drill the holes.

Run a bead of clear silicone rubber sealant on the bottom of the squared off end of pipe. Place the lexan disk on the bead of sealant.

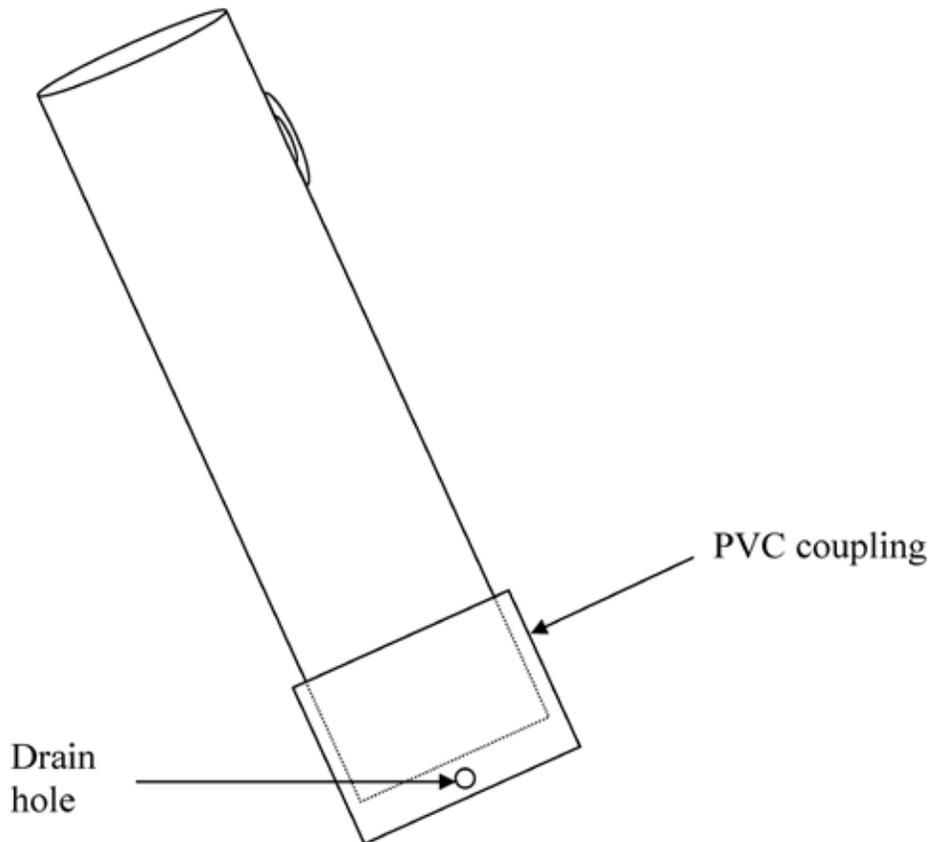
Smear a small amount of silicon sealant on the outside of the pipe one half inch from the end of the pipe with the lexan. Slide the coupling over the end and give it a slight twist to distribute the sealant evenly. Slide the coupling on as far as it will go. The collar will extend out beyond the lexan disk protecting it from scratching.

Drill two small (1/4") holes in the side of the collar close to the lexan so that air won't be trapped in the open end of the coupler when you put the view scope into the water. The holes should be drilled on opposite sides of the pipe.

Weatherstripping is placed around the top of the open end of the scope (the side you look into). Weatherstripping has a sticky side that sticks to the plastic and the foam makes it a little more comfortable for your face to rest against.

Aqua-view scope instructions adapted from those designed by Jeff Schloss, coordinator of New Hampshire Lakes Lay Monitoring Program (603) 862-3848.

AQUA-VIEW SCOPE DRAWING



Eurasian
Water-milfoil

CURLY-LEAF PONDWEED

3

MONITORING PROTOCOL



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BACKGROUND/OVERVIEW

Curly-leaf pondweed is a non-native submerged aquatic plant. Its unique ability to thrive in cool water allows it to out-compete other aquatic plants. Curly-leaf pondweed can grow under the ice while most plants are dormant, but then dies back in mid-July when other plants are just reaching peak growth. This mid-summer die-off can cause dense mats of dying vegetation on the lake surface. When the plants die, nutrients such as phosphorus are released into the water, fueling algal blooms.

Curly-leaf pondweed is one of 80 pondweed species found throughout the world. It is native to the fresh waters of Eurasia, Africa and Australia. This aquatic plant was accidentally introduced into the United States when the common carp was brought in during the mid 1800's. It is thought to have made its way to Wisconsin in 1905 along with fish imported from Europe. DNR staff have just recently begun tracking lakes with curly-leaf pondweed, so there is not yet a complete listing of waterbodies in Wisconsin with curly-leaf pondweed. The information currently available on waterbodies known to have curly-leaf pondweed can be found at <http://dnr.wi.gov/lakes/invasives/>. **We need your help to determine which additional lakes have curly-leaf pondweed.**

Volunteers play an integral part in learning to recognize the plant and checking local lakes for the presence of curly-leaf pondweed. Early identification of the plant makes control much easier, and can help prevent the spread into other waterbodies. If you detect the invasives early enough, you may be able to prevent them from spreading throughout your lake system. It is cheaper to control small patches of invasives than to control invasives that have taken over an entire lake system. Once invasives are established in a lake, they are nearly impossible to eradicate.



LIFE CYCLE

Curly-leaf pondweed has a unique life cycle. Unlike most of our native aquatic plants that come out of dormancy in spring and reach their maximum growth in late summer or early fall, curly-leaf pondweed normally begins growing in the fall. Depending upon snow cover and winter severity, curly-leaf pondweed may be dormant or actively growing under the ice. Curly-leaf pondweed has a large growth spurt from ice out to early spring.

Its natural inclination for low water temperatures helps it avoid competition with other plant species. Its fast, early spring growth allows the stems to reach the water's surface before any other plant. By late spring, a dense canopy of curly-leaf can form, blocking sun light from reaching other plants.

Curly-leaf pondweed plants usually complete their life cycle in June or July. When they die back, they can form dense mats of dying vegetation on the surface. If you notice that plants on your lake are dying back in June or early July, you will want to check to see if it is curly-leaf pondweed.



Turions and seeds are formed on the plants before they die. A turion is a dormant shoot segment (vegetative bud) that can form most anywhere on the plant. It is a hard structure that looks a little bit like a burr or pinecone. Although the plants also produce seeds, the turions are probably the most reliable form of reproduction. The turion falls to the bottom of the lake as the plant dies and begins to decay. Most of the turions begin to sprout in fall, responding either to the shortening day length or to water temperature. However, some turions will actually sprout in the spring and some will lie dormant in the sediment until environmental conditions are favorable to sprouting (turions can remain dormant for years).

For the plants that sprout in the fall, the initial growth form is a winter foliage that stays green (sometimes dormant or sometimes actively growing) even under the ice. The curly-leaf pondweed foliage in winter to early spring are quite narrow and lack the wavy edges. A few days after ice off, curly-leaf pondweed begins to grow more rapidly and attain its spring foliage (lasagna noodle wavy edges with the crispy appearance). Those turions that sprout in the spring also have the narrow “non-wavy” leaves when the plant first sprouts, then the wavy leaves develop as the plant grows.

Curly-leaf pondweed is tolerant of disturbance and can grow in most water conditions. One way to protect your lake from curly-leaf pondweed and other invasives is to protect and maintain native aquatic plant beds.

The turions are sometimes carried in muck attached to an anchor or dropped in the bottom of your boat. These turions can sprout and grow new curly-leaf pondweed colonies. 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 curly-leaf pondweed and other invasives.



IDENTIFICATION

In your packet you will find a laminated example of curly-leaf pondweed (*Potamogeton crispus*, pronounced POT-a-mo-JEE-ton CRISP-us).

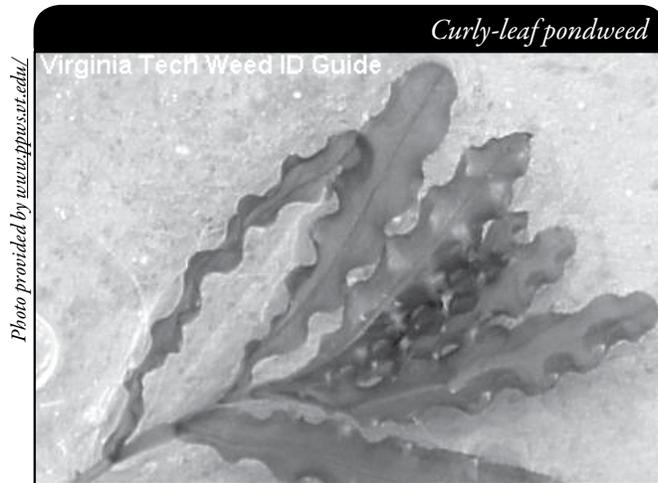
Refer to the pictures on the next page, as well as reference materials in your packet, to see the following characteristics:

CURLY-LEAF PONDWEED CHARACTERISTICS:

- Alternate leaves that are minutely toothed (you may need a magnifying glass to see the teeth).
- Leaf edges are wavy and have a crispy appearance – hence the name. The leaves are often described as mini “lasagna noodle” looking leaves.
- Most leaves have a prominent red-tinged mid-vein.
- The stem is slightly flattened.
- No floating leaves. (Some native pondweeds produce specialized floating leaves that are thicker than submerged leaves and often have a waxy feel.)

- A short flower stalk may rise above the water's surface in spring, though the rest of the plant is submersed.
- Turions are produced and drop to the lake bottom when the plants decay in late summer. Turions are vegetative reproductive buds that are very rigid and resemble small pinecones.
- In winter and very early spring, the leaves on the plant are quite narrow and lack the wavy edges.

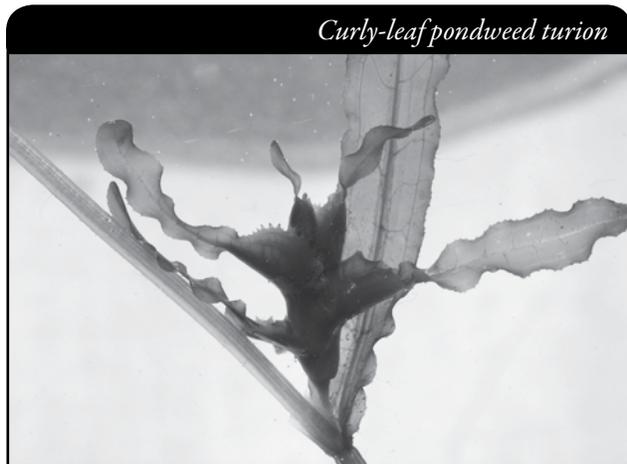
Curly-leaf pondweed can be confused with Clasping-leaf pondweed (*Potamogeton richardsonii*). Clasping-leaf pondweed does not have toothed leaf edges nor does it produce turions.



Curly-leaf pondweed leaves are often light green and fairly transparent.



Note the "lasagna-like" wavy leaves of curly-leaf pondweed.



Curly-leaf pondweed turion with leaves still attached. The leaves will eventually rot and fall off of the turion.



Potamogeton richardsonii (Clasping-leaf pondweed)



CURLY-LEAF PONDWEED MONITORING

TYPES OF MONITORING

There are two types of monitoring for curly-leaf pondweed - Prevention Monitoring and Established Population Monitoring.

PREVENTION MONITORING

If a lake is not known to have curly-leaf pondweed, citizen lake monitors can play a very important role by regularly monitoring the lake for curly-leaf pondweed and reporting if curly-leaf pondweed is found or that nothing has been found. The “negative” information is important as it lets the lake managers know when curly-leaf pondweed is not in a lake so they can better focus their work efforts. If curly-leaf pondweed is found at an early stage, there may be hope of knocking it back. With the turions remaining viable for several years, multiple years of control are necessary – but with each control year, the treatment area and density should decrease. Several lakes that found curly-leaf pondweed at an early stage have been able to keep it “in check” with minimal cost and efforts.

ESTABLISHED POPULATION MONITORING

If a lake is already known to have curly-leaf pondweed, citizen lake monitors can help track its spread. If treatment options are being used to control curly-leaf pondweed, citizen lake monitors can track the effectiveness of the management options by monitoring the spread or decline of curly-leaf pondweed. With the turions remaining viable for several years, multiple years of control are necessary – but with each control year, the treatment area and density should decrease.

Even if your lake group is controlling curly-leaf pondweed, you still want to monitor for curly-leaf pondweed. You want to know if they have spread to any new locations, so that you can begin control of these new beds ASAP. The earlier you find a new invasive, the easier it will be to control.

WHEN TO MONITOR

PREVENTION MONITORING

Volunteers should try to monitor twice a month in May and June when curly-leaf pondweed is at its peak density. With this early season monitoring, it might be easier to see and identify. If you notice plants that suddenly disappear in late June or early July, it may be curly-leaf pondweed. Since curly-leaf pondweed is normally only dense for a few months, most groups monitor every 2-3 weeks. Some groups also check for curly-leaf pondweed in the late fall, as the new plants will be growing at this time and the native pondweeds are dying back. If curly-leaf pondweed plants are found in fall, a response could be planned into management for the following spring, if needed. This will increase the chances for control of curly-leaf pondweed. When checking the shorelines, it is especially important to check piles of plants and debris **after storms and high boat traffic times**, as this is when plant fragments will be the heaviest.

ESTABLISHED POPULATION MONITORING

If you or your lake group have found new beds of curly-leaf pondweed, volunteers will probably want to monitor more carefully and more often. If treatment options are being used, it is very helpful to have volunteers monitor before and after treatment, especially around the treatment beds. In cases where treatment is occurring, more monitoring is better, especially if the plant may still be in an expanding stage within the lake. This allows the lake community to see if management options are working to meet their goals. The more involved lake residents are in monitoring, the more likely they will understand the process and support actions they see as reasonable and worthwhile.

Since curly-leaf pondweed comes from the over-summering turions, additional monitoring should take place in late fall or early the next season. Regular monitoring of a lake with curly-leaf pondweed allows you to locate new beds so they can be treated (by hand-pulling, chemical treatments, or other means) while the beds are still small. If curly-leaf pondweed plants are found in fall, beds can be treated as early in the spring as possible. This will increase the chances for control. An aquatic plant management plan (often required as a part of a permit for chemical treatment) may prescribe a monitoring schedule. For example, you may be required to follow the Pre- and Post-Treatment Evaluation of Aquatic Plant Community, DNR, 2008 (<http://dnr.wi.gov/org/water/fhp/lakes/PrePostEvaluation.pdf>).

WHERE DO I LOOK FOR CURLY-LEAF PONDWEED?

Curly-leaf pondweed can survive in a wide range of lake conditions. It grows in water depths of less than 1-foot to water depths of about 15-feet. In Wisconsin, curly-leaf pondweed becomes the most dense in water depths of 3-10 feet, but can reach nuisance levels in as little as 1-foot to as deep as 15-feet. Curly-leaf pondweed does best in moderate to fertile lakes and does well in turbid water conditions. Curly-leaf pondweed is often associated with degraded water quality. Curly-leaf pondweed can live in sandy soils, but prefers soft substrates. Please remember, curly-leaf pondweed will grow throughout the entire lake where water depths are less than 15 feet, so do not just rely on monitoring “prime habitat” areas.

PREVENTION MONITORING

Even before looking for beds of curly-leaf pondweed, you will want to look for floating plants. Think about your lake. What is the direction of the prevailing winds and where are plants and floating debris likely to be? Go to the areas where you have seen the piles of plants and debris. Look in these piles to see if you can find any curly-leaf pondweed plant fragments. It is especially important to visit these areas **after storms and high boat traffic times**, as this is when the plant fragments will be the heaviest. Check **beach areas, inlets, boat launches, high use areas and the perimeter of the lake**.

When looking for rooted plants, look for curly-leaf pondweed in both sandy and mucky areas. Curly-leaf pondweed will grow in a variety of sediment conditions, but will do the best in areas with a mucky bottom.

ESTABLISHED POPULATION MONITORING

If curly-leaf pondweed has been verified in your lake, you will probably want to monitor the existing beds as well as checking the rest of the lake to locate any new beds (especially if the plant may still be in an expanding stage within the lake). In cases where treatment is occurring, you will probably want to monitor in and around the treatment beds, as well as new areas around the lake to locate new plants if they have spread.

HOW TO MONITOR

PREVENTION MONITORING

Shorelines

When looking for floating plant fragments, look in shallow water areas and in piles of washed up plant fragments along the shoreline to see if you can find any curly-leaf pondweed plant fragments. It is especially important to visit these areas after storms and high boat traffic times, as this is when plant fragments will be the heaviest. If you find any curly-leaf pondweed fragments, you know the invasive is in your lake.

Shallow-water Areas

Boat or walk around the shoreline of your lake and look for curly-leaf pondweed in the shallow water areas.

Deeper-water Areas

Once you have monitored a variety of near shore areas, go out in your boat and begin to collect plants in the deeper water areas. It will be easiest to see the plants if you are wearing polarized sunglasses and/or using an Aqua-View Scope. Make sure the weather will allow for successful and safe sampling. Clear, calm weather is the best for sampling. Sunny skies make it easier to see into the water.

Use a long-handled rake to collect plants that are hard to reach or difficult to identify. In deeper areas, you can lower the rake to the bottom of the lake and drag the rake along. Pull the rope so that the rake pulls across several feet of the lake bed. This makes for relatively easy monitoring of deep water areas. This method will also help you pull up roots and collect plants that are not readily visible from the lake's surface. Be sure to monitor over sand as well as muck areas.

If you find beds of curly-leaf pondweed, you may want to determine how dense the beds are. This information will be very useful when determining the proper control method for your invasive.



Please do not throw plants that you collect back into the lake. Instead, dispose of them on shore or take them for mulch or compost for your garden. If you toss back plants, you may inadvertently spread plants to different locations on the lake. Since it's sometimes difficult to know which plants are native and which are non-native, it is best not to throw any plants back into the lake.

ESTABLISHED POPULATION MONITORING

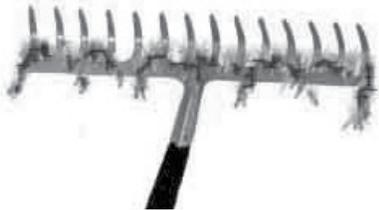
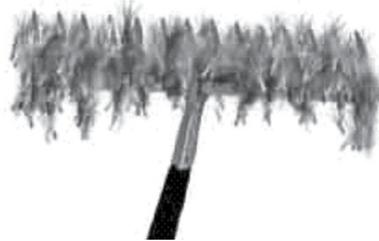
In cases where treatment is occurring, more monitoring is better, especially if the plant may still be in an expanding stage within the lake. This allows the lake community to see if management options are working to meet their goals. The more involved lake residents are in monitoring, the more likely they will understand the process and support actions they see as reasonable and worthwhile.

Look for curly-leaf pondweed plants in and around existing beds using polarized sunglasses and/or an Aqua-View Scope. Make sure the weather will allow for successful and safe sampling. Clear, calm weather is the best for sampling. Sunny skies make it easier to see into the water.

Use a rake to pull up and record the plant density of curly-leaf pondweed beds. In deeper areas, you can lower the rake to the bottom of the lake and drag the rake along. Pull the rope so that the rake pulls across several feet of the lake bed. This makes for relatively easy monitoring of deep water areas. This method will also help you pull up roots and collect plants that are not readily visible from the lake's surface.

On the Plant Bed Density Report, Form 3200-132, found at the end of this section and <http://dnr.wi.gov/lakes/monitoring/forms.aspx>, use the following numbers to denote the plant density for each invasive aquatic plant bed found.

Rake fullness ratings are given from 1-3. Conditions of the ratings are described below.

RATING	COVERAGE	DESCRIPTION
1		A few plants on rake head
2		Rake head is about 1/2 full Can easily see top of rake head
3		Overflowing Cannot see top of rake head



Please do not throw plants that you collect back into the water. Instead, dispose of them in the trash or take them for mulch or compost for your garden.

OTHER INFORMATION YOU MAY WANT TO COLLECT

Sample Location

Record the sample GPS position.

Depth

Measure depth at each sampling site regardless of whether vegetation is present. A variety of options exist for taking depth measurements, including SONAR guns, depth finders that attach to the boat, or an anchor attached to a line with depth increments.

Dominant Sediment Type

Record sediment type (based on how the rake feels when in contact with the bottom) at each site where plants are sampled as: (a) mucky, (b) sandy, or (c) rocky.

If you are checking the rest of the lake to locate potential new beds of curly-leaf pondweed, follow the instructions in the Prevention Monitoring section above.

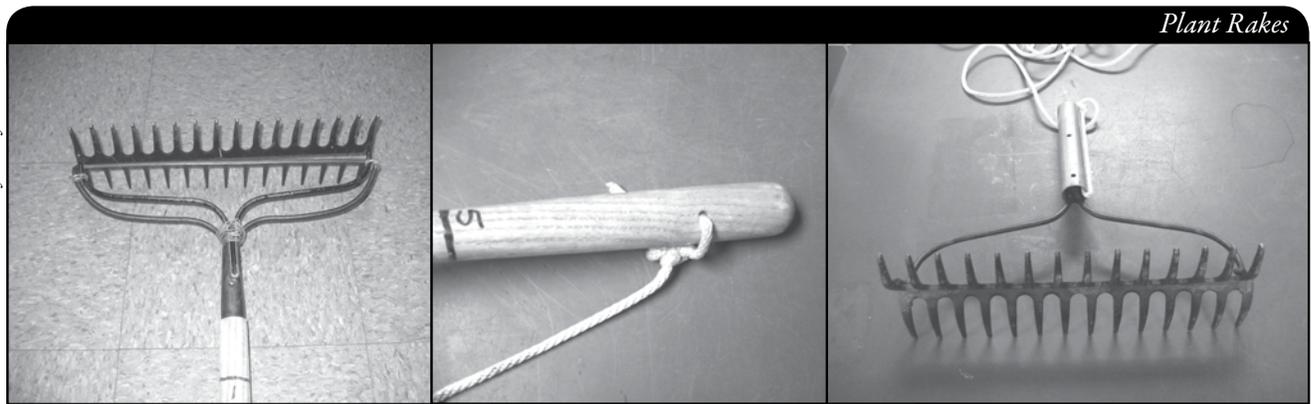
EQUIPMENT NEEDED

- Boat (canoe, kayak, fishing boat, paddle boat, etc.)
- Personal Floatation Device (PFD)
- Long handled rake with attached rope (see description and pictures on the next page)
- Lake map for marking suspect curly-leaf pondweed beds and keeping track of where you have been.
- Pencil for marking on map
- Clip board or other hard surface for writing
- Ziploc bags
- Waterproof sharpie pen (to write on Ziploc bags)
- Cooler to keep plants in
- GPS unit (optional)
- Polarized sunglasses (optional)
- Aqua-View Scope (optional). To build your own Aqua-View Scope, see construction directions at the end of this section (page 43-44).
- A copy of appropriate report form(s) (found at the end of this section and at <http://dnr.wi.gov/lakes/monitoring/forms.aspx>) depending on the type of monitoring you are doing:
 - ▶ Aquatic Invasives Surveillance Monitoring Report, Form 3200-133
 - ▶ Aquatic Invasive Plant Incident Report Form, 3200-125
 - ▶ Plant Bed Density Reporting Form, 3200-132

PLANT RAKES

Since it is sometimes difficult to identify plants under water, volunteers use rakes to sample plants. When the rake is thrown into the water, it settles to the bottom of the lake. When the rake is hauled back into the boat, aquatic plants come with it making for easier identification. A thatching rake can be used, or you can make a “2-headed” garden rake by purchasing 2 garden rakes (try looking at garage sales). Disconnect the head from one rake and wire or weld the rake heads together (teeth facing out). To monitor in deeper water, drill a hole in the end of the handle and tie a rope to it. With the two heads, no matter which way the rake falls to the lake bed, the teeth will catch the roots of the plants making plant collection a lot easier. If you need to make the rake heavier, you can use cable ties to attach duck decoy weights, a small brick or other weights. Some volunteers do not like to deal with a rake handle in deeper water, so they cut off the rake handle and attach the rope directly to the rake heads. If you use this type of rake, it is essential that you weigh the rake by using the decoy weights, a small brick, hand weights, etc. No matter which rake is used, please be sure to tie the loose end of the rope to the boat. This way you will not lose your sampling rake.

Plant Rakes



A rope is tied to the handle of this “2-headed” garden rake, so it can be used in deep water.

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 for vouchering. By having the team leader take in suspect plants, you will not have the confusion of every team member taking in plants and you will be able to keep a list of what plants have been taken in and identified. Some groups have asked bait dealers or other businesses to “hold” suspect plants bought in by residents. Then the team leader can collect the plants from the bait dealers and take them in for identification when necessary. By the end of the summer, your team leader should be quite familiar with the native plants in your lake. If you are mapping native plants as part of your CLMN monitoring, you will probably not have to submit all your plants to be vouchered. Be creative and most importantly, do not burn out your team leaders!



Consider having a mini-plant training session for your team. The Citizen Lake Monitoring Network Coordinator or the Aquatic Plant Management Coordinator (refer front of manual and <http://dnr.wi.gov/lakes/contacts> for your area may be able to assist you with a training session. If not, 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 and 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 plant communities, 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 fish. 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 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 are monitoring existing beds of curly-leaf pondweed and you have a GPS unit, you may want to mark in the edges of the beds, and then load this data into a mapping program and print out maps of the beds. You may also want to mark other locations 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 information that is reported through the Citizen Lake Monitoring Network 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 and 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 a confirmation email, 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* drop down box.

- For prevention monitoring, report your results using the: Aquatic Invasives Surveillance Monitoring Report, Form 3200-133.
- If you find curly-leaf pondweed for the first time on your lake, report your results using the: Aquatic Invasive Plant Incident Report, Form 3200-125.
- For established population monitoring, report your results using the Plant Bed Density Report, Form 3200-132. At this time, there is no computer data entry option for this form. Online data forms will be created as time allows. The data collected with this form will be very useful in tracking the spread of curly-leaf pondweed throughout the lake if curly-leaf pondweed does spread and is necessary in tracking success of your management option. Keep hard copies for your reference and/or submit them to your local DNR Aquatic Plant Management Coordinator.

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 more often. If you have any questions about reporting, contact your local DNR CLMN contact (page viii).

NOTE

Remember, for prevention monitoring, a report of ‘no curly-leaf pondweed’ at a location is just as important as finding curly-leaf pondweed. One cannot confidently state that curly-leaf pondweed is not present in an area if no one has looked.

WHAT TO DO WITH SUSPECT PLANTS

Note the “suspect” plant’s location on your map, making sure you can find the spot(s) again. Fill out the Aquatic Invasive Plant Incident Report (Form 3200-125) (found at the end of this section, and at <http://dnr.wi.gov/lakes/monitoring/forms.aspx>, and deliver it with the suspect plant to your team leader or local DNR CLMN contact. Suspect plants need to go to a herbarium for vouchering. DNR staff can transport plants to the herbarium for the lake group.

To collect a specimen of the plant:

- Gently pull the plant from the lake bottom. Be sure to collect as much of the plant as possible, paying special attention to getting the leafy and flowering portion, if present. Try not to break up or rip the plant as the pieces of the plant can float away and start new plants.
- Use a permanent marker and record the following information on a plastic bag:
 - a. Date
 - b. Water body
 - c. Description of where the sample was found.
- Put the sample in the plastic bag and keep it in a cool place (a cooler in your car or refrigerator at home). Take the specimen to your team leader, your local CLMN contact, your local Land and Water Conservation Department, UW-Extension office or the local DNR contact for identification. If you found curly-leaf pondweed in a lake where it has not been verified before, it is important to get the plants verified and vouchered (usually by an herbarium botanist) ASAP, so that control can take place in a timely manner. Your local CLMN contact will get the plant to the DNR or local herbarium.



If your lake has been verified to have curly-leaf pondweed, samples do not need to go to the DNR for vouchering - you can just take the plants to your team leader.

- If you cannot bring the plant in to your team leader or other contact:
 - ▶ Rinse the plant under running tap water or in a large pan of water. This will slow the rotting process.
 - ▶ Blot the plant dry with a paper towel.
 - ▶ Spread the plant out on a dry paper towel or newspaper. Try to spread the leaflets apart to help with identification.
 - ▶ Cover with a dry paper towel and press in a catalog or phone book for about a week.
 - ▶ Complete a label (see example at the end of this section) and the Aquatic Invasive Plant Incident Report (Form 3200-125) (found at the end of this section and at <http://dnr.wi.gov/lakes/monitoring/forms.aspx>).
 - ▶ When the plant is dry, place it between sheets of thin cardboard (like a cereal box). Mail the plant, map and the reporting form to your local CLMN contact.
 - ▶ Remember to make a copy of your map and reporting forms for your records.

Remember if you find “something,” don’t give up; there are a variety of control and management options to address invasive species on your lake. Early detection is the key to controlling the situation!



PREVENTION STARTS WITH US

Whether you are out monitoring, or just boating for fun, 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 Curly-leaf Pondweed.

*Curly-leaf
Pondweed*



Photo by Robert Korth





*Curly-leaf
Pondweed*



ADDITIONAL MATERIALS AND SUPPORTING DOCUMENTATION

PLANT IDENTIFICATION SOURCES

REFERENCES

REPORTING FORMS

AQUATIC INVASIVES SURVEILLANCE MONITORING REPORT

- **SINGLE LOCATION, MULTIPLE DATES**

- **MULTIPLE LOCATIONS, ONE DATE**

AQUATIC INVASIVE PLANT INCIDENT REPORT

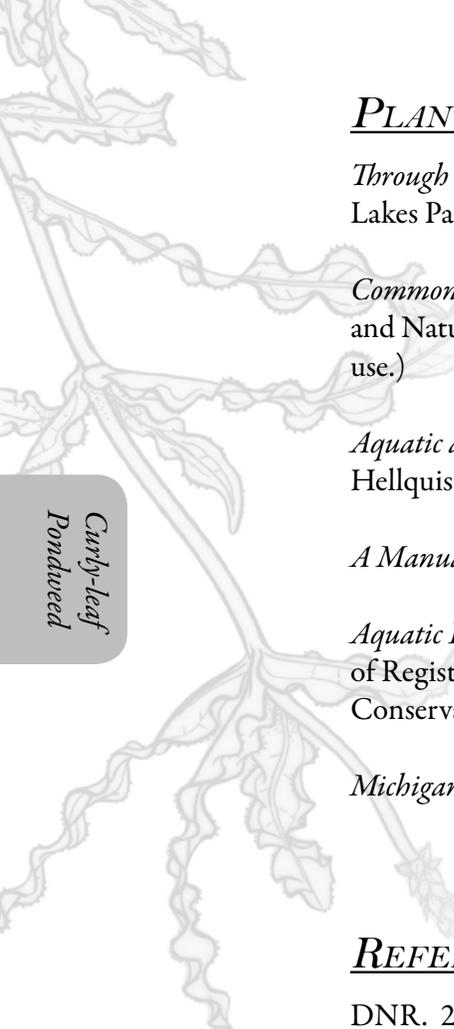
PLANT BED DENSITY REPORT

PLANT LABELS

AQUA-VIEW SCOPE CONSTRUCTION DIRECTIONS

*Curly-leaf
Pondweed*





PLANT IDENTIFICATION SOURCES

Through the Looking Glass. 1997. Susan Borman, Robert Korth, Jo Temte. Wisconsin Lakes Partnership. DNR publication # FH-207-97.

Common Aquatic Plants of Wisconsin list prepared by Stan Nichols, Wisconsin Geological and Natural History Survey, Madison, WI. (This is not a true key, but it is easy for all to use.)

Aquatic and Wetland Plants of Northeastern North America. Garrett E. Crow and C. Barre Hellquist. University of Wisconsin Press.

A Manual of Aquatic Plants. 1957. Norman C. Fassett. University of Wisconsin Press.

Aquatic Plants of Illinois. 1966. Glen S. Winterringer and Alvin C. Lopinot. Department of Registration and Education, Illinois State Museum Division and the Department of Conservation, Division of Fisheries.

Michigan Flora. 1985. Edward G. Voss. University of Michigan Press.

REFERENCES

DNR. 2008. *Pre and Post Treatment Evaluation of Aquatic Plant Community*.

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)

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...	Did you...
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
Curly-Leaf Pondweed?	Yes	No	Did not look for	Purple Loosestrife?	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
Freshwater Jellyfish?	Yes	No	Did not look for	Zebra Mussels?	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>

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 plant 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 Plant Found (Fill out one form for each species found.)

Which aquatic invasive plant did you find?:

<input type="checkbox"/> Curly-leaf Pondweed	<input type="checkbox"/> Eurasian Water-milfoil	<input type="checkbox"/> Purple Loosestrife
<input type="checkbox"/> Brittle Naiad	<input type="checkbox"/> Hydrilla	<input type="checkbox"/> Brazilian Waterweed
<input type="checkbox"/> Yellow Floating Heart		

Where did you find the invasive plant?

Latitude: _____ Longitude: _____

Approximately how large an area do the plants occupy?

<input type="checkbox"/> A Few Plants	<input type="checkbox"/> One or a few beds	<input type="checkbox"/> Many beds	<input type="checkbox"/> A Whole Bay or Portion of Lake
<input type="checkbox"/> Widespread, covering most shallow areas of lake	<input type="checkbox"/> Don't know (e.g. didn't check the whole lake)		

Was the plant floating or rooted?

<input type="checkbox"/> Floating	<input type="checkbox"/> Rooted
-----------------------------------	---------------------------------

Estimated percent cover in the area where the invasive was found (optional)

Substrate cobble, %	Substrate muck, %	Substrate boulders, %	Substrate sand, %	Bottom covered with plants, %
---------------------	-------------------	-----------------------	-------------------	-------------------------------

Voucher Sample

Did you collect a sample of the plant (a 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 plant 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 5-10 intact specimens. Try to get the root system, all leaves as well as seed heads and flowers when present. Place in ziplock bag with no water. Place on ice and transport to refrigerator. Bring samples, a copy of this form, along with a map showing where you found the suspect plants to your regional AIS or Citizen Lake Monitoring Coordinator at the DNR.

For DNR AIS Coordinator to fill out

AIS Coordinator(s) 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? Yes No If no, what was it?

Herbarium where specimen is housed: _____ Herbarium Specimen ID: _____

Have you entered the results of the voucher in SWIMS? Yes 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.

Use this form when you have verified that your lake has Eurasian Water-Milfoil or Curly-leaf Pondweed and you want to assess the densities of the bed(s). Please use one form per plant bed raked.

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, s. 19.32 - 19.39, Wis. Stats.

Primary Data Collector

Name	Phone Number	Email
------	--------------	-------

Monitoring Location

Waterbody Name	Township Name	County	Station Name
----------------	---------------	--------	--------------

Latitude of approx. center of plant bed	Longitude of approx. center of plant bed
---	--

Method of obtaining Latitude and Longitude: GPS Online Surface Water Data Viewer
 Other Mapping Software Other _____

Date and Time of Monitoring

Monitoring Date	Start Time	End Time
-----------------	------------	----------

Estimated percent cover in the sample area (Optional)

Substrate cobble, %	Substrate muck, %	Substrate boulders, %	Substrate sand, %	Bottom covered with plants, %
---------------------	-------------------	-----------------------	-------------------	-------------------------------

Monitoring Results

Which aquatic invasive plant are you monitoring the density of?:
 Curly-leaf Pondweed Eurasian Water-milfoil Other _____

Plant Density Rating
 1-A few plants on rake head 2-Rake Head is about 1/2 full 3-Overflowing

Depth to lake bottom at edge of plant bed closest to shore (min depth) feet/meters (circle one)

Depth to lake bottom at edge of plant bed furthest shore (max depth) feet/meters (circle one)

Estimated Height of Plants (use marked-off rake handle to determine)
 0.5 - 1 foot 1 - 2 feet >2 feet

If monitoring Eurasian Water-Milfoil, did you notice any holes or damage to the stems that could possibly be weevil damage ?
 Yes No

PLANT LABELS



Project Name: Citizen Lake Monitoring Network

(Scientific Name & authority)

Common Name:
Lake Name:
Water Body ID code#:
County:
Collected by:
Date:
Depth:
Location and Habitat:



*Curly-leaf
Pondweed*



Project Name: Citizen Lake Monitoring Network

(Scientific Name & authority)

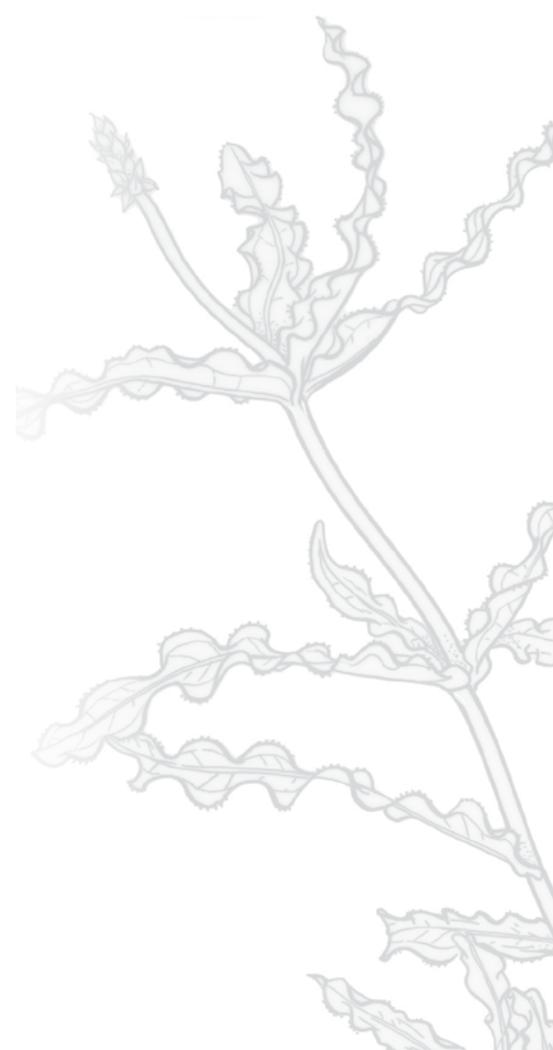
Common Name:
Lake Name:
Water Body ID code#:
County:
Collected by:
Date:
Depth:
Location and Habitat:



Project Name: Citizen Lake Monitoring Network

(Scientific Name & authority)

Common Name:
Lake Name:
Water Body ID code#:
County:
Collected by:
Date:
Depth:
Location and Habitat:



AQUA-VIEW SCOPE CONSTRUCTION DIRECTIONS

- 1 - 3 foot section of 4" diameter plastic pipe. We use ABS pipe because it is black and because it is lighter than PVC pipe. If you are unable to find ABS pipe, PVC pipe will work just fine. Your hardware store may have a short piece of pipe they will sell you. We bought a 10-foot piece of pipe and cut it.
- 1 or 2 - 5 ½" pull handles (we used one, it was easier to hold and guide)
- Screws if not supplied with handle
- 1 - 4" ABS coupler
- 1 - 4 3/8" diameter lexan disk – Lexan is non-breakable plexiglass that we had cut at our local glass repair shop. You can use plexiglass for the disk but it is difficult to cut the plexiglass in a circle.
- Clear silicone rubber sealant
- Drill and screw driver
- Weatherstripping for around the top of the aqua-view scope. Marine and automotive weatherstrip tape works well.

HOW TO MAKE AN AQUA-VIEW SCOPE (picture on next page)

Cut a 3 foot section of 4" diameter ABS or PVC pipe. The cut must be straight and square to the pipe. If you can't find pipe with a black interior, you can paint the inside a flat black. If the pipe is shiny on the inside, rough it up using sandpaper or steel wool so that there won't be any glare inside the tube. **If you are going to rough it up on the inside, make sure to do that before you attach the screws so you don't scratch your hand!**

Attach one or two handles on either side of the pipe about four inches from one end. ABS pipe is fairly soft, you can use a screw driver to put the screws in or you can drill pilot holes and put the screws in. If you are using a drill, make sure to make the hole smaller than the screw so the screw will hold. If using PVC pipe, you will need to drill the holes.

Run a bead of clear silicone rubber sealant on the bottom of the squared off end of pipe. Place the lexan disk on the bead of sealant.

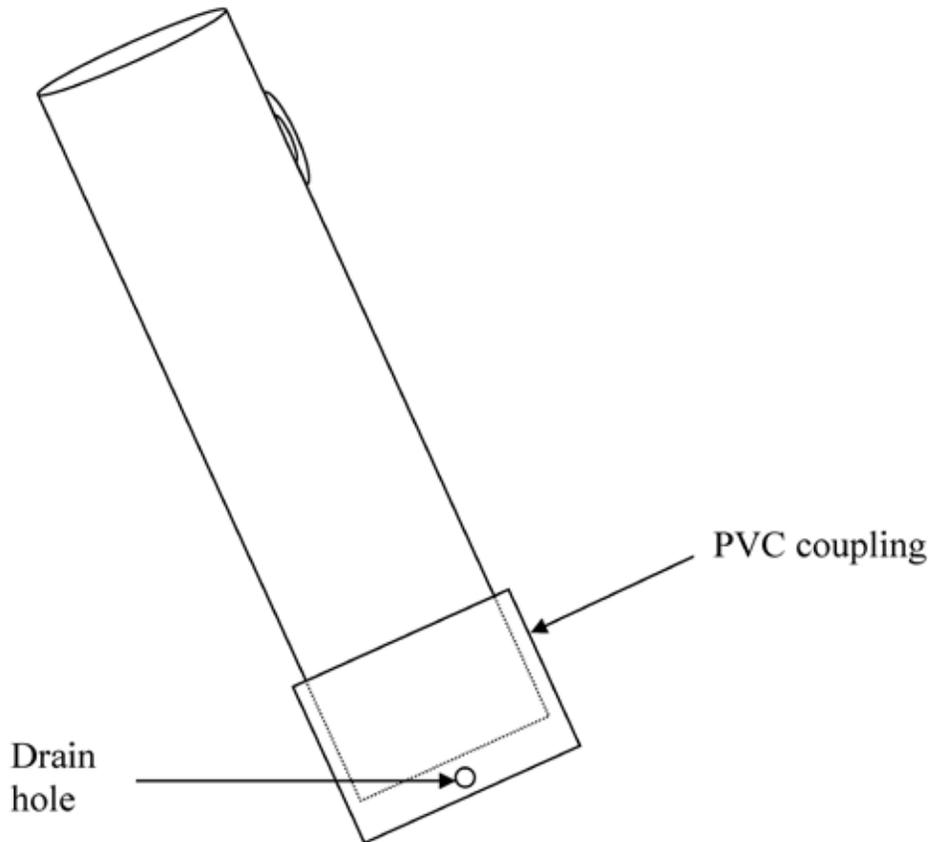
Smear a small amount of silicon sealant on the outside of the pipe one half inch from the end of the pipe with the lexan. Slide the coupling over the end and give it a slight twist to distribute the sealant evenly. Slide the coupling on as far as it will go. The collar will extend out beyond the lexan disk protecting it from scratching.

Drill two small (1/4") holes in the side of the collar close to the lexan so that air won't be trapped in the open end of the coupler when you put the view scope into the water. The holes should be drilled on opposite sides of the pipe.

Weatherstripping is placed around the top of the open end of the scope (the side you look into). Weatherstripping has a sticky side that sticks to the plastic and the foam makes it a little more comfortable for your face to rest against.

Aqua-view scope instructions adapted from those designed by Jeff Schloss, coordinator of New Hampshire Lakes Lay Monitoring Program (603) 862-3848.

AQUA-VIEW SCOPE DRAWING



*Curly-leaf
Pondweed*

PURPLE LOOSESTRIFE

4

MONITORING PROTOCOL AND CONTROL INFORMATION



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You may not have paid much attention to the vegetation growing along the shores of your lake in the past. You may have fished the lake or boated for years vaguely remembering the greenery along the shoreline as a pleasing array of grass-like plants, water lilies, or any of a number of common shoreline plants. Have you noticed any changes lately? Are there plants you don't recall seeing in the past? Or maybe you've noticed there is more of one certain type of plant.

If you haven't looked for these changes, you should since they may be signs of invasive plants moving in. Not knowing friend from foe, you should be concerned whenever you see a new face or a dramatic increase in any plant. You should definitely sound the alarm if lake edges that were once green with cattails or other plants have suddenly erupted in massive amounts of pink-purple in mid to late summer; almost a sure sign that purple loosestrife has established. It would be even better to recognize and remove the first of these plants before they bloom...and set seed.



Purple Loosestrife

Photo by Illinois DNR

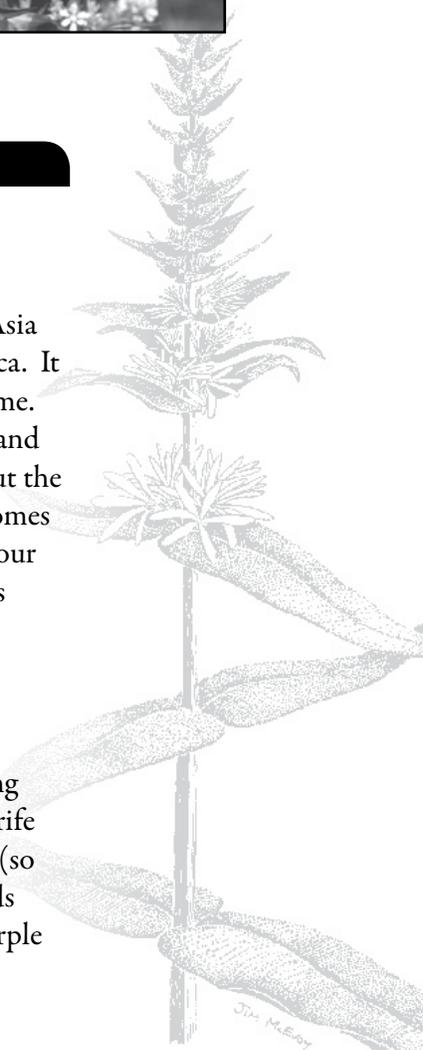
Purple
Loosestrife



BACKGROUND/OVERVIEW

Purple loosestrife is an attractive wetland perennial plant originating in Europe and Asia that has become a real threat to wetland communities across temperate North America. It was introduced without the specialized insects and diseases that help control it at home. Freed from its natural controls, it grows faster and taller than most of our native wetland plants. Once established on a lakeshore or adjacent wetland, it often shades out all but the tallest of its competitors, and can replace large numbers of native plants where it becomes established. This should concern you since it can dramatically change the health of your lake's edge - and how you and wildlife are able to use the lake system. As native plants decline, so do the other species that depend on them!

The plant's habit and vigor also result in large numbers of small seeds that are easily dispersed to wetlands everywhere via moving water, on the feet of migrating birds, or in the cleats of muddy boots or tires. The seeds germinate on open, moist soil, creating first year flowering plants that produce many more thousands of seeds! Thus, loosestrife quickly creates large seed banks that make the plant virtually impossible to eliminate (so remove those young plants before flowering, if you can!) Lots of easily dispersed seeds also virtually ensure its spread. The information currently available on sites where purple loosestrife grows can be found at <http://dnr.wi.gov/lakes/invasives/>.





LIFE CYCLE

Purple loosestrife spreads mainly by seed, but it can also spread vegetatively from root or stem segments. A single stalk can produce from 100,000 to 300,000 seeds per year. Seed survival is up to 60-70%, resulting in an extensive seed bank. Mature plants with up to 50 shoots grow over 2 meters high and produce more than two million seeds a year.

Most of the seeds fall near the parent plant, but water, animals, boats, and humans can transport the seeds long distances. Seed germination is restricted to open, wet soils with a wide range of pH. Germination requires high temperatures, but seeds can remain viable in the soil for many years. Even seeds submerged in water can live for approximately 20 months.

Most seedling establishment occurs in late spring and early summer when temperatures are high. Optimum substrates for growth are moist soils of neutral to slightly acidic pH, but the plants can exist in a wide range of soil types.

Vegetative spread through disturbances is also characteristic of purple loosestrife; clipped, trampled, or buried stems of established plants may produce shoots and roots. Plants may be quite large and several years old before they begin flowering. It is often very difficult to locate non-flowering plants, so monitoring for new invasions should be done at the beginning of the flowering period in mid-summer.

Any sunny or partly shaded wetland is susceptible to purple loosestrife invasion. Vegetative disturbances such as water drawdown or exposed soil accelerate the process by providing ideal conditions for seed germination. Invasion usually begins with a few pioneering plants that build up a large seed bank in the soil for several years. When the right disturbance occurs, loosestrife can spread rapidly, eventually taking over the entire wetland. The plant's ability to adjust to a wide range of environmental conditions gives it a competitive advantage; coupled with its reproductive strategy, purple loosestrife tends to create monotypic stands that reduce biotic diversity.



IDENTIFICATION

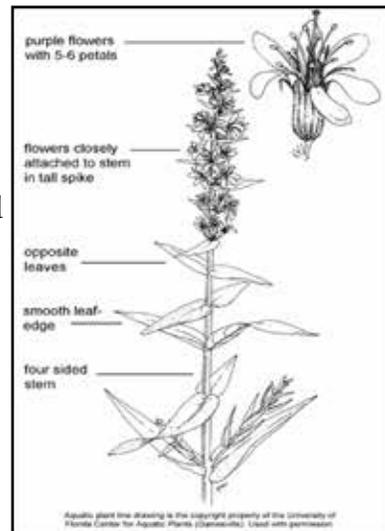
In your packet is a laminated example of Purple Loosestrife (*Lythrum salicaria*, pronounced (LITH-rum sal-i-CARE-ee-a), as well as a brochure that includes pictures of purple loosestrife and native look-a-likes.

Purple loosestrife can be confused with a number of other purple-spiked flowers including gayfeather, blue vervain and fireweed. (The state purple loosestrife brochure included with this manual has a guide to native look-a-like plants.)

Refer to picture here, as well as reference materials in your packet, to see the characteristics listed below.

PURPLE LOOSESTRIFE CHARACTERISTICS

- Semi-woody, hardy perennial with a dense bushy growth of 1-50 stems.
- Leaves are usually opposite, but can be found whorled or even alternate.
- Leaves attached directly to the stem. They do not have petioles (leaf stalks). Leaves are lance-shaped and 1-4 inches long with smooth edges.
- Stems are square (four-sided) or many sided (five or six-sided). Plants can grow 3-7 feet tall.
- Flowers are purple to pink in color; have 5-6 petals; and form on spikes. Flowers bloom from the bottom of the spike to the top of the spike.
- Flowers bloom July–September, with blooming occurring earlier in southern Wisconsin than in northern Wisconsin.



PURPLE LOOSESTRIFE MONITORING

PREVENTION MONITORING

As a citizen lake monitor, you can play a very important role by regularly looking for purple loosestrife when you are traveling around your area. While driving, you can conduct “windshield” surveys. That is, just watch the roadways and note where you see purple loosestrife. (This is quite easy on back road areas, but nearly impossible on highways and freeways.) You can also monitor while boating by watching the shoreline for the pink-purple flowers. And you can look for purple loosestrife while walking, hiking or biking.

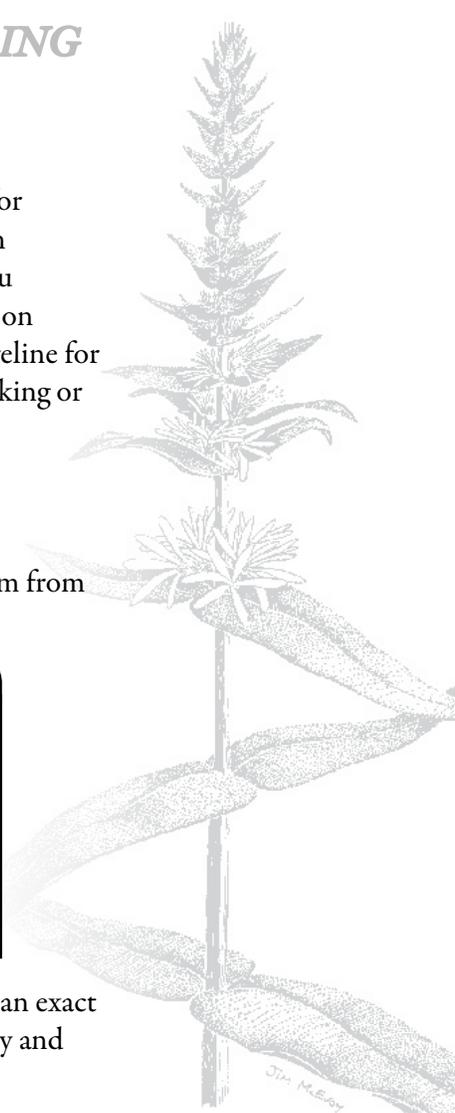
WHEN TO MONITOR

The best time of year to identify and look for purple loosestrife is when it’s in bloom from mid July through September.



The monitoring time varies from year to year depending upon the year’s weather conditions and where you are located in the state. With warm summers, you will find purple loosestrife blossoming in southern Wisconsin in July. With cooler temperature, purple loosestrife may not blossom in northern Wisconsin until August.

There are no set numbers of surveys for purple loosestrife monitoring, nor is there an exact time to do the survey, but the best time of the year for identification is between July and September when the plants are in bloom.





WHERE DO I LOOK FOR PURPLE LOOSESTRIFE?

Purple loosestrife is typically found in wetlands, along the shorelines of lakes and streams, and along roadsides and trails. In order to discover it, especially before blooming, you need to be able to correctly identify it and distinguish it from native plants. Please refer to the identification section on pages 78-79, and the state purple loosestrife brochure in your packet.

HOW TO MONITOR

Looking for purple loosestrife is most easily done while riding in a car, boat or canoe, or while, biking or hiking. It is best to have a map available to mark locations (see mapping section below).

While becoming familiar with purple loosestrife identification, you may want to stop and get a closer look at the plants. You may want to carry binoculars to assist you in your plant identification. And remember, please do not trespass on private property while monitoring. Notes on locations should be marked on road maps and/or lake maps.

EQUIPMENT NEEDED

A GPS is ideal for correctly identifying locations. Photos are also a wonderful tool. Make sure you mark the location on the back of the photo. Binoculars will make monitoring easier. You can “zoom-in” on plants without getting out of your car or off your boat.

SETTING UP A MONITORING TEAM

It may help to designate multiple volunteers to monitor for purple loosestrife. Designate a team leader who can keep track of what areas were reported to have purple loosestrife. The team leader can also be the person who enters monitoring results on the Great Lakes Indian Fish and Wildlife Commission website <http://www.glifwc-maps.org/> or the CLMN website <http://dnr.wi.gov/lakes/CLMN> and to whom other volunteers can bring suspect species.

Consider having a mini-plant training session for your team. The Citizen Lake Monitoring Network Coordinator or the Aquatic Plant Management Coordinator for your area may be able to assist you with a training session (refer to pages viii-ix or <http://dnr.wi.gov/lakes/contacts>). If not, 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/uwexplakes/CLMN/training.asp>.

MAPPING

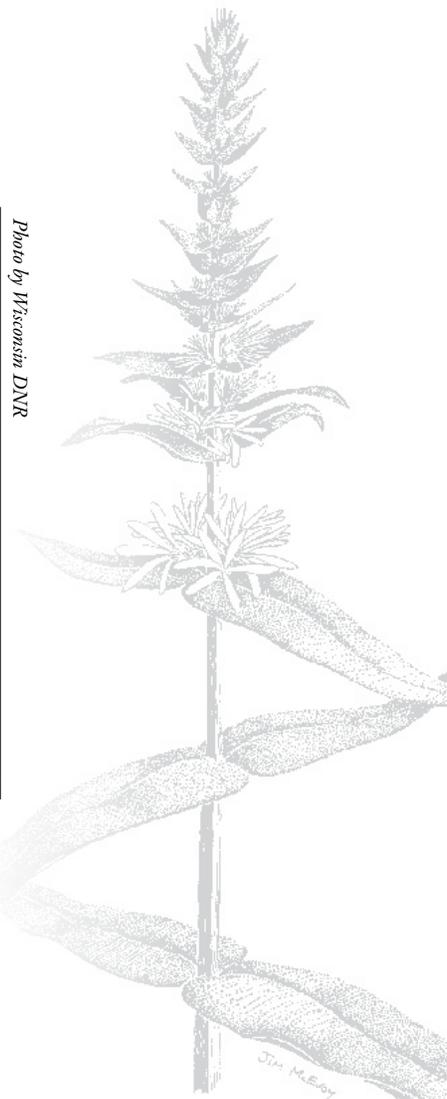
A map is a very quick and reliable way to assure that everyone knows the place you are talking about when you describe a certain location. County maps are great to use as they have the roads clearly marked. County maps are available at Visitor Information Centers or the Department of Transportation offices. Plat books are another option and may be purchased from your county government or UW-Extension offices. Lake and river maps make on-water monitoring record keeping a snap.

You can get lake and rivers 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 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.

If you have a GPS unit, you may want to use it to correctly identify the location of your purple loosestrife sighting.



Photo by Wisconsin DNR



Purple
Loosestrife

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 invasive species 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 information that is reported through the Citizen Lake Monitoring Network 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 Great Lakes Indian Fish and Wildlife Commission (GLIFWC) website (<http://www.glifwc-maps.org/>), or 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 and password, click ‘Request a Wisconsin User ID and Password’. Then email Jennifer Filbert 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 drop down box. The data entry format is like the forms listed above.

Estimate the size of the infestation and/or number of plants and indicate this on a map, a separate piece of paper or on the reporting form itself. **Please send all maps and/or GPS locations to Brock Woods, WDNR Purple Loosestrife Control Coordinator (page vii).**

To see where purple loosestrife has been reported, go to <http://dnr.wi.gov/lakes/invasives/>. The information that is provided through the CLMN will be incorporated into a statewide database maintained by GLIFWC. 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.

WHAT TO DO WITH SUSPECT PLANTS

- Note the “suspect” plant’s location on your map, making sure you can find the spot(s) again. Fill out the Purple Loosestrife Volunteer Watch Report (Form 3200-119) and deliver it with the suspect plant to your team leader or local CLMN contact. Copies of the form can be found at the end of this section and at <http://dnr.wi.gov/lakes/monitoring/forms.aspx>.
- If you have a good camera, you can take pictures of the plant and its location. If you have close-ups of the plant, no samples of the plant are necessary. If you do not have a camera, you will need to take a sample to your local contact. With purple loosestrife, be sure to collect the flowering portion along with a section of stem with the leaves attached. Place the plant in a plastic bag so that no seeds are dropped during the transport. Use a permanent marker and record the following information on a plastic bag:
 - a. Date
 - b. Waterbody or road name
 - c. Description of where the sample was found
- Put the sample in the plastic bag and keep it in a cool place (a cooler in your car or refrigerator at home). Take the specimen to your local team leader, your local Land and Water Conservation Department, UW-Extension office or local DNR contact for identification.



Remember if you find “something,” don’t give up; there are a variety of control and management options to address purple loosestrife. Early detection is the key to controlling the situation!

The electronic reporting form can be found at the end of this section as well as <http://dnr.wi.gov/lakes/monitoring/forms.aspx>.



CONTROL METHODS

Control methods are included in this chapter since these methods are better defined than control methods for other AIS.

Effective long-term control of purple loosestrife in Wisconsin may require the use of both traditional control methods as well as biological control. Each has advantages and you must carefully decide which to use on any site. The most important thing is to start controlling the purple loosestrife now. Use traditional methods (see below) on all sites on which you need quick and effective control and have adequate resources to be successful. These measures are labor intensive and expensive on large sites, so small or low-density sites are most often controlled this way. These techniques will require additional vigilance. Even if all purple loosestrife is accessible, missed plants and seeds in the soil that germinate up to



a decade later result in more purple loosestrife plants. Thus, you must annually check for and treat these plants. You should also destroy any purple loosestrife in surrounding areas to stop new seed dissemination to your site. In fact, if your site is in an area surrounded by other loosestrife infestations, traditional control methods may not be worth the effort. These methods can also be very disruptive to wetlands and, in addition to cost and possible unwanted chemical effects, suggest a serious consideration of alternative biological control.

Traditional controls and biocontrol may be used together on the same site as long as insects have foliage to eat and are not killed by other methods. One combination is to cut the stems just beneath the flower head to prevent seed production, but leave lower foliage for the beetles. Another is to put beetles in the center of an infestation while using other controls on its edge to prevent the infestation from growing larger or spreading. Integrating control methods may be the best plan because there is some immediate purple loosestrife control while biocontrol insect numbers increase--perhaps eventually replacing the need for any traditional controls!

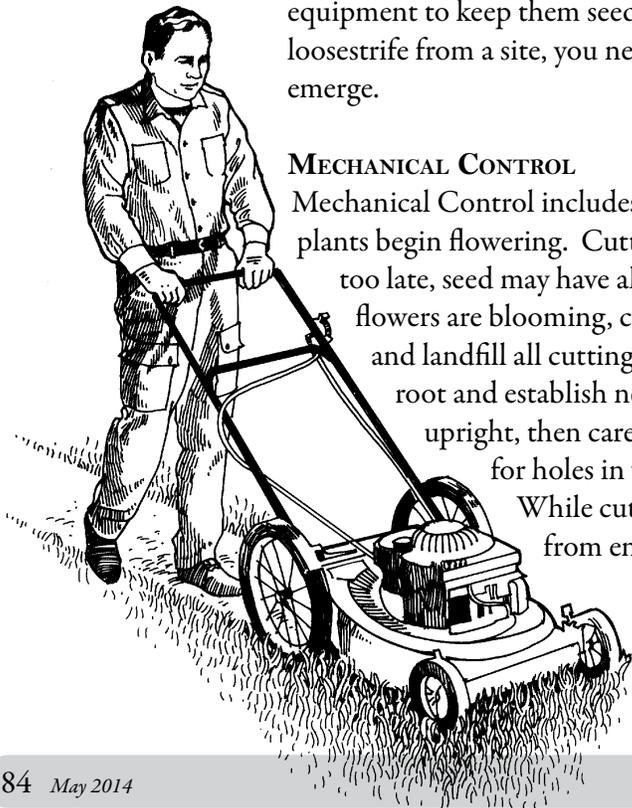
TRADITIONAL CONTROL METHODS

PREVENTION

Preventing purple loosestrife from infesting new sites is the best and easiest way to control it. In addition to where loosestrife is found in the wild, it may also be found in local gardens or near outlets from local storm sewers. Prior to 1987 purple loosestrife and hybrids of it were sold in nurseries in Wisconsin as a favorite garden plant. It's now illegal to sell or plant purple loosestrife because seeds from these plants often start new wild infestations. Please remove and destroy these--and any new plants--whenever you see them (get the landowner's permission first). At a minimum cut off their blooms. Do all this before they drop seed (which begins before blooming is complete). Dispose of plant parts in garbage bags and take them to the landfill. Purple loosestrife is exempt from yard waste regulations. Composting is not an option since compost piles do not reach temperatures sufficient to destroy the seeds and hardy roots. Also be careful to inspect clothing and equipment to keep them seed-free and prevent further spread. Once you remove purple loosestrife from a site, you need to monitor the site for any new seedlings which may emerge.

MECHANICAL CONTROL

Mechanical Control includes cutting, pulling or digging. Cutting is best done just before plants begin flowering. Cutting too early encourages more flowers to grow. If done too late, seed may have already fallen. Since lower pods can drop seed while upper flowers are blooming, check for seed on the entire flower stalk. If none, simply bag and landfill all cuttings. Do not leave the cut plants at the site as fragments will root and establish new plants. If there is seed, cut off each top while holding it upright, then carefully place it into the bag to catch any dropping seeds. Watch for holes in your bags so you don't spread seed while moving the bags. While cutting does not destroy the plant, it can prevent more seeds from entering the environment until you can destroy the plant.

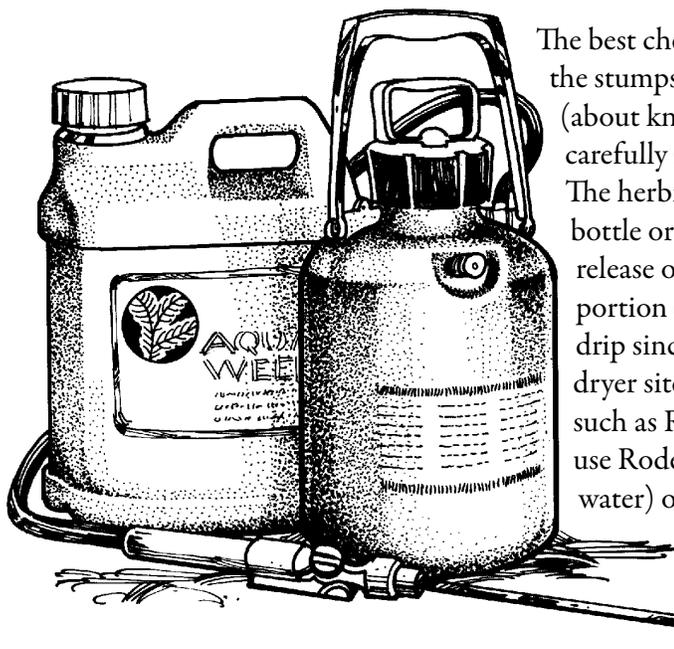


PULLING AND DIGGING

Pulling and digging can be effective, but can also be disruptive by creating disturbed bare spots, which are good sites for purple loosestrife seeds to germinate. They may also leave root fragments behind. These root fragments can grow new plants. Use pulling and digging primarily with small plants in loose soils, since they do not usually leave behind large soil gaps or root tips. Digging large plants with multiple stems and brittle roots often leaves root tips behind. Dispose of dug plants as listed above.

CHEMICAL CONTROL

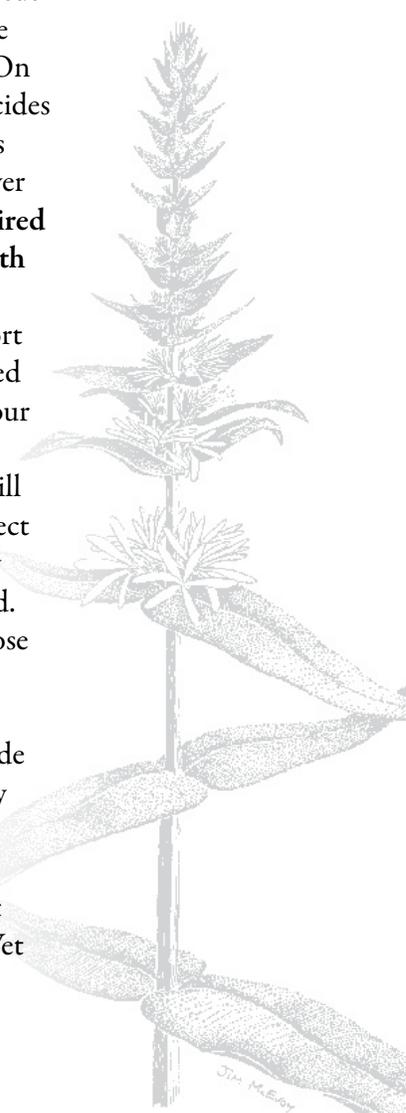
This is usually the best way to eliminate purple loosestrife quickly, especially if you have mature plants with extensive root systems. Timing is important: treat before flowering to prevent seed set. Dispose of plant parts as listed above. Always back away from sprayed areas as you go to prevent getting herbicide on your clothes.



The best chemical method is to cut stems and paint the stumps with herbicide. Cut low on the stem (about knee level) and apply the herbicide, while carefully stuffing the plant top into a plastic bag. The herbicide can be applied with a small drip bottle or spray bottle, which can be adjusted to release only a small amount. Cover the entire cut portion of the stem, but don't let the herbicide drip since it may kill other plants it touches. On dryer sites, use non-selective glyphosate herbicides such as Roundup and Glyphosate. For wet areas use Rodeo (a glyphosate formulated for use over water) or equivalent (WDNR permit is required – there is no cost for the permit with purple loosestrife control). These

chemicals have a short soil life. Stem applied glyphosate should be mixed to 20 to 40% active ingredient, depending on effects on your specific area's plants (always test). For sites with many native grasses, sedges, cattails, rushes, etc. consider using triclopyr herbicide marketed as Renovate since it does not kill these monocots, though it does breakdown slower. Check Renovate's label for its correct usage. Since you must treat at least some stems of each plant and the plants often grow together in a clump, all stems in a clump should be treated to ensure all plants are killed. Bag cuttings since they can root if they come in contact with water or moist soil. Dispose of clippings as mentioned above.

Another chemical method is using very carefully targeted foliar applications of herbicide (NOT broadcast spraying). This may be acceptable and reduce costs for sites with very high densities of purple loosestrife, since fewer non-loosestrife plants will be hit. Use a glyphosate formulated for use over water and in a weaker solution (around 1% active ingredient; always test first). You may need to wet only 25% of the leaves of each plant to kill it. Triclopyr can be used as a foliar spray, too; check its label for instructions. Wet most of the foliage if using Triclopyr.





You must obtain a permit from WDNR before applying any chemical over or near standing water. The process has been streamlined for control of purple loosestrife and **there is no cost.** The appropriate person to contact is your regional WDNR Aquatic Plant Management Coordinator (<http://dnr.wi.gov/lakes/contacts/> and click on “Aquatic Plant Management” or see page viii). S/he will want to know about your site and plan, may make further suggestions and will issue your permit.

BIOCONTROL

One of the cheapest, most effective control methods for purple loosestrife is biocontrol - using one organism to control another. One hundred species of insects that feed on purple loosestrife in Europe were tested on North American agricultural, wetland, and loosestrife-related plants to be sure there were little or no cross-over feeding. The selected insect species were then shipped to this continent and tested in quarantine on more species of North American plants before release. Four species passed all safety tests: two flower and root weevil species, and two types of “Cella” foliage beetles. No one has reported any substantive problems with the insects being used, nor has WDNR seen any real problems in over ten plus years of field monitoring.

A citizen biocontrol program uses the two safe *Galerucella* beetle species in combination with traditional methods. You can acquire these beetles by rearing a small number of starter beetles that you receive from WDNR. You may also be able to collect or buy beetles for rearing or release. Biocontrol is beginning to reduce the purple loosestrife in many areas around the state, and yours should be included. Along with prevention efforts, we still need to put out many more beetles to reduce purple loosestrife statewide. Success in this endeavor depends on YOU!

Please read any of the following items for a better understanding of the purple loosestrife problem and its solutions. All are available on the Internet and at many WDNR and UW Extension offices. Start with the WDNR/UWEX Purple Loosestrife Brochures: in color, WDNR publication # PUB-WT-799 2004 and in black/white, PUB-WT-829 2006 at <http://clean-water.uwex.edu/pubs/pdf/purple.pdf>. More details are found in “Purple Loosestrife: What You Should Know, What You Can Do,” PUB WT-276-2003. Specific biological control information and forms are found in the appendices of “See Cella Chow! A Purple Loosestrife Biocontrol Manual for Educators.” Download the manual or selected activities and appendices mentioned here, online at http://dnr.wi.gov/org/es/science/publications/ss981_2003.htm (PUB-SS-981 2003). Additional purple loosestrife and biocontrol information is also at <http://dnr.wi.gov/invasives/fact/loosestrife.htm>.

Most cooperators initiate biocontrol by rearing large numbers of beetles. This is the best way to ensure successful beetle establishment. WDNR supplies starter beetles for rearing, most needed supplies, and the know-how. The volunteer supplies purple loosestrife roots and a sunny location. Rearing is easy and cheap (\$50 or less for several sites), though it requires a little gardening skill. A small sunny area is needed and the hours of labor required are few. The beetle starter population for rearing is free if picked up at the DNR office in Madison, or they can be mailed to you for a program donation to cover shipping.

You may also be able to collect free beetles in the field yourself for propagation or simple dispersal, or buy ready-to-release beetles (private sellers). Call/write Brock Woods (608-221-6349) for details, including the current year's schedule of free field trips. No special permit is needed if beetles are purchased in-state for release, though you still need to send in the *Purple Loosestrife Cultivation Authorization and Biocontrol Insect Application* (at the end of this section), so WDNR knows when and where you have put your beetles.

Rearing is easy. (Details are on page 91.)

1. Send in your signed "Application/Authorization Form" found at <http://dnr.wi.gov/lakes/monitoring/forms.aspx> (or at the end of this section);
2. Sew sleeve cages from fabric mailed to you.
3. Transplant the 10 biggest purple loosestrife rootstocks (from a local area) into pots. Do this first thing in the spring.
4. Immediately place sleeve cages on the pots.
5. Place all the pots into kids' wading pools or similar containers.
6. Maintain several inches of water in the pools to re-create wetland habitat.
7. In May, when plants are 2+ feet tall, put ten starter beetles into each of the cages. Secure the bags at the top so that the beetles do not escape.
8. When new beetles start appearing in June or July, simply move the potted plants to local purple loosestrife-infested wetlands and remove the sleeve cages so beetles can disperse. That's all there is to rearing your own beetles! Plus, if you pick a good local spot for first beetle releases, you can develop your own local insectary site for collecting free future beetles for rearing or immediate release!

After your release(s), report your site details to WDNR with the easy-to-fill-in *Purple Loosestrife Cultivation Authorization and Biocontrol Insect Application* (at the end of this section). Since beetle damage to purple loosestrife flowers is typical after a couple years, an easy way to see the decline in your purple loosestrife is to photograph your site's purple loosestrife blooms annually. You'll see sites change from purple to green by comparing the first year photo with ensuing years.

Try to team up with others to share in the work, costs, fun, and learning. Consider friends, or organizations such as Lake Districts, schools or conservation groups. This can be a great school project, but it usually needs to be finished in summer school or by a non-school tag team partner since a project's typical field time runs from April to July. (Rearing earlier, entirely within the school year, is possible, as well. Inquire if interested.) Also, the first half of "See Cella Chow!" includes 15 curricular activities centered on purple loosestrife and biological control, specifically to encourage use of the project for teaching!

To reserve your beetles from WDNR and get authorization to grow purple loosestrife for beetle production, fill out and send in your signed "Authorization/Application Form" (at the end of this section), along with the donation check if you want beetles delivered by mail. (Make your check payable to 'Wisconsin DNR' and note that it's for 'Purple Loosestrife Bio-Control'. To legally cultivate purple loosestrife plants to rear beetles, you must return the authorization form whether or not you need beetles from DNR. Send information packet to **Brock Woods, Purple Loosestrife Project Coordinator, DNR Science Operation Center, 2801 Progress Road, Madison, WI 53716**. One hundred



beetles is a typical starting number, but you can start with fewer or more. If you decide to purchase ready-to-release beetles or collect for immediate distribution you must still send in the *Purple Loosestrife Cultivation Authorization and Biocontrol Insect Application*.

If you cannot rear or acquire beetles for local release, the state purple loosestrife brochure lists many other ways you can help! One great way is to report new purple loosestrife sites on our “Watch Form,” downloaded at <http://dnr.wi.gov/lakes/monitoring/forms.aspx>. Describe the sites, and send the form to **Brock Woods, Purple Loosestrife Project Coordinator, DNR Science Operation Center, 2801 Progress Road, Madison, WI 53716**. Also, please share this information with interested others--especially teachers.

We hope you can join us in controlling purple loosestrife in Wisconsin. This will require a long-term effort involving many citizens. WDNR and UWEX will do everything possible to work cooperatively with all interested citizens and organizations in this work. If you have any questions or comments about the program, please contact **Brock Woods, Purple Loosestrife Project Coordinator, DNR Science Operation Center, 2801 Progress Road, Madison, WI 53716**. Brock can be reached at brock.woods@wisconsin.gov or by calling 608/221-6349.

Purple
Loosestrife



Photo by Robert Korth



ADDITIONAL MATERIALS AND SUPPORTING DOCUMENTATION

MATERIALS FOR REARING 100 GALERUCELLA BEETLES

OUTLETS FOR HARD-TO-FIND MATERIALS AND VIDEOS

REPORTING FORMS

AQUATIC INVASIVES SURVEILLANCE MONITORING REPORT

- **SINGLE LOCATION, MULTIPLE DATES**

- **MULTIPLE LOCATIONS, ONE DATE**

PURPLE LOOSESTRIFE WATCH: REPORTING PROCEDURES

*PURPLE LOOSESTRIFE CULTIVATION AUTHORIZATION AND
BIOCONTROL INSECT APPLICATION*

*Purple
Loosestrife*





Purple
Loosestrife

MATERIALS FOR REARING 100 GALERUCELLA BEETLES

This is an exhaustive list and you may not need to purchase all items. Some may be available for free from the Wisconsin Purple Loosestrife Biological Control Project (WPLBCP). Those items are followed by an asterisk *. Other items, such as pots, you may be able to get from landscape businesses or buckets [that need holes drilled] from school lunch programs.

Getting Ready and Collecting Roots

1. Wetland plant identification book(s)
2. Map(s) to location of loosestrife roots and beetle release sites – Use a good local map after consulting the Great Lakes Indian Fish and Wildlife Commission’s website at <http://www.glifwc-maps.org>.
3. Colored flagging in a roll or on metal stakes
4. Filled out, signed, copied, and mailed Purple Loosestrife Cultivation Authorization and Biocontrol Insect Application (Form 3200-116) found at <http://dnr.wi.gov/lakes/monitoring/forms.aspx> and at the end of this section)
5. Shovel or fork for digging and cutting roots
6. Plastic tubs (Rubbermaid® type) or plastic bags for hauling roots and waste
7. Pruning shears to cut off old dead stem tops and root tips, if necessary
8. Gloves, eye protection, rubber boots, and old clothes

Potting Roots

9. 12-15 large purple loosestrife roots from a local wetland
10. 12-15 plastic pots, 10-14 in. diameter*
11. About 2.5 cubic feet of high peat content potting soil (Fafard or a similar mix)*
12. 1 lb. fertilizer, slow release type like Osmocote 18-6-12, unless in the soil*
13. Hose and water source for rinsing roots, wetting soil, and filling pools
14. Two 4-foot child’s wading pools, one 5-foot pool, or other suitable containers*

Pool Set-up and Plant Care

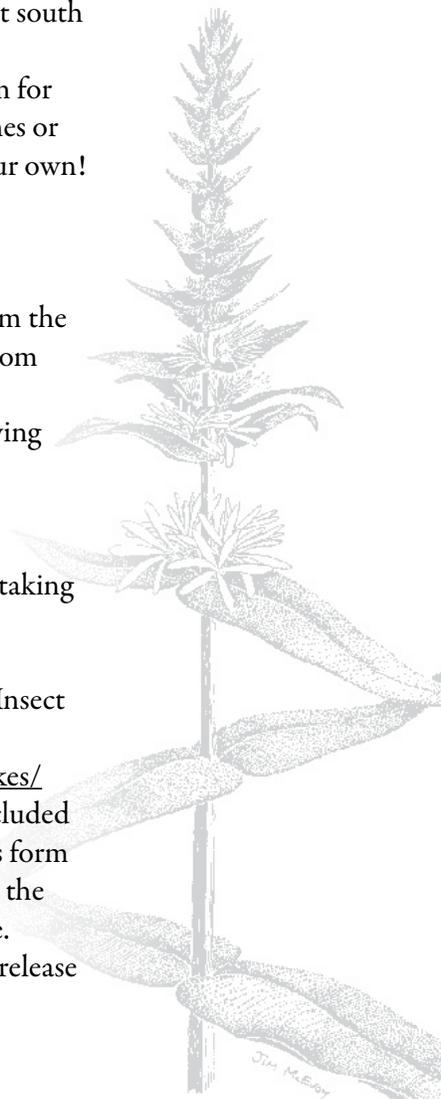
15. 24 yd. of 48+ in. wide, no-see-um insect netting, thread, and sewing machine to make 11 net sleeve cages about 78 in. long. Fold each piece of fabric along its short side and sew down the open 78-in. seam, tapering the cage at one end to match the diameter of your pots.*
16. Duct tape (and perhaps bungee type cords) to attach cages firmly to pots*
17. Wire or string to tie cage tops shut and to supports: also for guy wires
18. 4 X 8 foot space in full sun or at south facing windows
19. 7-foot high cage support system for suspending net cages-clotheslines or conduit posts or a design of your own!
20. Dependable watering system

Raising Beetles

21. 100+ over-wintered beetles from the WPLBCP, field collected, or from other suppliers*
22. Aspirator for catching and moving beetles*

Releasing Beetles and Follow-up

23. Heavy-duty transportation for taking potted plants into the field.
24. Purple Loosestrife Cultivation Authorization and Biocontrol Insect Application (Form 3200-116) (found at <http://dnr.wi.gov/lakes/monitoring/forms.aspx> and included at the end of this section). This form is to be filled out and mailed to the WPLBCP on the day of release.
25. 3-11 PVC posts – for marking release site and photo point
26. Camera and film



OUTLETS FOR HARD-TO-FIND MATERIALS AND VIDEOS

Beetles for rearing or field release in July-August (Call for details):

- Cornell University, (607) 275-3786 (from New York State – minimum # to order)
- Beetles Unlimited, (608) 831-5601 (from Wisconsin – no minimums)

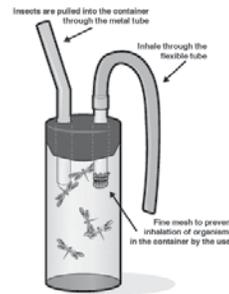
*Insect netting (need approximately 78 inches of fabric/cage)
(WPLBCP supplies free with 3 year rearing):*

Venture Textiles 56 inches of white or slate; 500 yd. bolt \$1.10/yard;
115 Messina Drive lesser yardage is \$1.10/yard plus \$10 cut charge
Baintree, MA 02185
(781) 794-1400

Miscellaneous other supplies:

Aspirators (a small jar with hoses for
collecting/moving beetles; about \$7)

BioQuip
17803 La Salle Avenue
Gardena, CA 90248
(310)324-7931
Fax: (310)324-7931



Videos:

- “Restoring the Balance: Biological Control of Purple Loosestrife” – a summary of the problem, traditional and biological solutions and biological control safety.
- “Rearing of Biological Control Agents for Purple Loosestrife” – more rearing details. \$25 each (but volume discounts apply)

Resource Center
7 Business & Technology Park
Cornell University
Ithaca, NY 14850
(607) 255-7660, ext. 2090
Fax: (607) 255-9946

NOTE

Your local and school libraries can also get these on inter-library loan from the Wisconsin DNR library in Madison for free!

**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)
----------------	---------------	--------	--

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...

Did you...

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>

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 plant 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 Plant Found (Fill out one form for each species found.)

Which aquatic invasive plant did you find?:

<input type="checkbox"/> Curly-leaf Pondweed	<input type="checkbox"/> Eurasian Water-milfoil	<input type="checkbox"/> Purple Loosestrife
<input type="checkbox"/> Brittle Naiad	<input type="checkbox"/> Hydrilla	<input type="checkbox"/> Brazilian Waterweed
<input type="checkbox"/> Yellow Floating Heart		

Where did you find the invasive plant?

Latitude:	Longitude:
-----------	------------

Approximately how large an area do the plants occupy?

<input type="checkbox"/> A Few Plants	<input type="checkbox"/> One or a few beds	<input type="checkbox"/> Many beds	<input type="checkbox"/> A Whole Bay or Portion of Lake
<input type="checkbox"/> Widespread, covering most shallow areas of lake	<input type="checkbox"/> Don't know (e.g. didn't check the whole lake)		

Was the plant floating or rooted?

<input type="checkbox"/> Floating	<input type="checkbox"/> Rooted
-----------------------------------	---------------------------------

Estimated percent cover in the area where the invasive was found (optional)

Substrate cobble, %	Substrate muck, %	Substrate boulders, %	Substrate sand, %	Bottom covered with plants, %
---------------------	-------------------	-----------------------	-------------------	-------------------------------

Voucher Sample

Did you collect a sample of the plant (a 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 plant 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 5-10 intact specimens. Try to get the root system, all leaves as well as seed heads and flowers when present. Place in ziplock bag with no water. Place on ice and transport to refrigerator. Bring samples, a copy of this form, along with a map showing where you found the suspect plants to your regional AIS or Citizen Lake Monitoring Coordinator at the DNR.

For DNR AIS Coordinator to fill out

AIS Coordinator(s) 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? Yes No If no, what was it?

Herbarium where specimen is housed: _____ Herbarium Specimen ID: _____

Have you entered the results of the voucher in SWIMS? Yes 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.

Purple Loosestrife Watch: Reporting Procedures

Where & When to Look

Purple Loosestrife is primarily a wetland plant. For this reason, you are most likely to find purple loosestrife growing in a wetland, or adjacent to marshes, lakes, ponds, rivers, or streams. Because of purple loosestrife's extreme hardiness it can also be found growing in ditches along roadways, lowlands, mud holes and drier sites like prairies and agricultural land. **A good rule of thumb is: any site where there are wet soils or standing water at any time during the year is potential purple loosestrife habitat.** Purple loosestrife also needs full sunlight to thrive, so shaded areas are typically not considered to be good habitat.

As a volunteer watcher, the best places for you to look for purple loosestrife are along lakeshores, wetlands, banks of rivers or tributaries, and in the ditches along roadways. Purple loosestrife blooms from about mid July through mid September. **For this reason, August is the best time to look for purple loosestrife.** Before monitoring, you should become familiar with the characteristics of purple loosestrife so that you don't confuse it with native look-alikes plants like fireweed, which bloom at the same time. Please refer to the new state purple loosestrife brochure or the brochure "Purple Loosestrife: What You Should Know, What You can Do" for information on identifying both the weed and similar native plants.

When to Report

- If you discover a new patch any size, any where, even just one plant (Consider personally treating very small infestations!)
- If you are unclear as to whether a site has or has not been reported previously.

How to Report

Fill out the form, detach, fold in half, stamp and mail to the Wisconsin Purple Loosestrife Control Coordinator or fax to 608-221-6353. If you have multiple forms to turn in, place all in an envelope and mail to the address on reverse. A copy of the form will be forwarded to your local DNR Purple Loosestrife Coordinator.

State of Wisconsin
Department of Natural Resources

Purple Loosestrife Volunteer Watch Report
Form 3200-119 (5/03)

Notice: Information provided on this form is voluntary, and authority for its use is identified in s. 23.11, Wis. Stats. Personally identifiable information, including such data as volunteer name, address, etc. will be used for DNR program research and management and is not intended to be used for other purposes. Wisconsin's Open Records law requires the Department to provide this information upon request [ss. 19.31 - 19.69, Wis. Stats.].

Purple Loosestrife Location Information

Report Date	County	Township	Range	E / W	Section(s)
		N			

<input type="checkbox"/> Lake _____	<input type="checkbox"/> Marsh/Wetland _____
<input type="checkbox"/> River _____	<input type="checkbox"/> Roadside Ditch _____
<input type="checkbox"/> Other _____	

Nearest Road or Intersection	OR	GPS Coordinates
		Latitude: DEG MIN SEC N Longitude: DEG MIN SEC W

Land Ownership (Check One): Public Private State County Unknown

Are you the owner? Yes No If No, Name of Owner _____

Directions to Find the Site _____

Approximate No. of Plants/Clumps	Infestation Acreage
<input type="checkbox"/> 1-10 <input type="checkbox"/> 11-49 <input type="checkbox"/> 50+	<input type="checkbox"/> Less than 1/4 acre <input type="checkbox"/> 1/2 - 1 acre (size of football field) <input type="checkbox"/> 1-10 acres <input type="checkbox"/> More than 10 acres

Loosestrife Density	Has the site been treated?	If so, how? (Check All That Apply)
<input type="checkbox"/> Less than 50% <input type="checkbox"/> More than 50%	<input type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> Unknown	<input type="checkbox"/> Pulled <input type="checkbox"/> Cut <input type="checkbox"/> Chem <input type="checkbox"/> Bio <input type="checkbox"/> Unknown

Volunteer Information

Name _____ Telephone Number or E-Mail Address _____

Street Address _____

City _____ State _____ ZIP Code _____

Place
Stamp
Here

DEPARTMENT OF NATURAL RESOURCES
WISCONSIN PURPLE LOOSESTRIFE CONTROL COORDINATOR
1350 FEMRITE DRIVE
MONONA, WI 53716

Notice: To be authorized to plant or cultivate purple loosestrife in the state for the purpose of controlled experimentation only, individuals must obtain authorization from the Wisconsin Department of Natural Resources (WDNR) or the Wisconsin Department of Agriculture, Trade and Consumer Protection (WDATCP). Any person who knowingly violates the requirement may forfeit not more than \$100 for each violation, per s.23.235, Wis. Stats. WDATCP also oversees importation of organisms and this form may also authorize you to import and disperse certain purple loosestrife control insects under WDNR's permit from WDATCP, as long as in-state or authorized sources are used. You are required to provide complete information requested in order to obtain these authorizations. Personally identifiable information collected will be used for program research and management purposes and is not intended to be used for other purposes. Wisconsin's open Records law requires the Department to provide this information upon request (ss. 19.31 - 19.89, Wis. Stats.).

Instructions: Fill out all sections completely, except for Beetle Release Site Information if you do not yet have an intended release location. Under Beetle Rearing Information, be sure to indicate if you need beetles or cage nets from WDNR for propagation, and how many. Mail your completed forms, along with your donation check made out to WDNR (tax deductible) to cover beetle delivery, if needed, to: Purple Loosestrife Biocontrol Coordinator, 1350 Femrite Drive, Monona, WI 53716. Address questions about the program to the Coordinator at 808-221-6349 or brock.woods@dnr.state.wi.us.

The Department Coordinator will sign and return a copy of the authorization form to you. Both the applicant and Coordinator must sign the form for the applicant to be officially registered with the Department to legally grow purple loosestrife or distribute beetles under WDNR's permit. This dually signed permit:

- Affirms your interest in joining the Department's purple loosestrife biocontrol program.
- Indicates your support for program goals and your agreement to grow purple loosestrife plants, solely for the purpose of rearing the biocontrol insects, *Galerucella californiensis* and/or *G. pusilla*.
- Authorizes you to acquire, raise and release these two beetle species under WDNR's permit from the Wisconsin Department of Agriculture, Trade and Consumer Protection (WDATCP), but only if they originate from the WDNR, other in-state sources or WDNR-authorized out-of-state sources.

As a biocontrol cooperator with WDNR you will join hundreds of other volunteers using a safe and effective, long-term strategy to control this aggressive, non-native plant. All your efforts will be crucial and greatly appreciated!

Updated program information is available on the WDNR web site at: <http://www.dnr.state.wi.us> (on various pages).

Applicant Information

Name		Organization (if any)	
Street Address			
City		State	ZIP Code
(Area Code) Home Telephone Number	(Area Code) Work Telephone Number	E-Mail Address	

Beetle Rearing Information

Years in which I have reared beetles (or "0").

Check all that apply:

- I wish to rear beetles in spring, _____ (year).
- I would like _____ beetles from WDNR for propagation (number; 100 is typical; 10 beetles/plant)
- Send free netting for _____ cages (1 cage/10 beetles, plus 1 spare) Let me know if other equipment is available.
- I need a copy of the beetle rearing guide.
- My \$30 donation to cover delivery is enclosed; or,
- I will collect my propagation/distribution stock or buy it elsewhere (not from WDNR). Send monitoring information.

Use this section for listing additional information you need.

Purple Loosestrife Cultivation Authorization and Biocontrol Insect Application

Form 3200-116 (R 5/03)

Page 2 of 2

Beetle Release Site Information - Optional

Information in this section is optional, based on whether or not you have already chosen a beetle release site. Check all that apply. This will help us evaluate the site to determine if it is suitable for beetles and bio-control. The site meets the following criteria:

Category 1	<input type="checkbox"/>	No purple loosestrife (PL) control at present
	<input type="checkbox"/>	Control of PL going on, but it's ineffective
	<input type="checkbox"/>	No chemical control over the last two years
Category 2	<input type="checkbox"/>	50 plants-1 acre of PL (best for insectary: recollecting, rearing/dispersing insects)
	<input type="checkbox"/>	More than 1 acre of PL
Category 3	<input type="checkbox"/>	Good site access and footing (for follow up monitoring or collecting)
	<input type="checkbox"/>	Access and/or footing poor
Category 4	<input type="checkbox"/>	Site secure for at least several years (no other PL control or development planned)
Category 5	<input type="checkbox"/>	Plants mature: at least several stems (3/16" plus diameter) per clump: 3' to 7' tall
Category 6	<input type="checkbox"/>	More that half of the plants are PL (almost solid PL)
	<input type="checkbox"/>	PL is half or less of all plants on the site
Category 7	<input type="checkbox"/>	Water level is below ground surface all year or, if it floods, then not during June-August
	<input type="checkbox"/>	Water below surface all year or, if it floods, not for more than several days at any time
Category 8	<input type="checkbox"/>	Site not likely to spread seed to nearby, un-infested areas while beetle numbers increase

Severity of purple loose strife infestation in the area around your site is: (check one)

Low Medium Severe

Site Location

Site Owner Name	Address	(Area Code) Telephone Number
-----------------	---------	------------------------------

Have you contacted your local WDNR or UW Extension agent about the site? Yes No

If YES, Name of agent contacted

Terms and Conditions of Permit

The cooperator agrees to the following requirements to participate in the WDNR Purple Loosestrife Biocontrol Program:

1. Raise purple loosestrife in a controlled setting to minimize the possibility of spreading the plant further through seed or plant parts; pinch off all developing flowers once larvae are done feeding; destroy unused plants/parts that not returned to loosestrife infestations.
2. Obtain permission from all landowners on whose property beetles will be collected or released.
3. Acquire for rearing or release, purple loosestrife foliage beetles (*Galerucella calmariensis* and/or *G. pusilla*) from WDNR or other Wisconsin suppliers, from Wisconsin sites, with landowner permission, or from any WDNR-authorized out-of-state supplier. (This includes Cornell University, New York, and the Illinois Dept. of Natural Resources and any other sources that may be added in the future.)
4. Furnish the WDNR with a complete list of all insect release site locations and landowners within one month of each release. Use the release site form # 3200-117, available from WDNR.

Applicant Signature	Date
---------------------	------

WDNR Use Only

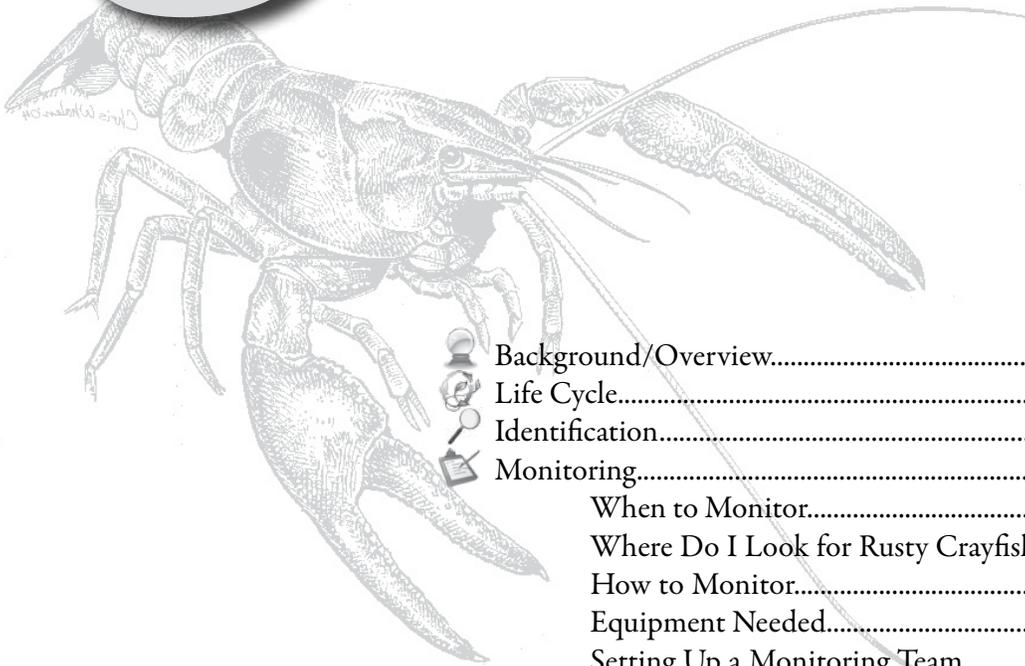
The State of Wisconsin Department of Natural Resources hereby issues this authorization to plant or cultivate purple loosestrife for biocontrol purposes, solely for the purpose of rearing the biocontrol insects as specified above.

WDNR Project Coordinator	Signature	Date
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RUSTY CRAYFISH

MONITORING PROTOCOL

5



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Special thanks to the UW- Madison Center for Limnology and the Wisconsin Water Action Volunteer program for assistance with protocol development.



BACKGROUND/OVERVIEW

Rusty crayfish are native to streams in the Ohio River Basin states of Ohio, Kentucky, Illinois, Indiana and Tennessee. They were likely introduced to Wisconsin waters primarily by anglers who used them as live bait.

In Wisconsin lakes, rusty crayfish can impact native crayfish populations, aquatic plant communities, and consequently entire lake ecosystems. Rusty crayfish are aggressive and will “chase” native crayfish from their prime habitat. When native crayfish are chased out into the open, they are more susceptible to predation by large fish. The rusty crayfish consequently displace the native crayfish, and often reach higher densities.

Rusty crayfish eat small fish, insects, fish eggs and aquatic plants. They eat about four times the amount of food a native crayfish eats. They are considered messy eaters because when they snip off a plant to eat, they often only eat small pieces of the plant and the remainder of the plant floats away. If rusty crayfish are eating Eurasian water-milfoil, they can actually spread the water-milfoil with their eating habits.

There are 330 native crayfish species in the United States, of which 111 species are in peril or believed to be extinct. Native crayfish are important members of aquatic ecosystems in Wisconsin. They perform many functions, including processing detritus and serving as food for game fish (Hobbs and Jass, 1988).

The Citizen Lake Monitoring Network (CLMN) volunteers monitor native crayfish populations as well as rusty crayfish populations when and where they monitor. Please do not sort or “select” only rusties to send in for identification. The Center for Limnology looks at native crayfish on lakes where rusty crayfish monitoring is taking place. For lakes with rare crayfish, we would not want multiple years of collection as this trapping could kill off these rare crayfish. CLMN volunteers only need to monitor on lakes not known to have rusties. The list of waterbodies in Wisconsin where rusty crayfish have been verified can be found at <http://dnr.wi.gov/lakes/invasives/>.



LIFE CYCLE

Mature rusty crayfish mate in late summer, early fall, or early spring. The male transfers sperm to the female, which she then stores until her eggs are ready to fertilize, typically in the spring (late April or May) as water temperatures begin to increase. The stored sperm are released as eggs are expelled and external fertilization occurs. The eggs attach to swimmerets (small, leg-like appendages under the tail). Just prior to egg laying, white patches will appear on the underside of the female’s abdomen (“tail section”), especially on the tail fan. These white patches are glair, a mucus-like substance secreted during egg fertilization and attachment. Rusty crayfish females lay from 80 to 575 eggs. Eggs hatch in three to six weeks, depending on water temperature. Once hatched, young crayfish cling to the female’s swimmerets for three to four molts (molting is when crayfish

shed their old shell to allow growth). Young crayfish may stay with the female for several weeks. She offers them protection during this vulnerable life stage. Eventually, the young leave the female. They undergo eight to ten molts before they mature (Hobbs and Jass 1988).



IDENTIFICATION

In your packet is the Rusty Crayfish Watch card. This card, along with the characteristics listed below will help you in the identification of rusty crayfish.

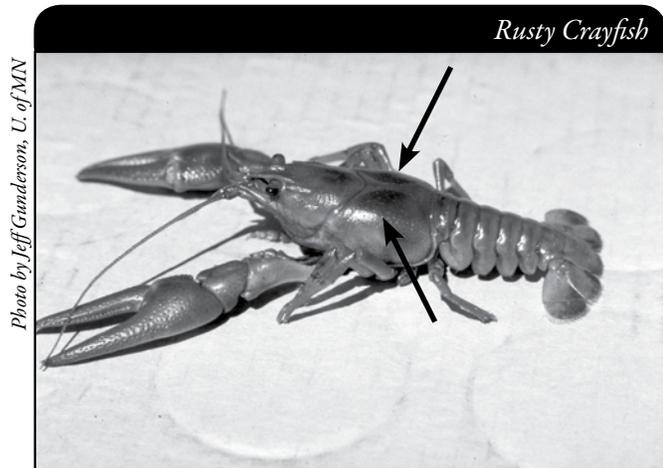
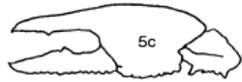
Rusty crayfish, *Orconectes rusticus* (pronounced or-kon-NEK-teez RUS-ti-kus) identification can be difficult. Positive identification requires looking at a number of characteristics and having enough experience to interpret them. Here are some general, easily-observed characteristics that can be used to help you identify mature rusty crayfish adults.

RUSTY CRAYFISH CHARACTERISTICS

- Bigger, more robust claws than native crayfish species
- Black bands at claw tips
- Rusty spots on each side of their carapace (the shell covering the first major body section). The spots are located on the carapace as though you picked up the crayfish with paint on your forefinger and thumb (see photo below). The spots may not always be present or well developed on rusty crayfish from some waters.



Rusty crayfish claw (5a) compared to some other species. Note the black bands at the claw tip.



Rusty crayfish showing the "rust-colored" spots on the carapace.



RUSTY CRAYFISH MONITORING

The goal of the Citizen Lake Monitoring Network is to find out which lakes have rusty crayfish. If you or your group is interested in monitoring for rusty crayfish densities and removal, refer to <http://limnology.wisc.edu/personnel/jakevz/pubs.html>.

The methods used in this manual are for crayfish collection in lakes. Stream and river sampling have different sampling protocols and trap restrictions. Please refer to the current Wisconsin fishing regulations for restrictions on crayfish collection.

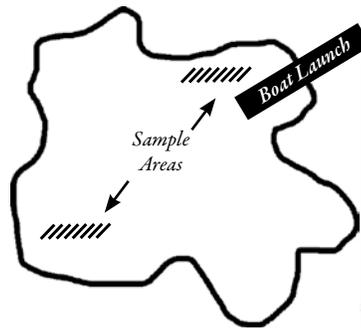
WHEN TO MONITOR

In Wisconsin, crayfish are most active from late June through mid-August, so this is the best time to trap crayfish. **Only sample your lake one time/summer.** Endangered crayfish can be easily trapped out of a lake.

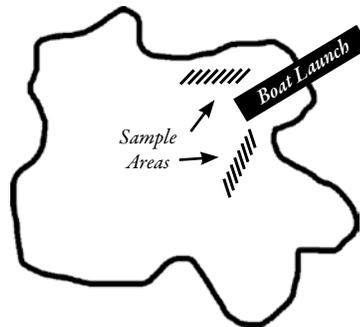
WHERE DO I LOOK FOR RUSTY CRAYFISH?

Crayfish reside in a variety of habitats including rocky substrates, sand flats and aquatic plant beds, so please sample a variety of ecosystem types.

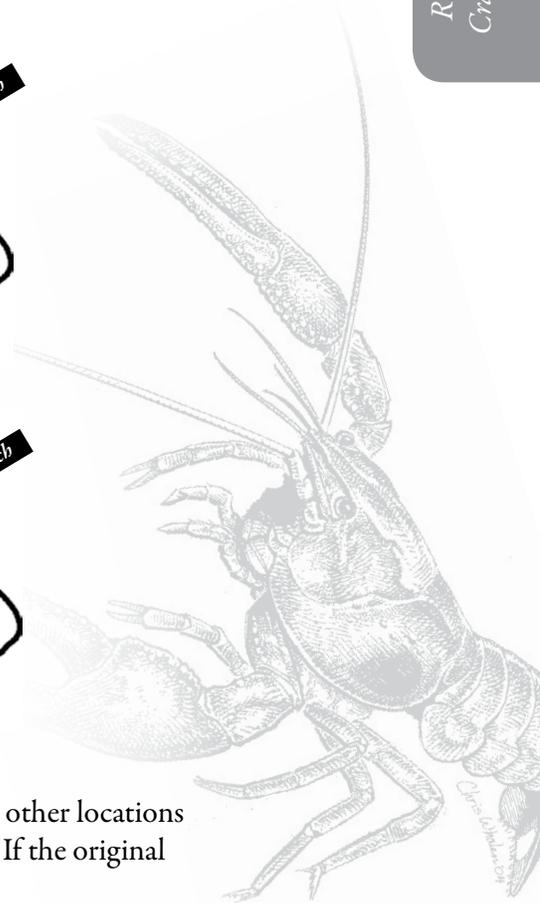
The preferred method of sampling in lakes is to collect crayfish along two transects on opposite sides of the lake.



For large lakes, this may be unrealistic, so collect crayfish along the shoreline in each direction from the boat launch, beach and/or other high use area.



If the sites you use do not produce crayfish, you may want to sample several other locations on the lake – focus the additional monitoring efforts on areas with cobble. If the original sampling location produces crayfish, no further monitoring is necessary.



HOW TO MONITOR

There are two methods of monitoring for the presence of rusty crayfish – trapping and hand/net collection. Both methods entail collecting crayfish, preserving individuals from all crayfish species present, and delivering them to your local CLMN contact.

Trapping is an effective way to collect crayfish. It entails a visit to the sampling site on two consecutive days. If sampling over a two day period is not possible, please collect the crayfish using a net and hand collection. Trapping is best for catching adult crayfish – especially adult males. They are aggressive and defensive of food and will eat juvenile crayfish in the trap.

Hand or net collection can be done in one visit to the site. Crayfish can be collected by hand (mask and snorkel) or with a dip nets or seines. Use a collection technique that suits the conditions of your lake. Hand or net collection is best for sampling juvenile crayfish.

A combination of trapping AND hand/net collection provides the best information on crayfish distributions.

Make sure that the water temperature is above 54° F (12° C) before you sample.

Crayfish are less active (and less able to be trapped) when water temperatures are below 54° F (12° C).

You will need a fishing license or small game license to trap crayfish. Before initiating any monitoring, verify that your license is valid. No person may possess live crayfish and angling equipment simultaneously on any inland water (except the Mississippi River), so please do **not** take your fishing equipment with you when doing the crayfish monitoring.

TRAPPING

1. **Expand the trap opening to 4-5 cm (1.5 – 2 inches) in diameter** (information on traps can be found in the Equipment section on page 112). This can be done by pushing an oar handle into the opening. If the holes are too large, you may trap and kill mink which may swim in to eat the bait.
2. **Put bait (about 1/4 pound) into a standard wire-caged minnow trap.** Beef liver works well for crayfish trapping. Some trappers put a can of cat food in the trap – open the can part way so the juices escape, but the crayfish cannot eat the entire contents – this will keep the crayfish coming into the trap.

NOTE

With the presence of Viral Hemorrhagic Septicemia (VHS) in Wisconsin, baiting requirements have changed. Parts of fish, by-products including fish meal or prepared parts of such fish may not be used for bait unless: the fish were caught from the water being trapped, were obtained from a bait dealer, or were used with written authorization from the WDNR. Other meats (e.g., chicken and beef livers) may be used for bait for crayfish.

3. **Label and tag the trap.** Floats and markers used to locate the traps must be less than 5 inches in diameter and cannot be orange or fluorescent. Traps must be tagged or marked with a contact name, street address, city, and phone number.
4. **If you have minnow traps at home, it is ideal to set more than one trap at each site. Ideally you would set 5-10 traps at each sample site. If you only have one trap, you can sample 5- 10 days in one site and then move the trap from site to site.** Traps should be at least 10 meters (30 ft.) apart from each other at water depths of 0.5 to 3.0 meters (2-10 feet). Select your sample sites so that you are monitoring both rocky areas (preferred) and other habitats (as available).
5. **Leave the trap(s) overnight and empty it/them the next day. Legally the traps have to be emptied within 24 hours** so if you only have one trap, you can reset the trap in the same location several days in a row. If overnight sets are not possible, please use the hand or net collection techniques described below.
6. **Collect until you have retrieved a maximum of 30 crayfish.** If you collect more than 30 crayfish, only keep 30 crayfish to preserve. When doing this, you want to select crayfish from each species collected, so you would select crayfish that have different characteristics (color, shape, size etc) from each other.
7. **If you do not catch any crayfish at your original sample sites, please feel free to trap in other areas around the lake.** Crayfish tend to hold on cobble areas as it offers a hiding place for the crayfish. You may want to focus your monitoring on these sites if the original sites are not productive.
8. **Stop collection efforts if no crayfish are trapped after several days of effort.** Note how many days of effort on the data form.

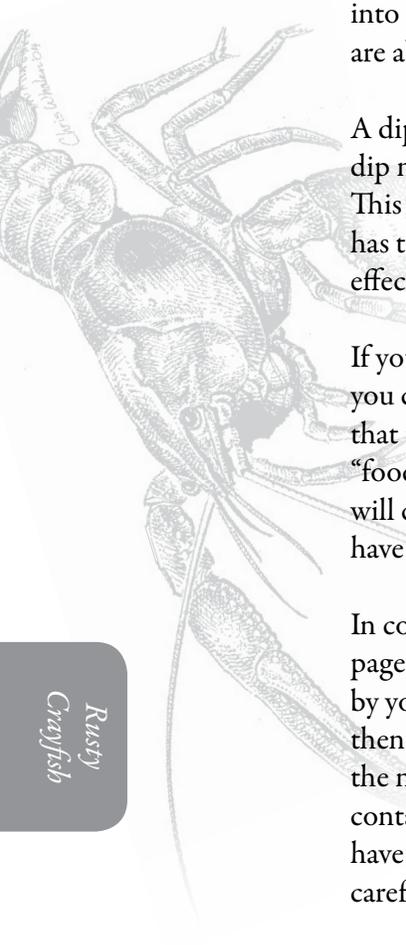
Do NOT try to target one crayfish species. Be sure to collect and preserve individuals from **ALL crayfish species** present. The information will be analyzed by the UW-Madison Center for Limnology to track native crayfish species and monitor the impact of rusty crayfish on the native species. Other invasive crayfish have also been found in Wisconsin lakes in the past. The Center for Limnology will identify all crayfish to see if other invasive or rare crayfish were caught.

HAND/NET COLLECTION

When possible, this technique should be used *in combination* with trapping. When it is not possible to return the following day to pick up crayfish traps, use hand/net collection alone.

Use a collection technique that suits the conditions. Crayfish can be collected by hand (mask and snorkel), with a dip net or through use of a minnow seine. These methods work well in lakes.

Collecting crayfish by hand is easiest if you use a mask and snorkel. This allows you to collect the crayfish in a little bit deeper water. Walk up to the crayfish and slowly lean over (mask and snorkel work great as now you can have your face in the water). You can distract the crayfish with one hand by moving your fingers in front of the crayfish. With



your other hand slowly come up behind the crayfish and pinch it around the area directly behind the head. This definitely takes some practice and gloves are recommended as crayfish will “pinch” back. If the crayfish “pinches” you and stays on, put your hand back into the water and the crayfish will let go. Crayfish will stay pinched on your finger if they are above water. Again you may want to wear gloves for this collection method.

A dip net can be used in shallow water areas. There are some legal restrictions with using a dip net that has a handle. You can only “lift” the dip nets. You cannot sweep with the nets. This is why the photo in the Equipment section (page 113) shows a bent handle. The net has to be lifted vertically through the water column. With practice, this method is quite effective.

If you are using an umbrella style net (pictured in the Equipment section on page 113), you can collect using several different methods. If you have time, you can lower the net so that the net rests on the lake bed. The crayfish will crawl onto the net. You can also place “food” (beef liver, canned tuna or canned cat food) in the center of the net and the crayfish will climb on top of the net so they can get the food. If you want to speed this process up, have someone wading next to the net, driving the crayfish onto the net.

In conditions of reduced water clarity, a seine net (pictured in the Equipment section on page 113) works best. A seine net can be used by one or two people. If you are netting by yourself, you drive one of the end posts into the sand/ground at the shoreline. You then take the other end of the seine and “walk” out into deeper water while stretching the net between you and the end post. Make sure the weighted edge of the seine stays in contact with the lake’s substrate. Keep walking in a semi-circle around the post. Once you have completed your semi-circle, you will be standing next to the end post. You can then carefully pull in the net, trapping the crayfish.

1. **Distribute your collection efforts over a variety of habitats, including rocks, vegetation, and sand.** Try not to concentrate your sampling effort in one small area.
2. **Collect until you have retrieved a maximum of 30 crayfish or when 40 minutes of “total search time” has elapsed, whichever comes first.** If you collect more than 30 crayfish, only keep 30 crayfish to preserve. When doing this, you want to select crayfish from each species collected, so you would select crayfish that have different characteristics (color, shape, size etc) from each other.

Do NOT try to target one crayfish species. Be sure to collect and preserve individuals from **ALL crayfish species** present. The information will be analyzed by the UW-Madison Center for Limnology to track native crayfish species and monitor the impact of rusty crayfish on the native species. Other invasive crayfish have also been found in Wisconsin lakes in the past. The Center for Limnology will identify all crayfish to see if other invasive or rare crayfish were caught.

PRESERVATION

All crayfish collected (a maximum of 30) are to be preserved and later identified by employees of the UW-Madison Center for Limnology. Please follow these guidelines when preserving crayfish:

1. Place the collected crayfish into the Whirl-Paks (specialized plastic bags) provided to you. Preserve up to 30 total crayfish for the site; using approximately 1-3 whirl-paks. If you are using a combination of sampling methods, include a variety of sizes and crayfish from both nets and minnow traps. If less than 30 crayfish were collected, preserve all of them.

NOTE *Do not overfill the pack with crayfish* – to prevent decay, each Whirl-Pak should only be $\frac{1}{4}$ full of crayfish.

- Use new Whirl-Paks at each site and be sure they are **well labeled**.
- If you do not have Whirl-Paks, freezer bags will work.
- Do not mix crayfish from different sites.

2. **Fill the pack with minimum 70% alcohol (rubbing alcohol) if you have it.** There should be approximately three parts alcohol to one part crayfish. Larger size bottles of alcohol can be purchased at hardware stores in the paint/refinishing sections of the stores. If you do not have alcohol, you can place the crayfish in a cooler that contains ice and then take the crayfish back to your house where you can freeze the Whirl-Paks and crayfish (see step 5).

3. Liquid-proof labels have been provided for your use. **Be sure to USE A PENCIL to fill out the labels**, and place them inside the Whirl-Paks. **DO NOT** label the outside of Whirl-Paks with a permanent marker; alcohol leakage makes the ink disappear!!! **SAMPLES WITH UNCLEAR LABELS CANNOT BE USED!!! Place a label inside the whirl-pak with:**

- a. Date
- b. Site # (*Use the same number as the data sheet*)
- c. Lake name
- d. Water Body Identification Number (WBIC)
- e. County
- f. Whirl-Pak # of total.

4. **Seal the Whirl-Pak.**

5. **Store the whirl-pak bags with crayfish in a freezer.** Even if you have alcohol in the bags, freezing will help slow the rotting process even further. If you cannot freeze the sample(s), finish the reporting and deliver the crayfish to your local DNR CLMN contact. They can place the samples in their freezer.

Photos provided by UW-Madison Center for Limnology



Step 1: Fold the top of the Whirl-Pak 4-5 times.

Step 2: Fold the wire tabs in front and twist together 4-5 times to seal the pack.

TRANSPORTATION

Take your samples to your local DNR CLMN contact. **Please phone your contact ahead of time to ensure they are in the office on the day you plan deliver the samples. Try to get your crayfish to your DNR contact by early September.**

DNR offices will arrange for transportation of the samples to the UW-Madison Center for Limnology, where all of the preserved crayfish will be cataloged at the end of the summer sampling season.

EQUIPMENT NEEDED

- | | |
|---|---|
| <input type="checkbox"/> Minnow or crayfish traps (for trapping) | <input type="checkbox"/> Nets (for net/hand sampling) |
| <input type="checkbox"/> Bait (for trapping) | <input type="checkbox"/> Whirl-Pak bags |
| <input type="checkbox"/> Buoys (for trapping) | <input type="checkbox"/> Whirl Pak labels |
| <input type="checkbox"/> Rope (for trapping) | <input type="checkbox"/> Sharpie marker |
| <input type="checkbox"/> Pencil | <input type="checkbox"/> Preservation alcohol* (optional) |
| <input type="checkbox"/> Crayfish Report Form #3200-129 (found at the end of this section and at http://dnr.wi.gov/lakes/monitoring/forms.aspx). | |
| <input type="checkbox"/> Map for marking crayfish collection locations | |

*Larger size bottles of alcohol can be purchased at hardware stores in the paint/refinishing sections of the stores.

TRAPS

Traps used in the training sessions were purchased through <http://www.frabill.com>. Other companies also sell traps. You can locate vendors by conducting a Google search on crayfish traps. The trap style is not important for presence / absence monitoring.

Most traps sold meet the trout stream size requirements which are:

- Traps must not be longer than 24" in a designated trout stream.
- Traps must not be wider than 16" in any stream.

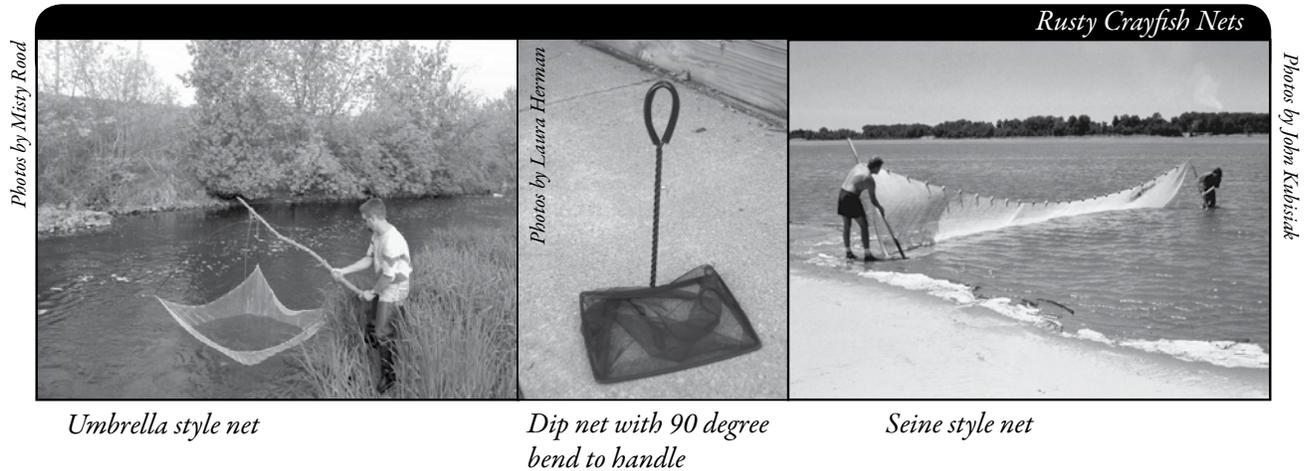
By using traps that meet these requirements, you can ensure that all proper size restrictions are followed.



Minnow trap version of the crayfish trap.

NETS

Nets can be the umbrella style dip nets (vertical lift net often used in sucker and smelt fishing). If the dip net has a handle, the net has to be at a 90 degree angle to the handle so that the net is raised vertically in the water. There is not minimum net size restriction, but the maximum net size is 8 feet in diameter for the umbrella style. In conditions of reduced water clarity, a seine net works best.



SETTING UP A MONITORING TEAM

If you are doing hand/net collections, it may be helpful to have a team of monitors. Designate a team leader who is willing to coordinate the group. The team leader can also be the person who enters the monitoring results on the CLMN website at <http://dnr.wi.gov/lakes/clmn>, takes the samples to the local CLMN DNR contact, and the person to whom other volunteers can bring suspect species. All crayfish should go to your local CLMN DNR contact by September so that the crayfish get transported to the Center for Limnology. Be creative and most importantly, do not burn out your team leaders!

Consider having a mini-crayfish training session for your team. The Citizen Lake Monitoring Network Coordinator (page viii) for your area may be able to assist you with a training session. If not, 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

It is beneficial to mark on a map where you collected your samples. This will help you document where the samples were taken. Make sure the locations on your map match with the station names on the data sheets.

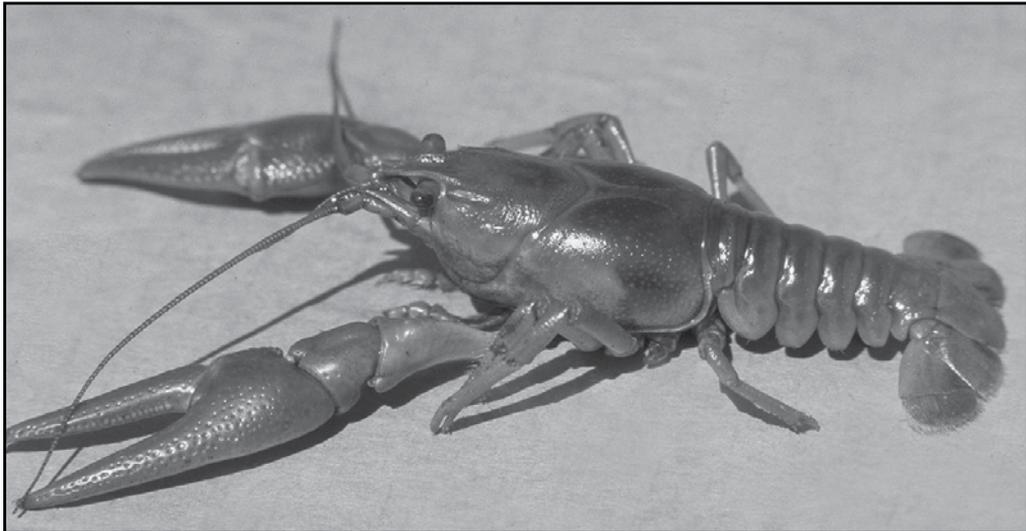
If you have a team of monitors doing hand/net collections, a map will also assist your team in deciding who will collect crayfish where. Once you have your “team” together, print out a map so that you can mark the areas where crayfish were collected.

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 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 where crayfish were collected and then load this data into a mapping program and print out the collection locations.

Photo by Jeff Gunderson, University of MN



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 Citizen Lake Monitoring Network 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 who 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 and 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 a confirmation email, 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.

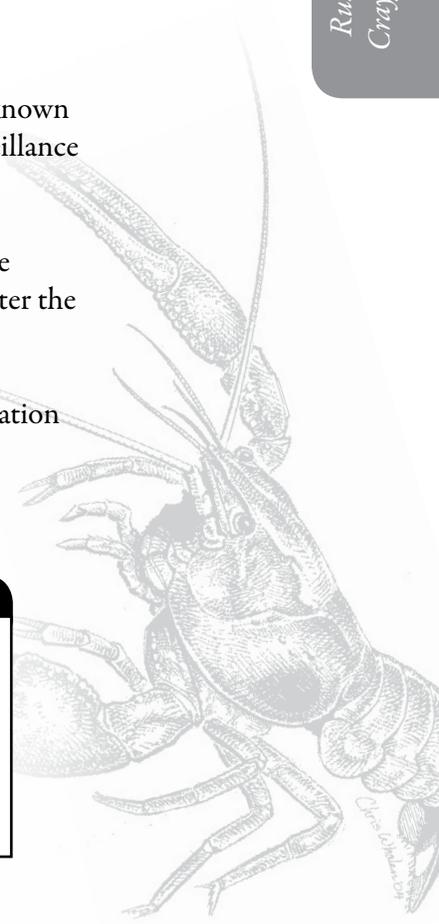
- Report your results using the Crayfish Report, Form 3200-129
- If you believe you found a rusty crayfish and your lake has not been previously known to have rusty crayfish, report the information using the: Aquatic Invasives Surveillance Monitoring Report, Form 3200-133.

Be sure to report your results after you sample. You can print out a paper copy of the reporting form off the website so you can fill it in during or after sampling. Then enter the information on <http://dnr.wi.gov/lakes/CLMN>.

You should also provide your local CLMN contact with a lake map showing the location of the monitoring site(s). The crayfish monitoring site(s), along with the names and addresses of the monitors, are maintained and updated periodically.



Remember, for tracking the movement of rusty crayfish infestations, a report of ‘0 crayfish’ at a location is just as important as finding crayfish. One cannot confidently state that rusty crayfish are not present in an area if no one has looked.



WHAT TO DO WITH SUSPECT SPECIMENS

If you believe you found a rusty crayfish and your lake has not been previously known to have rusty crayfish, fill out the 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>) and deliver it with the suspect specimen to your team leader, local DNR office, or the UW Center for Limnology.



PREVENTION STARTS WITH US

If your child brings home a crayfish from school, a lake or river, please do not release the crayfish into the environment. The crayfish could be an invasive species. Remember, females store sperm until they are ready to release their eggs. So, even adding one crayfish may cause problems.

- Do not use live crayfish for bait as it may escape.
- Do not transfer crayfish to your lake in the hopes that they will kill plants. Crayfish prefer native plants over invasives and, by their eating habits, can spread invasive plants causing more problems.



Photo by Paul Skawinski



ADDITIONAL MATERIALS AND SUPPORTING DOCUMENTATION

LEGAL INFORMATION ABOUT CRAYFISH HARVESTING

REFERENCES

REPORTING FORMS

AQUATIC INVASIVES SURVEILLANCE MONITORING REPORT

- **SINGLE LOCATION, MULTIPLE DATES**

- **MULTIPLE LOCATIONS, ONE DATE**

CRAYFISH REPORT

*Rusty
Crayfish*



LEGAL INFORMATION ABOUT CRAYFISH HARVESTING

2008-2009 Crayfish Fishing Regulations (<http://dnr.wi.gov/fish/regulations/>)
(from *Guide to Wisconsin Hook and Line Fishing Regulations*)

- A fishing or small game license is required to take crayfish.
- No person may possess live crayfish and angling equipment simultaneously on any inland water except the Mississippi River
- No person may place, deposit, throw or otherwise introduce live crayfish or crabs into any water of the state unless a permit authorizing introduction has been issued.

There are no bag or size limits on crayfish and no closed season except on the Wisconsin/Minnesota boundary waters where the open season is from May 1 to the following March 1, both dates inclusive.

Crayfish scoops may be used in the Wisconsin/Minnesota boundary waters provided the scoops do not exceed 4 feet in length, 3 feet in width and 18 inches in depth attached to a handle not to exceed 4 feet in length.

Crayfish may be taken in all waters by the following means only:

- By hand
- By use of minnow seines and minnow dip nets, where the same are permitted for the taking of minnows, and
- By crayfish traps (other than in trout streams) with the entrance of the trap not to exceed 2-1/2 inches at the greatest diagonal measurement.

Traps must bear the name and address of the owner and must be raised and emptied at least once each day following the day set.



With the presence of Viral Hemorrhagic Septicemia (VHS) in Wisconsin, the laws on crayfish baiting have changed. Parts of fish, by-products including fish meal or prepared parts of such fish may not be used for bait unless: the fish were caught from the water being trapped, were obtained from a bait dealer, or were used with written authorization from the WDNR. Other meats (e.g., chicken and beef livers) may be used for bait for crayfish. For the most current information on VHS, please refer to <http://dnr.wi.gov/fish/vhs/>.

Floats or markers used to locate traps may not exceed 5 inches in size, may not extend more than 4 inches above the water surface and cannot be orange or fluorescent in color.

REFERENCES

Hobbs, H.H. and J. P. Jass. 1988. The crayfishes and shrimp of Wisconsin. Milwaukee Public Museum: Milwaukee, Wisconsin.

Rusty Crayfish: A Nasty Invader. Sea Grant, Minnesota-University of Minnesota. Pub # 34. Revised August 2002.

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)

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...	Did you...
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
Curly-Leaf Pondweed?	Yes	No	Did not look for	Purple Loosestrife?	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
Freshwater Jellyfish?	Yes	No	Did not look for	Zebra Mussels?	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>

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? 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:
-----------	------------

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?

Dock/pier Dam Rocks Plants Boats or Gear Plate Sampler(s) Logs, acorns, pine cones or other woody structure
 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?

Rhinelander Spooner Green Bay Oshkosh Did not take sample to a DNR office
 Fitchburg Waukesha Eau Claire Superior 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.

Aquatic Invasive Animal Incident Report

Form 3200-126 (R 02/10)

Page 2 of 2

Length of Zebra or Quagga Mussels from Sample (if applicable)

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

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.

The purpose of this form is to track the presence/absence and abundance of crayfish in lakes as part of AIS surveillance monitoring.

If you used traps, use one form for each area of the lake trapped.

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 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	Station Name	WBIC	County
Latitude of approx. center of traps at site		Longitude of approx. center of traps at site	
Method of obtaining Latitude and Longitude: <input type="checkbox"/> GPS <input type="checkbox"/> Online Surface Water Data Viewer <input type="checkbox"/> Other Mapping Software <input type="checkbox"/> Other _____			

Date and Time of Monitoring			
Start Date	Start Time	End Date	End Time

If you used a net, the Start Date and End Date are the date you monitored. If you used traps, Start Date = Date minnow traps deployed, or since you last removed crayfish from the traps. End Date = Date you pulled up the minnow traps. NOTE: Traps must be pulled every 24 hours.

Equipment Used	
Equipment (check all that apply) <input type="checkbox"/> Minnow Trap <input type="checkbox"/> Net <input type="checkbox"/> Other	Type of trap or net used:

If you used traps		
Number of traps used	Average Water Depth where you put traps	Feet / Meters (circle one)

If you used a net	
Total search time (minutes x # of people)	Average water depth where looked Feet / Meters (circle one)

Estimated percent cover in the sample area				
Substrate cobble, %	Substrate muck, %	Substrate boulders, %	Substrate sand, %	Bottom covered with plants, %

Monitoring Results	
Species	Total Number of Crayfish Caught at Site
Calico Crayfish (<i>Orconectes immunitus</i>)	
Devil Crayfish (<i>Cambarus diogenes</i>)	
Northern Clearwater Crayfish (<i>Orconectes propinquus</i>)	
Prairie Crayfish (<i>Procambarus gracilis</i>)	
Red Swamp Crayfish (<i>Procambarus clarkii</i>)	
Rusty Crayfish (<i>Orconectes rusticus</i>)	
Virile Crayfish (<i>Orconectes virilis</i>)	
White River Crayfish (<i>Procambarus acutus</i>)	

Voucher Sample	
Number of voucher specimens collected at this site:	
If you found what you suspect are rusty crayfish or red swamp crayfish, did you collect a 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"/> Other Office: _____ <input type="checkbox"/> Fitchburg <input type="checkbox"/> Waukesha <input type="checkbox"/> Eau Claire <input type="checkbox"/> Superior	

Additional Comments

For DNR staff to fill out	
Did you get sample to a crayfish identification expert? <input type="checkbox"/> Yes <input type="checkbox"/> No	If yes, who verified it?
http://www.dnr.wi.gov/lakes/ais/whattodo/staff/AisVerificationExperts.pdf	
Was the sample confirmed as including rusty crayfish? <input type="checkbox"/> Yes <input type="checkbox"/> No	Red swamp crayfish? <input type="checkbox"/> Yes <input type="checkbox"/> No

DNR staff: Please enter voucher information for new AIS findings into SWIMS under the Incident Report Project for your county (Choose Incident Report Form in SWIMS). Enter date of sampling for "Start Date", Person who identified specimen as "Data Collector", and Monitoring location as "Station".

ZEBRA & QUAGGA MUSSELS

MONITORING PROTOCOL

6



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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 do 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/Quagga
Mussels



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 Korth



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.

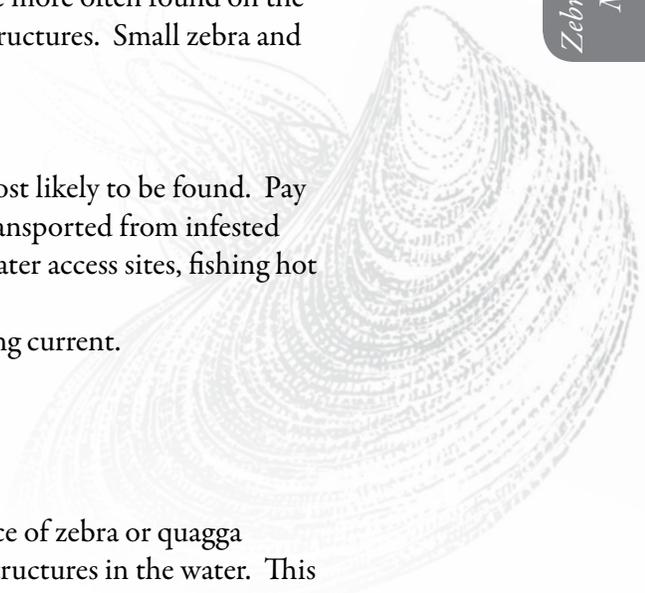
ESTABLISHED SPECIES MONITORING

- 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.

Photos by Laura Herman

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.

Zebra Quagga
Mussels

- 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.

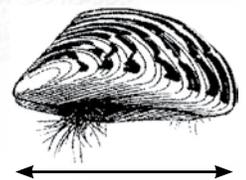
1. Place sampler in a small, white or clear garbage bag as you remove it from the water. This will prevent the mussels from falling off into your boat.
2. At home, disassemble the sampler and examine each plate with a 30x-hand lens. Scan all four plates, top and bottom, looking for zebra or quagga mussels.
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).



NOTE 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.

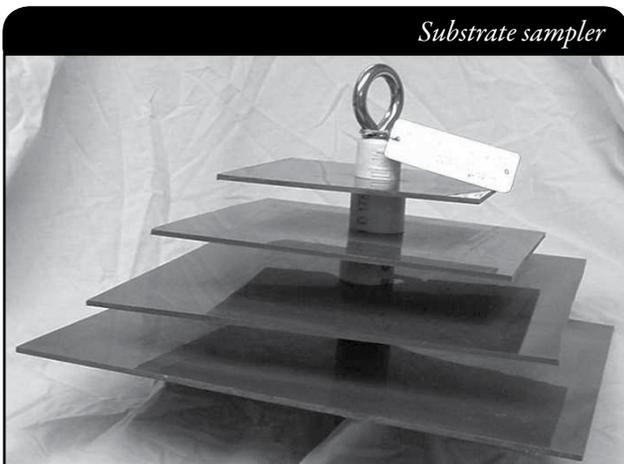


Photo by Ron Martin

Substrate 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

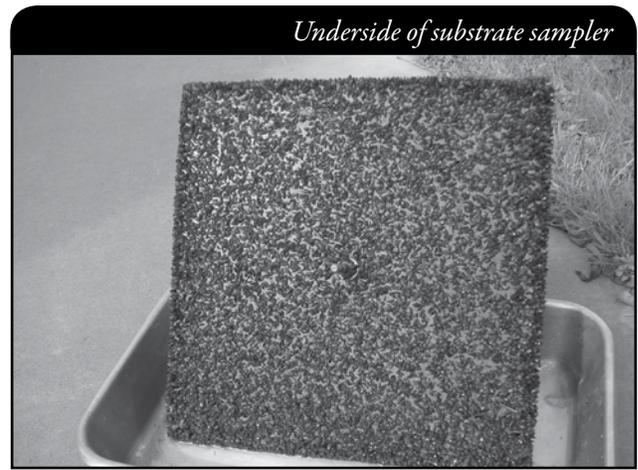


Photo by Mike Prud

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



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.



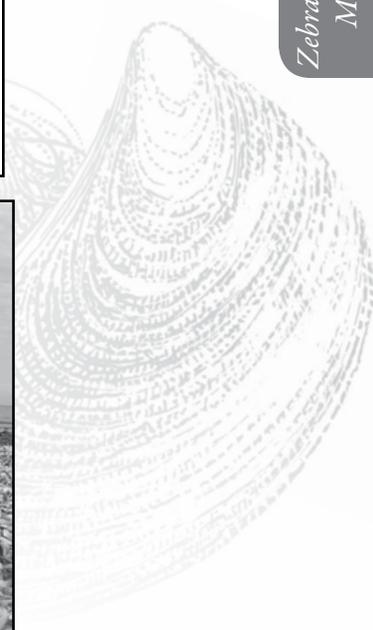
PREVENTION STARTS WITH US

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 Kortib



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>

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)

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...	Did you...
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
Curly-Leaf Pondweed?	Yes	No	Did not look for	Purple Loosestrife?	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
Freshwater Jellyfish?	Yes	No	Did not look for	Zebra Mussels?	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>

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>.

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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: _____

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?
 Dock/pier Dam Rocks Plants Boats or Gear Plate Sampler(s) Logs, acorns, pine cones or other woody structure
 Other: _____

Size of Largest Zebra Mussel Found	Size of Smallest Zebra Mussel Found (individual measurements on back of page)
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Voucher Sample

Did you collect a sample (voucher specimen) and bring it to your local DNR office? If so, which office?
 Rhinelander Spooner Green Bay Oshkosh Did not take sample to a DNR office
 Fitchburg Waukesha Eau Claire Superior 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?
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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>.

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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
-----------------	------------	----------

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: _____

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?
 Dock/pier Dam Rocks Plants Boats or Gear Plate Sampler(s) Logs, acorns, pine cones or other woody structure
 Other: _____

Size of Largest Zebra Mussel Found	Size of Smallest Zebra Mussel Found (individual measurements on back of page)
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Voucher Sample

Did you collect a sample (voucher specimen) and bring it to your local DNR office? If so, which office?
 Rhinelander Spooner Green Bay Oshkosh Did not take sample to a DNR office
 Fitchburg Waukesha Eau Claire Superior 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: _____ <small>(for list see http://dnr.wi.gov/invasives/aquatic/whattodo/staff/AisVerificationExperts.pdf)</small>	
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 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.

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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

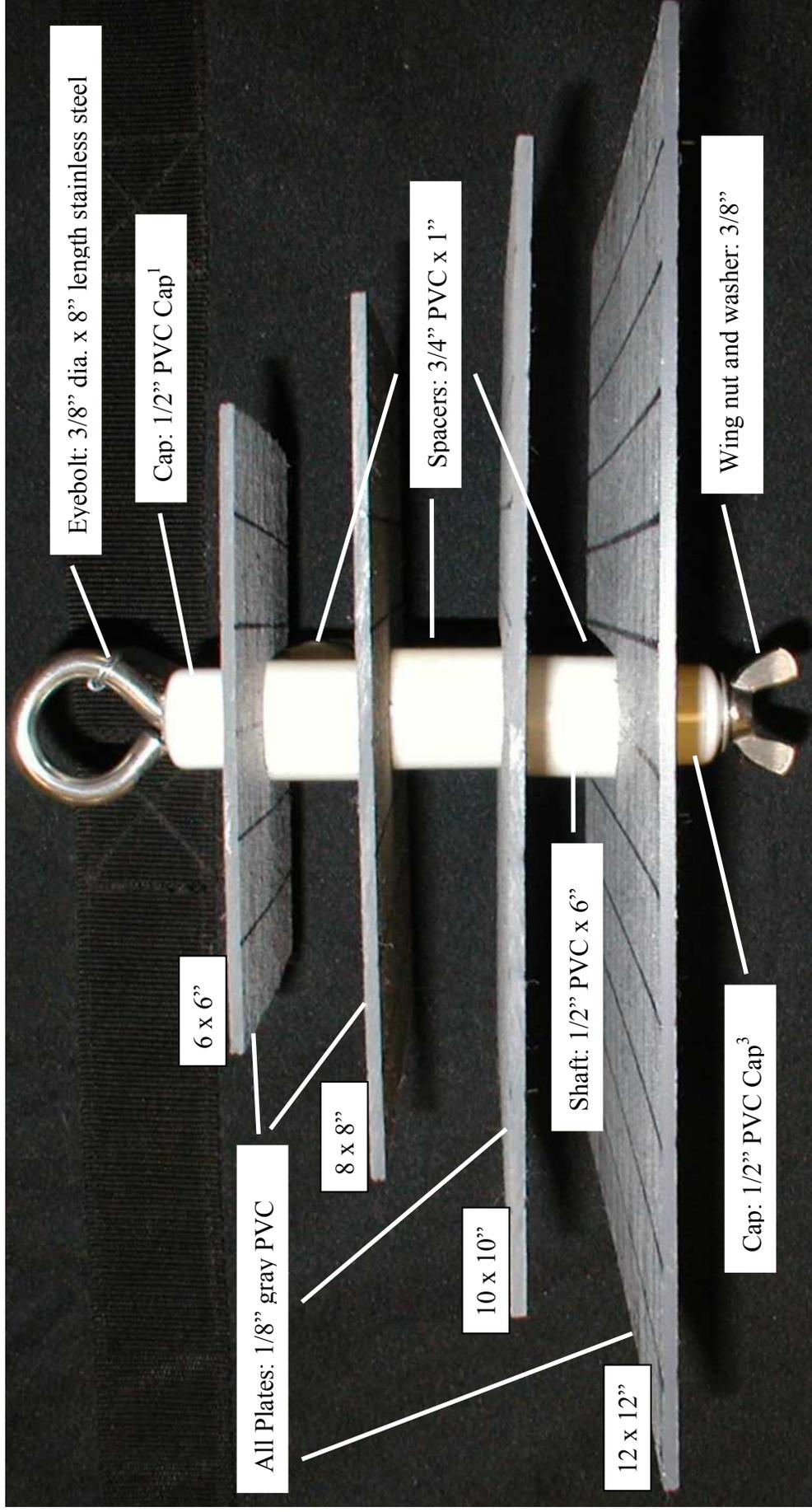
Form 3200-135 (R 02/10)

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

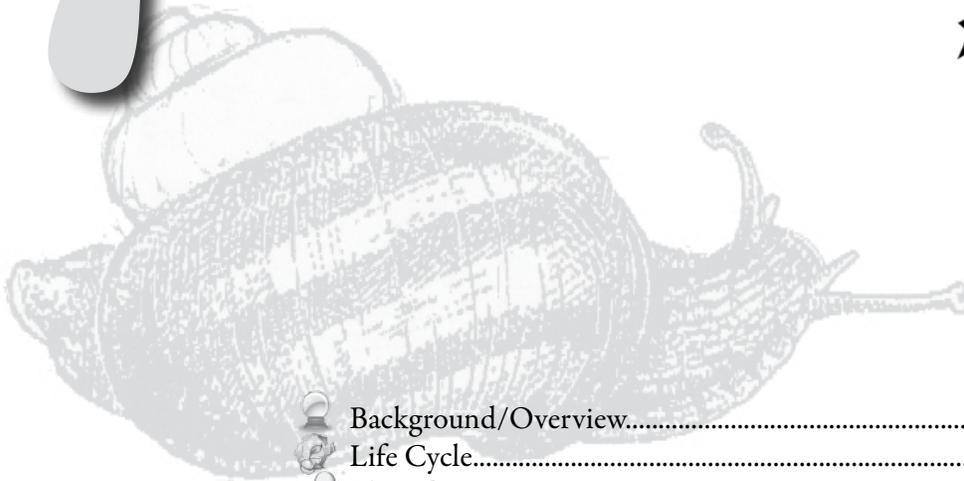
²Drill 5/8" hole in plates to accept shaft

³Drill a 13/32" hole in bottom cap

MYSTERY SNAILS

MONITORING PROTOCOL

7



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BACKGROUND/OVERVIEW

The Chinese mystery snails and the banded mystery snails are non-native snails that have been found in a number of Wisconsin lakes. There is not a lot yet known about these species, however, it appears that they have a negative effect on native snail populations. The mystery snail's large size and hard operculum (a trap door cover which protects the soft flesh inside), and their thick hard shell make them less edible by predators such as rusty crayfish.

There are three species of mystery snails in Wisconsin. Only one of these species, the brown mystery snail (*Campeloma decisum*), is native to Wisconsin. The Chinese mystery snail (*Bellamya chinensis*, pronounced bell-ah-MEE-ya chi-NEN-sus) is native to Asia, and is also called the Japanese or Oriental mystery snail. The banded mystery snail (*Viviparus georgianus*, pronounced vi-vi-PAIR-us jor-jee-AN-us) is native to the southeastern US. Mystery snails are called “mystery” snails because in the spring they give birth to young, fully developed snails that suddenly and mysteriously appear.

Chinese mystery snails are a source of food in Asia. They were first imported into the US in 1891 and sold in a Chinese marketplace in San Francisco (Wood, W.M. 1892). Some communities still harvest the Chinese mystery snail and use them as a food base. Their mode of spread throughout the United States has not been well documented, but is probably in part due to human activities (aquarium releases, snails attached to plants that are transported on boats and trailers, etc.) There is little documentation on the introduction and spread of the banded mystery snails into Wisconsin. Introduction into the Hudson River has been documented, and then the spread thereafter is suspected to be the aquarium market and via natural spread.

Many lake residents are worried about mystery snails being carriers of the swimmer's itch parasite. In theory they are potential carriers, however, because they are an introduced species and did not evolve as part of the lake ecosystem, they are less likely to harbor the swimmer's itch parasites. This remains an open and important question that warrants more research. In 2006 the University of Wisconsin – Madison Center for Limnology dissected a number of Chinese mystery snails and none had the swimmer's itch parasite.

The list of waterbodies in Wisconsin where banded and Chinese mystery snails have been verified can be found at <http://dnr.wi.gov/lakes/invasives/>.



LIFE CYCLE

The female mystery snail gives birth to live crawling young. This may be an important factor in their spread as it only takes one impregnated snail to start a new population. Mystery snails thrive in silt and mud areas although they can be found in lesser numbers in areas with sand or rock substrates. They are found in lakes, ponds, irrigation ditches, and

slower portions of streams and rivers. They are tolerant of pollution and often thrive in stagnant water areas. Mystery snails can be found in water depths of 0.5 to 5 meters (1.5 to 15 feet). They tend to reach their maximum population densities around 1-2 meters (3-6 feet) of water depth. Mystery snails do not eat plants (macrophytes). Instead, they feed on detritus and in lesser amounts algae and phytoplankton. Thus removal of plants in your shoreline area will not reduce the abundance of mystery snails.

Lakes with high densities of mystery snails often see large die-offs of the snails. These die-offs are related to the lake's warming coupled with low oxygen (related to algal blooms). Mystery snails cannot tolerate low oxygen levels. High temperatures by themselves seem insufficient to kill the snails as the snails could move into deeper water.



IDENTIFICATION

In your packet is a green grid that can be used to “measure” your mystery snails. This grid is also the grid you use when taking pictures of the snails. You need to send in pictures to verify the identification of the snails.

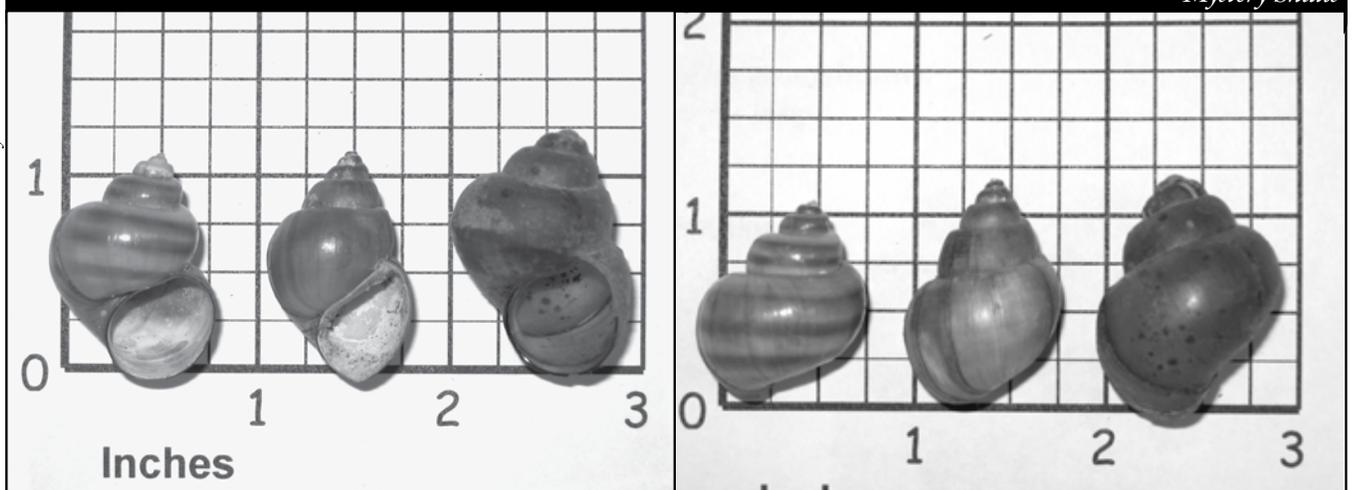
One of the main identification features of the mystery snails is their size. Adult snails of some species are over 1½ inches in length. Snail shell length is measured from the lip of the shell to the tip of the whorl. All mystery snail species will show corrosion (“chipping” and “weathering”) on the top of the whorl of the shell. This is particularly true in soft-water lakes.

Mystery snails have opercula (singular operculum), which are “trap doors” that can be closed. The mystery snail pulls its body back into the shell and closes its operculum to protect its soft body from danger. This operculum is darkly colored, solid in consistency and has concentric rings. Outside of the brown mystery snail, most native snails do not have opercula.

Since mystery snails give birth to live young, you may find small snails inside of the adult females.

Mystery Snails

Photo by Laura Herman



From left to right: banded, brown and Chinese mystery snails.

CHINESE MYSTERY SNAIL – non-native:

- Adult snails are often greater than 1.5 inches in length.
- Operculum (trap door) present
- Shell is typically light to dark olive green
- Uniform coloring on the shell (no banding)
- Chinese mystery snail is often wider than the brown mystery snail.

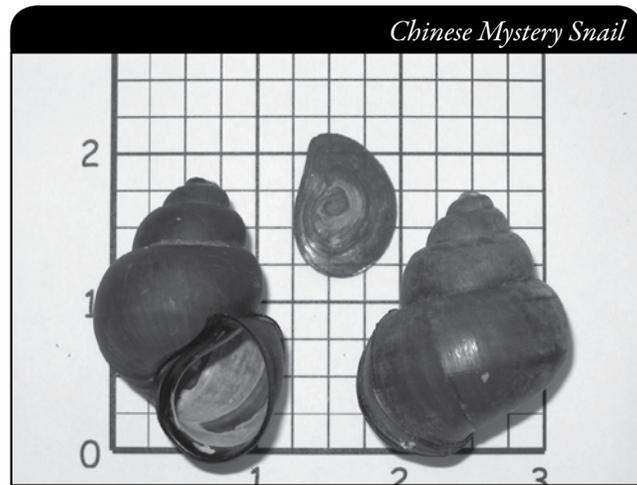


Photo by Laura Herrman

ventral view, operculum and dorsal view

BANDED MYSTERY SNAIL – non-native:

- Often smaller than Chinese mystery snails
- Adult snails can get up to 1.5 inches in length
- Operculum (trap door) present
- Shells have distinct reddish-brown bands circling the shell. This feature is obvious in empty shells, but more subtle on living snails.
- Banded mystery snail is often wider than the brown mystery snail

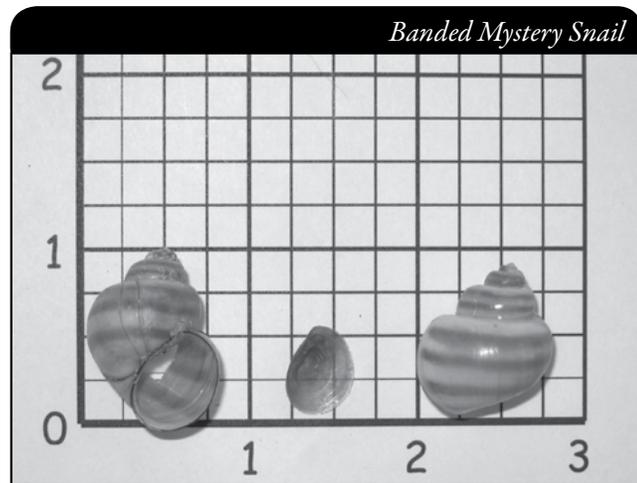


Photo by Laura Herrman

ventral view, operculum and dorsal view

BROWN MYSTERY SNAIL – native:

Adult snails rarely reach 1.5 inches in length.

- Operculum (trap door) present
- Shell is typically olive green
- The width to height ratio is smaller in the brown mystery snail than in the Chinese or banded mystery snails (the brown mystery snail is proportionally narrower than the Chinese or banded mystery snails - which tend to be very wide).

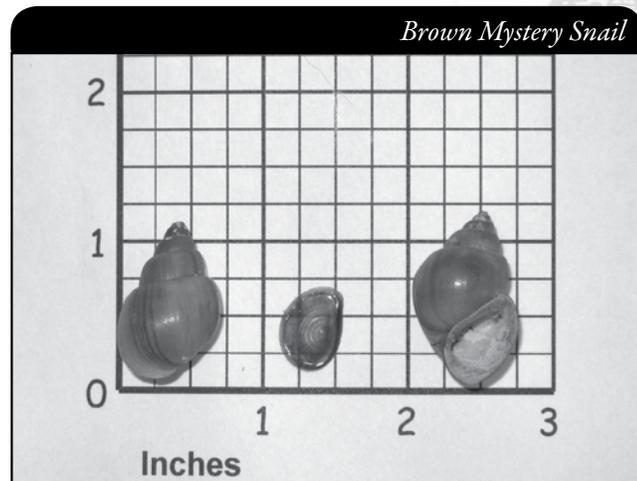


Photo by Laura Herrman

dorsal view, operculum and ventral view

Mystery Snails



MYSTERY SNAIL MONITORING

MONITORING BACKGROUND

In 2006, the University of Wisconsin - Madison Center for Limnology surveyed 45 Wisconsin lakes for Chinese and banded mystery snails. These snails were present in nearly 40% of the sampled lakes! This was way beyond what was expected. Center for Limnology staff are now analyzing the data now to see how the snail's presence correlates with native snail abundance, water chemistry, etc. The Center for Limnology has also completed a large, outdoor experiment examining how Chinese mystery snails and rusty crayfish affect native snails. The preliminary results are clear-cut -- both invaders have strong negative effects on the native snails. The Chinese mystery snails, owing to their large size and hard opercula (trap doors that protect the soft flesh inside), are relatively immune from rusty crayfish attack, so rusty crayfish more often feed on native snails.

The goal of the Citizen Lake Monitoring Network is to collect any and all records of mystery snails in Wisconsin lakes. It is also important to know which lakes do not currently have mystery snails. Researchers are still learning about differences in densities throughout a lake. Often, some areas of a lake will have higher snail densities than other areas on the same lake. This may be related to calcium levels (higher is better for snail development and survival) and food levels of that area.

WHEN TO MONITOR

The best time of the year to monitor for the mystery snails is late summer, but monitoring can take place anytime you are on the water.

WHERE DO I LOOK FOR MYSTERY SNAILS?

Look for the large snails along the shoreline. Shells of dead snails are often found near the high water mark of the lake, particularly on the downwind side of the lake. You may also want to look for them while boating. Mystery snails can be found in the shallows and out into the lake where the water depth reaches 15 feet.

Mystery snails are often found in areas with mud and/or sand. They are seldom found in rocky areas or areas with a lot of plants.

HOW TO MONITOR

Conduct a 10 minute "rapid assessment" of the lake shoreline. Walk the shore and look for shells on the shoreline and in the shallow water area. If you find snails, there is no need to continue monitoring for the full 10 minutes.

If you want to monitor while boating, take a landing net to collect snails in deeper water. Stop monitoring if you do not find snails after 10 minutes of looking.

EQUIPMENT NEEDED

- Landing net (if you will be monitoring in deeper water)
- Green paper grid system (optional – in the back of your manual)
- A copy of appropriate report form(s) (found at the end of this section and at <http://dnr.wi.gov/lakes/monitoring/forms.aspx>), depending on the type of monitoring you are conducting:
 - ▶ Aquatic Invasives Surveillance Monitoring Report, Form 3200-133
 - ▶ Aquatic Invasive Animal Incident Report Form, 3200-126

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 for vouchering. Be creative and most importantly, do not burn out your team leaders!

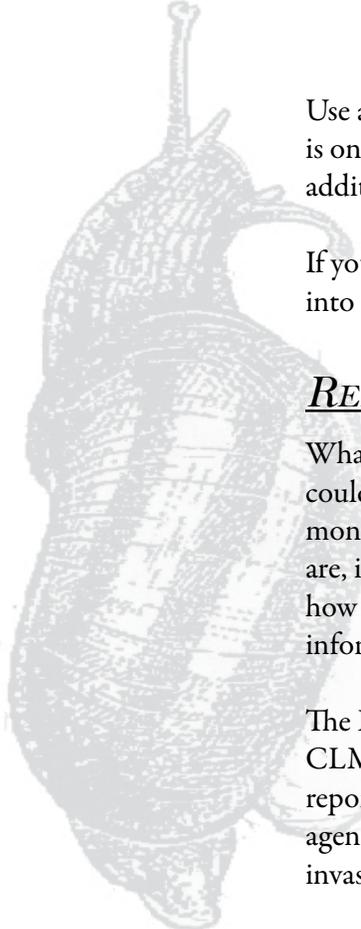
Consider having a mini-training session for your team. The CLMN Coordinator for your area may be able to assist you with a training session. If not, contact your local CLMN contact to see if an Aquatic Invasive Species training session will be scheduled for your area. These sessions are often set up 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 areas. At the end of the season, you can map all of the areas sampled.

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 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 who 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.
- If you find Chinese or banded mystery snails for the first time on your lake, report your results 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 have any questions about reporting, contact your local DNR CLMN contact (page viii).

You should also provide your local CLMN contact with a lake map showing the location of the monitoring site(s). The mystery snail monitoring site(s), along with the names and addresses of the monitors, are maintained and updated periodically.



Remember, for tracking the movement of mystery snail infestations, a report of 'no mystery snails' at a location is just as important as finding mystery snails. One cannot confidently state that mystery snails are not present in an area if no one has looked.

WHAT TO DO WITH SUSPECT SPECIMENS

If you find what you suspect is a Chinese or banded mystery snail, you can do one of two things:

1. Take digital pictures of the snail next to a ruler or on the green paper grid system provided and email the pictures as well as the date, lake name, county and your contact information to Dr. Pieter Johnson (pieter.johnson@colorado.edu) with an email subject heading of "MYSTERY SNAIL". Dr. Johnson is working on mystery snail identification as well as mystery snail distribution in Wisconsin. Be sure to fill out the reporting form on the CLMN website: <http://dnr.wi.gov/lakes/CLMN> (click "Enter Data" on the left side bar).



PICTURE TAKING TIPS

- To reduce glare, take pictures of dry shells
- The marking of the shells shows up better in pictures if you take pictures of shells without the bodies inside. You can freeze the snails to kill them. Defrost the snail, and the snail bodies can be pulled from the shell quite easily (a lot easier than if you kill the snails with alcohol).
- Use large snails, small snails are hard to differentiate by picture alone. (If you only find small snails, see option 2).
- The camera flash will cause glare - take several pictures to get glare off of shell or leave the flash off (take pictures outside for more light).
- Take ventral and dorsal pictures (the underside and the topside of the snail). See the examples in the identification section.
- You will want to keep the shells until Dr. Johnson lets you know what species you have. If the pictures do not work out, the University of Wisconsin – Madison Center for Limnology may need to see the shell. Dr. Johnson will email you back and let you know if he was able to do the identification via the pictures.



- 
2. Place several snail shells in a ziplock bag and deliver them and a copy of a completed Aquatic Invasive Animal Incident Reporting Form, #3200-126 (found at the end of this section and at <http://dnr.wi.gov/lakes/monitoring/forms.aspx>) to your local CLMN contact. If there are still live snails in the shells when you collect them, freeze them first. By freezing the snails, the snail bodies can be pulled from the shell. If the snails are killed by placing them in alcohol, the snail bodies cannot be pulled from the shells easily.



PREVENTION STARTS WITH US

If you have an aquarium at home or your child brings home a snail from school, a lake, or a river, please do not release the snail into the environment. The snail could be an invasive species. Remember female mystery snails give birth to live young. So even adding one snail may cause problems.

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. Snails, mussels and other organisms are often found attached to plants that have been removed from boating equipment. By removing aquatic plants and animals from boating equipment and encouraging others to do the same, you can help protect Wisconsin lakes from Chinese and banded mystery snails.



Photo by Paul Skawinski

Paul Skawinski



ADDITIONAL MATERIALS AND SUPPORTING DOCUMENTATION

MYSTERY SNAIL CONTROL OPTIONS

ADDITIONAL SOURCES OF INFORMATION

REFERENCES

REPORTING FORMS

AQUATIC INVASIVES SURVEILLANCE MONITORING REPORT

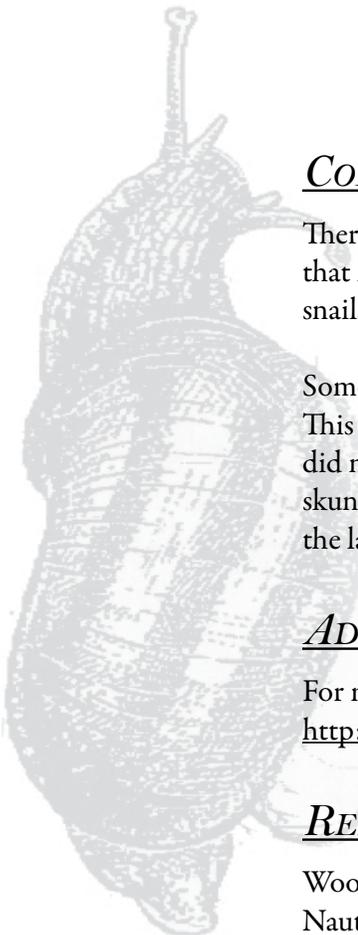
- SINGLE LOCATION, MULTIPLE DATES

- MULTIPLE LOCATIONS, ONE DATE

AQUATIC INVASIVE ANIMAL INCIDENT REPORT



*Mystery
Snails*



CONTROL OPTIONS

There is no legal chemical control method for mystery snails in Wisconsin. Any chemical that has the potential to control Chinese and banded mystery snails would impact native snails, clams and other organisms and is illegal.

Some residents have raked mystery snails out of the lake from in front of their property. This is legal. The lake residents then took the snails and buried them so that the snails did not smell when rotting. Some have also added lime to the hole to deter raccoons and skunks from digging up the snails. If you do bury the snails; please bury them away from the lake so that you are not impacting your shoreline area.

ADDITIONAL SOURCES OF INFORMATION

For more information on Chinese mystery snails, please refer to:
<http://www.gsarp.org/>

REFERENCES

Wood, W.M. 1892. *Paludina japonica* Mart. For sale in the San Francisco Chinese markets. *Nautilus* vol. 5, issue 10: pages 114-115.

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)
----------------	---------------	--------	--

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...

Did you...

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>

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? 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: _____

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?
 Dock/pier Dam Rocks Plants Boats or Gear Plate Sampler(s) Logs, acorns, pine cones or other woody structure
 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?
 Rhinelander Spooner Green Bay Oshkosh Did not take sample to a DNR office
 Fitchburg Waukesha Eau Claire Superior 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: _____ <small>(for list see http://dnr.wi.gov/invasives/aquatic/whattodo/staff/AisVerificationExperts.pdf)</small>	
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.

Aquatic Invasive Animal Incident Report

Form 3200-126 (R 02/10)

Page 2 of 2

Length of Zebra or Quagga Mussels from Sample (if applicable)

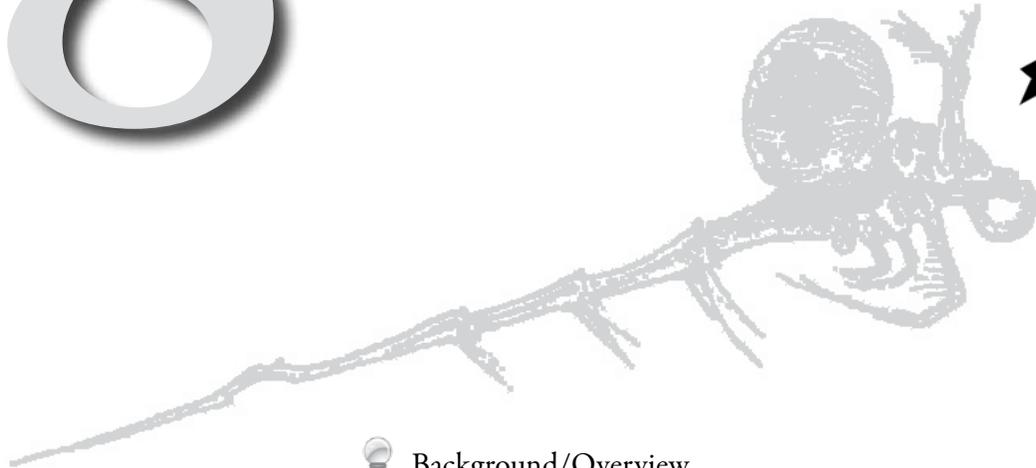
If more than 20 zebra or quagga mussels are found, measure 20 mussels chosen randomly from the sample. If less than 20 mussels are found, measure all mussels.

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.

8

MONITORING PROTOCOL



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BACKGROUND/OVERVIEW

Spiny and fishhook waterfleas are often first noticed by anglers and recreational lake users. These invasive waterfleas have a tendency to become entangled on fish lines, anchors, downrigger cables, and other types of gear used in boating activities. Masses of waterfleas can clog the first eyelet of rods, damaging a reel's drag system.

In addition to causing problems for anglers and recreational users, the invasive waterfleas have the potential to disrupt food webs. Spiny and fishhook waterfleas are large (up to $\frac{3}{4}$ inch) predatory crustacean zooplankton (planktonic animals). They eat smaller zooplankton including *Daphnia* (native waterfleas). This puts them in direct competition with juvenile fish that also eat native zooplankton. Like juvenile fish, spiny and fishhook waterfleas will “stalk” their prey. And, like most invasive species, they lack predators that can keep their population in check. Young fish have trouble eating the spiny and fishhook waterfleas due to their long, spiny tails.

Spiny and fishhook waterfleas are native to parts of Europe and Asia. Both species of waterfleas entered the Great Lakes in ship ballast water from Europe. The spiny waterflea arrived in the 1980's, followed in the 1990's by the fishhook waterflea. One or both species are now found in all of the Great Lakes. The list of waterbodies in Wisconsin where waterfleas has been verified can be found at <http://dnr.wi.gov/lakes/invasives/>. Both the spiny and fishhook waterfleas can be transported from an infested waterbody to another lake if they are attached to fishing gear and boating equipment. Extreme care should be exercised to avoid transporting these organisms between lakes.



LIFE CYCLE

(From <http://www.seagrant.umn.edu/exotics/spiny.html>)

The spiny and fishhook waterfleas reproduce sexually and asexually. Asexual reproduction means that no males are required and a single female can start a new population. Fishing, boating and other water recreational equipment can transport waterfleas and their eggs to new water bodies. Their resting eggs can survive long after the adults are dead, so care must be taken not to transport water between an infested lake and a non-infested lake.

Reproductive females carry their offspring on their backs in a balloon-like brood pouch, which can be filled with either developing embryos or resting eggs. Most of the time, female spiny and fishhook waterfleas exhibit rapid asexual reproduction where females produce from one to ten eggs that are able to develop into new females without mating or fertilization. The new females are genetic replicas, or clones, of the mother. The generation time of this life cycle (embryo to adult female) varies with water temperature because rates of metabolism rise and fall with temperature. During the summer, when the surface water of the lake is warm, waterfleas can produce a new generation in less than two weeks. Since males are not needed for reproduction, they are rarely found when food is plentiful or when environmental conditions favor rapid population growth.





In spiny and fishhook waterfleas, sex of offspring is not determined genetically, but rather by environmental factors. When food becomes limited or when the lake cools in the fall, males begin to appear. Declining environmental quality can be sensed by adult females, who respond by producing male rather than female offspring. These males are able to mate with surviving females, producing resting eggs. The resting eggs are first carried as orange-brown spheres in the female brood pouch. They are later released and fall to the lake bottom where they can survive the cold winter. In spring or early summer, these eggs hatch into juvenile females that begin the asexual reproduction again.

Resting eggs can remain dormant for long periods of time, and they offer an explanation for the arrival of spiny and fishhook waterfleas in North America.

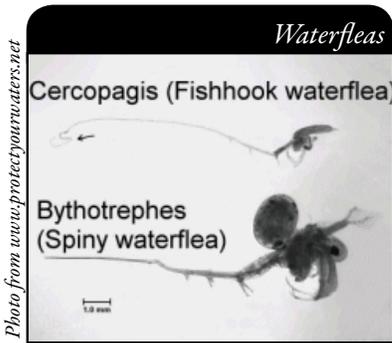


IDENTIFICATION

In your packet is a Spiny and Fishhook Waterflea watch card. This, along with the description below, should be used in identification.

Outside of Mysis shrimp, spiny and fishhook waterfleas are considerably larger than any naturally occurring Wisconsin inland lake zooplankton. They are large enough (up to 3/4 inch) to be seen by the naked eye.

Spiny waterfleas (*Bythotrephes longimanus*, pronounced bith-o-TREH-fee-z long-gi-MAN-us) are readily distinguished by their long tail spines, which generally support between one and three barbs. Fishhook waterfleas (*Cercopagis* sp., pronounced sir-CO-pa-jis) have smaller barbs on their tails and the end of tail has a “fishhook” shape.



SPINY WATERFLEA CHARACTERISTICS

(from <http://www.seagrant.umn.edu/exotics/spiny.html>)

The spiny waterflea is easily recognized by its unique body shape. The head consists primarily of a single, large eye filled with black pigment. The tail spine is its distinguishing feature and separates it from all other free-swimming lake invertebrate animals, or zooplankton. The spine is proportionately long; it often comprises over 70 percent of the animal's total length. The spine contains from one to four pairs of thorn-like barbs. Juveniles are born with just one pair of barbs. As the waterflea

grows and molts, additional barbs are added, so these barbs can be used to determine the age of the animal. Under ideal conditions, spiny waterfleas can live for several months.

FISHHOOK WATERFLEA CHARACTERISTICS

The most pronounced parts of the fishhook waterflea's body are: the head, the second pair of antenna, four pairs of thoracic legs, abdomen, tail (spine with small barbs and a fishhook shape at the end), and a brood pouch in females. The head is essentially composed of a large single eye, where the amount of black pigment makes up less than one half of the diameter of the eye. Abdomen length is equal to length of the rest of body, and spines are large, equal to 2-3 diameters of tail.



WATERFLEA MONITORING

Some lake groups are already monitoring algae and zooplankton on their lakes. These folks can monitor for spiny and fishhook waterfleas by looking for the waterfleas in their plankton nets when they do their regular sampling.

If your lake group is not already monitoring for algae and zooplankton, but you would like to monitor for waterfleas, you will need to obtain a zooplankton tow net. For groups that have monies for monitoring equipment, you may be able to purchase a net or obtain a grant to help cover the cost – this option may be most appropriate in areas near spiny waterflea infested waters. Other groups may wish to construct their own net. Information on plankton nets can be found in the “Equipment Needed” section on page 178.



ADDITIONAL MONITORING OPPORTUNITIES

The CLMN is unable to provide zooplankton tow nets to individual lake volunteers because the equipment is very expensive. However, DNR Aquatic Invasive Species monitoring staff annually select water bodies to sample for waterfleas, 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 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 assisting with DNR waterflea monitoring, contact your local DNR Aquatic Invasive Species staff.

WHEN TO MONITOR

Ideally, monitoring should take place on three dates between June and September. Samples should be collected at monthly intervals after the water temperature reaches 54 degrees. The first collection date will vary from early to late June.

When time and other constraints exist, sampling can be downsized to one sample period during mid-summer.

WHERE DO I SAMPLE FOR WATERFLEAS?

On each sampling date, waterflea samples should be collected from three different locations in the lake. The sites should be in different bays or basins or at several of the more heavily used lake sites. The three sampling sites should be deep enough to sample - 15 to 20 feet of water is a good rule of thumb. The deepest point of the lake and areas near boat landings (sites of boat traffic) or the lake's outlet are the best locations to sample. Mark on the lake map where samples were collected. These same sites should be used for each of the sample periods – if not, then submit a revised map with subsequent samples.



HOW TO MONITOR

COLLECTING SAMPLES

Monitoring for waterfleas entails towing a zooplankton net horizontally through the water. Ideally you would collect the sample using a 0.5-1 meter (1.6-3.3 foot) diameter opening zooplankton net with a mesh size of 250 microns (0.01 inch). Smaller mesh nets can easily clog with small forms of phytoplankton and zooplankton and can allow spiny waterfleas to elude capture. A 100 meter (330 foot) horizontal tow is best suited for capturing waterfleas.



1. Tow the net behind a boat for 100 meters (330 feet) or for 120 seconds at a low boat speed – about 3 km/hour (2 mi/hr). You can use a GPS unit to measure distance and/or rate of travel. To prevent the net from surfacing, you can add weight to the rope. Tie a loop in the rope approximately 0.5-1 meter (1.6-3.3 feet) in front of the net and attach a weight [e.g., a brick with a hole in it] using an additional piece of rope or cable tie.

Ideally, the tow should be for 100 meters (330 feet) at an oblique angle, sampling from the top of the thermocline to just below the water's surface. The thermocline is the transition layer between the warmer surface water and the cooler deep water. You can distinguish these layers based on temperature. The surface water layer is relatively uniform in temperature and the deep water layer is relatively uniform in temperature. In the thermocline, the temperature decreases rapidly from the surface layer temperature to the much colder deep water temperature. You can find the location of the thermocline using a temperature meter. If your lake does not have a thermocline, care must be given that the net does not hit the lake bottom. When the net hits the lake bottom, the sample is of muddy water, which is very difficult or impossible to analyze. If you hit the lake bottom, rinse out the sampling equipment and go to a different area of the lake that will provide enough depth for a good tow.

2. Rinse the net into the plankton collection cup or the bottom of your net. You can use either lake water or tap water. Be sure to rinse the net from the outside of the net so that all of the material washes into the plankton collection cup. Since waterfleas are large, you will likely, but not always, see them in the collection cup/bottom of the net if they are present.
3. Condense the size of the sample by filtering out as much water as possible in the field. You should “swirl” the sample, so that the excess water drains out the sides of the net screen. If you plan to look through the sample yourself, please skip to #8 or you can take the sample to your local CLMN contact to examine the sample. Swirling the sample helps reduce the amount of alcohol that needs to be added and aids in the analyses as well.
4. Preserve the sample using 95% alcohol. Rubbing alcohol can be used if you have it. Larger size bottles of alcohol can be purchased at hardware stores in the paint / refinishing sections of the stores. The ratio should be 4 parts alcohol to 1 part sample. Note: if the prescribed alcohol to sample ratio (4:1) cannot be achieved after repeated condensing and decanting, then the sample should be split between two sample bottles. Label each with the same information (as specified under “Labeling Samples” in the next section), and label one as “Split 1 of 2” and the other as “Split 2 of 2”.

5. Repeat the process at the other two pre-selected sites. Composite the samples from the three sites into one 250-ml or larger (1-liter) bottle.
6. Record sampling information on the Waterflea Tow Monitoring Report, Form 3200-128. Reporting forms can be found at the end of this section and at <http://dnr.wi.gov/lakes/monitoring/forms.aspx>
7. Transport the sample bottle(s) on ice in a cooler.
8. Identification of waterfleas can be conducted by the regional DNR water quality biologist or you can look through the sample yourself. Place sample in a white cake pan style dish. Make sure there is enough water so the sample floats. Then look for the waterfleas. Spiny and Fishhook Waterflea Watch and Wild cards are excellent resources for identification. If you find anything that you think are spiny or fishhook waterfleas, the samples should be preserved in alcohol and driven to your local CLMN contact. **It is illegal to mail samples that contain alcohol.** Make sure you fill out the Waterflea Tow Monitoring Report, Form 3200-128 and bring it with the sample. If no spiny or fishhook waterfleas are found, please report your results on the CLMN website (see “Reporting” section on page 180), indicating that you sampled and no waterfleas were found.

LABELING SAMPLES THAT ARE DELIVERED TO THE DNR OFFICE

Label sample bottles with the following information:

- Sampler’s name
- Sampler’s phone number – DNR staff may need to contact you regarding the sample
- Lake name
- County
- Site number
- Sample date

Be sure to write legibly and with indelible ink (e.g. Sharpie) – do not use a ball point pen, as the ink is soluble in alcohol. Remember to deliver the Waterflea Tow Monitoring Report Form & your map with the sites marked.

DISINFECTION PROCEDURES

If sampling multiple lakes on the same day, the net, boat and all other sampling equipment must be disinfected between lakes. Disinfection will eliminate cross-contamination and reduce the risk of transporting invasive species from lake to lake. You do not have to disinfect equipment between sample sites on the same lake. If multiple lakes are sampled in one day, it is recommended that you sample any lakes that are not on the watch or infestation lists before sampling lakes on those lists. This will minimize the potential for transport of the AIS species to a “clean” lake. The net, other sampling equipment and boat can be disinfected using diluted bleach solution (1 Tablespoon per gallon of water - do not use color safe bleach or ultra bleach for this mixture). Leave this solution on the net for 10 minutes. If waterfleas are observed, extreme care should be taken to avoid transporting individuals to a “clean” lake. Every time you take your boat out of a lake, place the net in bleach solution. It is a good idea to rinse your equipment in hot water and let the net dry thoroughly for at least 24-48 hours after a day of sampling. This is done to preserve the integrity of the net and to reduce the risk of any resting eggs remaining viable. Find disinfection protocols at http://dnr.wi.gov/fish/documents/disinfection_protocols.pdf.



EQUIPMENT NEEDED



- Zooplankton net with a 250-micron (0.01 inch) mesh. (Smaller mesh nets can easily clog with small forms of phytoplankton and zooplankton and can allow waterfleas to elude capture.) Try to use a net with a 0.5-1 meter (1.6-3.3 foot) opening (diameter). If you use a smaller net size, you will not be sampling as much water volume so you may need to take additional samples to increase the amount of water sampled. You will be asked on the reporting form what size net you used in the collection. For those without a net, you can Google search on “make your own plankton net” to find directions to making a plankton net.
- Rope tied to the zooplankton net with meter increments marked. An 8 meter rope (about 25-feet) is plenty long.
- Boat/anchor
- Plastic bottles to put the sample in
- Alcohol, 95% alcohol (190 proof ethyl alcohol). This will be used if you take samples to the DNR, but is not necessary if you process your own samples.
- Lake map.
- Waterflea Tow Monitoring Report, Form 3200-128 (found at the end of this section and at <http://dnr.wi.gov/lakes/monitoring/forms.aspx>)
- Cooler with ice if you plan to take samples to the DNR
- GPS unit (optional)
- Bleach/large container to hold plankton net for bleach bath if you are sampling multiple lakes. See disinfection procedures on page 177 for more information.

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 for vouchering. Be creative and most importantly, do not burn out your team leaders!

Consider having a training session for your team. The CLMN coordinator for your area may be able to assist you with a training session. If not, 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

Mark on a lake map where samples were collected. These same sites should be used for each of the sample periods – if not, then submit a revised map to your local CLMN contact (page viii) with subsequent samples.

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 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.

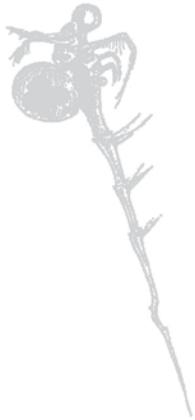
If you have a GPS unit, you may want to mark locations where waterfleas were collected and then load this data into a mapping program and print out the collection locations.

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 Citizen Lake Monitoring Network 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 who 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.
- If you find spiny or fishhook waterfleas for the first time on your lake, report your results 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 have any questions about reporting, contact your local DNR CLMN contact (page viii). The waterflea monitoring site(s), along with the names and addresses of the monitors, are maintained and updated periodically.

NOTE Remember, for tracking the movement of waterflea infestations, a report of ‘no spiny or fishhook waterfleas’ in an area is just as important as finding waterfleas. One cannot confidently state that spiny or fishhook waterfleas are not present in an area if no one has looked.

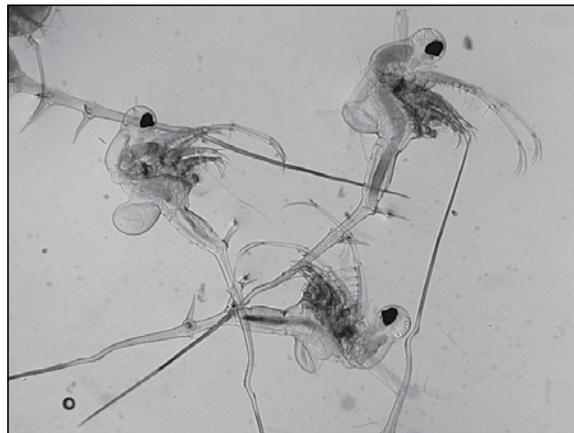


Photo by Pieter Johnson

WHAT TO DO WITH SUSPECT SPECIMENS

If you find anything that you think are spiny or fishhook waterfleas, the samples should be preserved in alcohol and hand delivered to your local CLMN contact. Do not mail them; it is illegal to mail samples that contain alcohol. Make sure you fill out the Waterflea Tow Monitoring Report, Form 3200-128 and bring it with the sample.



PREVENTION STARTS WITH US

Whether you are out monitoring, or just boating for fun, be sure to drain all water from your boat, motor, live wells, bilge, bait buckets and other containers before launching and after leaving the water. If you will be using your boat in another lake, rinse your boat and equipment with hot or high pressure water to make sure all waterfleas and eggs are removed or dry the boat and equipment for at least five days. By cleaning your boating equipment and encouraging others to do the same, you can help protect Wisconsin lakes from spiny and fishhook waterfleas.



ADDITIONAL MATERIALS AND SUPPORTING DOCUMENTATION

ADDITIONAL SOURCES OF INFORMATION

REFERENCES

REPORTING FORMS

AQUATIC INVASIVES SURVEILLANCE MONITORING REPORT

- **SINGLE LOCATION, MULTIPLE DATES**

- **MULTIPLE LOCATIONS, ONE DATE**

WATERFLEA TOW MONITORING REPORT





ADDITIONAL SOURCES OF INFORMATION

<http://dnr.wi.gov/invasives/fact/spiny.htm>

http://www.in.gov/dnr/files/spiny_and_fishhook_water_flea.pdf

REFERENCES

Life history and effects on the Great Lakes of the spiny tailed Bythotrephes. Carla E. Caceres and John T. Lehman. Department of Biology, Natural Science Building. The University of Michigan Ann Arbor, MI 48109-1048

<http://www.seagrant.umn.edu/exotics/spiny.html>

**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)

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...	Did you...
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
Curly-Leaf Pondweed?	Yes	No	Did not look for	Purple Loosestrife?	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
Freshwater Jellyfish?	Yes	No	Did not look for	Zebra Mussels?	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>

The purpose of this form is to track the presence/absence of spiny or fishhook water fleas collected using a plankton net during AIS 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. 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			
Method used: <input type="checkbox"/> horizontal tows (near surface) <input type="checkbox"/> oblique tows (thermocline to surface) <input type="checkbox"/> vertical tows (bottom to surface)			
Diameter of plankton net opening 30cm 50cm other _____ (circle one)			
Site 1: Latitude (optional): _____		Longitude (optional): _____ <input type="checkbox"/> Preservative Added	
Secchi depth (m) _____ (optional)		Depth sampled (if vertical or oblique tow) _____ ft/m circle one	
Site 2: Latitude (optional): _____		Longitude (optional): _____ <input type="checkbox"/> Preservative Added	
Secchi depth (m) _____ (optional)		Depth sampled (if vertical or oblique tow) _____ ft/m circle one	
Site 3: Latitude (optional): _____		Longitude (optional): _____ <input type="checkbox"/> Preservative Added	
Secchi depth (m) _____ (optional)		Depth sampled (if vertical or oblique tow) _____ ft/m circle one	
<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?			
During this monitoring trip, did you find what you suspect are Spiny or Fishhook Waterfleas in this waterbody? <input type="checkbox"/> Yes <input type="checkbox"/> No			
Voucher Sample			
If you found Spiny or Fishhook Water fleas, did you collect a 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: _____

If you find Spiny or Fishhook Water Fleas

Please bring a copy of this form, along with a voucher specimen and if possible, a map showing where you found the suspect waterfleas to your regional Citizen Lake Monitoring Coordinator at the DNR. All initial discoveries should be placed in rubbing alcohol until verification by an expert is obtained.

If you don't Find Spiny or Fishhook Water Fleas

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>

For DNR staff to fill out	
Volume of sample that was analyzed (ml)	Date analyzed
Name of plankton sample analyst:	
Name of person or museum who identified the voucher specimen	
Was the specimen confirmed as...?	
Spiny Waterflea? <input type="checkbox"/> Yes <input type="checkbox"/> No	Fishhook Waterflea? <input type="checkbox"/> Yes <input type="checkbox"/> No
Have you entered the results of the voucher in SWIMS? <input type="checkbox"/> Yes <input type="checkbox"/> No	
<i>DNR staff: Please enter voucher information for new AIS findings into SWIMS under the Incident Report Project for your county (Choose Incident Report Form in SWIMS). Enter date of sampling for "Start Date", Person who identified specimen as "Data Collector", and Monitoring location as "Station".</i>	

FRESHWATER JELLYFISH

9

MONITORING PROTOCOL



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The information for this chapter was compiled by Sandy Engel and Professor Terry Peard.



BACKGROUND/OVERVIEW

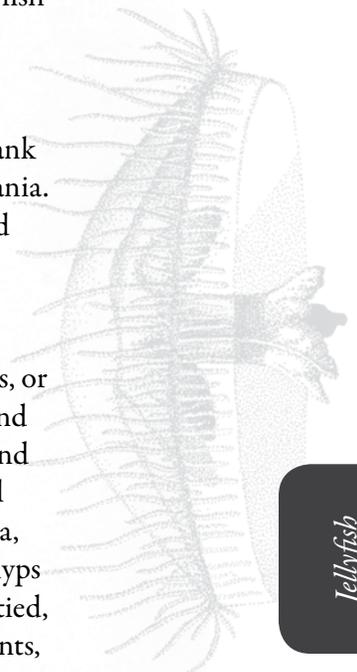
The freshwater jellyfish found in Wisconsin are one of several species of *Craspedacusta* native to China. Two species (*C. sowerbii* and *C. sinensis*) live in the Yangtze River—the world's third longest river and one so vast it makes the Wisconsin River seem like a trout stream! Freshwater jellyfish were first reported in North America as early as 1884. Sightings in Wisconsin date back to 1969. Much more remains to be learned about these fascinating creatures. Although they probably evolved from estuarine species, themselves descendants of ocean jellyfish, little is known about the evolution of freshwater jellyfish. That's because jellyfish leave no fossil records.

In China, male and female medusae form from spring until fall and congregate in quiet reaches of the river. The medusa lifecycle stage is where the jellyfish form the bell shaped body with tentacles – this stage is what most of us associate with jellyfish. The frequent occurrences of these bisexual medusa swarms in China are one reason why these jellyfish are thought to be native to China.

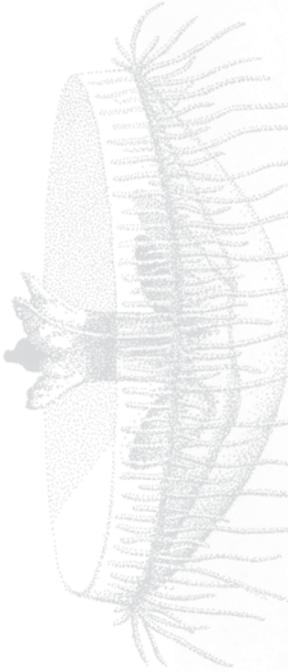
Freshwater jellyfish were found outside of China in the 1800s. William Sowerby (1827-1906) found jellyfish medusae swimming in a large, water-lily tank at the Royal Botanic Gardens in Regent's Park, just outside London, England. Sowerby was the director of these private botanical gardens and thus in charge of their indoor and outdoor exhibits. He found the medusae, all males, among sediment and the root crowns of pickerelweeds - only three weeks after filling the water tank. Thinking they came from South America with the plants, he dubbed them Amazon jellyfish. The discovery came with much publicity and fanfare. Then, six weeks later, a curator's worst nightmare struck: all jellyfish medusae vanished! (They did reappear in the same tank, though not every year.)

But where were the polyps (the body form consisting of a small bud or stalk with tiny tentacles around the mouth)? In 1884, mature jellyfish polyps were found in a water tank at Regent's Park. That same year, immature polyps were found in a stream in Pennsylvania. More than forty years would pass before the two polyps - the bigger ones from England and the newly budded ones from America - would be identified as one species.

How did these freshwater jellyfish get to London and Pennsylvania? The jellyfish probably landed at both locations as polyps or cysts attached to sediments, water plants, or fishes. The 1880s were the heyday of water gardens and carp stocking. Garden clubs and aquarium societies in this Victorian Era were busy gathering the world's exotic plants and fishes for proud display and study. Soon the jellyfish made their way to other botanical societies, as well as to public and private aquariums in England, Europe, North America, South America, and Australia. Once again, plants and fishes provided a vehicle for polyps and cysts. Other jellyfish were flushed into lakes and rivers when aquariums were emptied, perhaps for cleaning or restocking with fish. Polyps and cysts, attached to river sediments, were swept downstream to new waters. Others may have arrived on the backs of turtles or the feet of water birds. Perhaps they even stuck to boats and boat motors.



After Pennsylvania, jellyfish progressively appeared in other states and provinces. By the time they were first sighted in Wisconsin, jellyfish had already been reported from 33 states, Hawaii (then a U.S. territory), and Washington DC. Their distribution in the United States now stretches to 47° N. latitude - well north of the Yangtze River, which lies between 27° and 37° N. latitudes.



In Wisconsin, jellyfish were first reported from a farm pond near Baraboo, Sauk County. Wood ducks, rather than fish or plants, were thought to have carried the polyps or cysts to the pond. By 2006, 26 years later, jellyfish had been reported from 40 water basins: 37 natural lakes, 2 dugout ponds, and 1 creek. The list of waterbodies in Wisconsin where freshwater jellyfish have been reported can be found at <http://dnr.wi.gov/lakes/invasives/>. These “jellyfish waters” vary in size from tiny ponds to lakes of 9,842 acres (Lake Mendota) and lakes that are 236 feet deep (Big Green Lake). The freshwater jellyfish has been found in a variety of water types. They have been observed in waters ranging from crystal clear rock quarries to soupy green farm ponds. Preliminary research indicates that waters high in chloride do not favor the appearance of the freshwater jellyfish. Unlike the list of Eurasian water-milfoil lakes, these Wisconsin water bodies may no longer have jellyfish! Almost all of the sightings have been of medusae, which are sporadic and soon disappear, sometimes never to be seen again. On the other hand, polyps tend to be more widespread than medusae, so Wisconsin could have more “jellyfish waters” than our lists indicate.

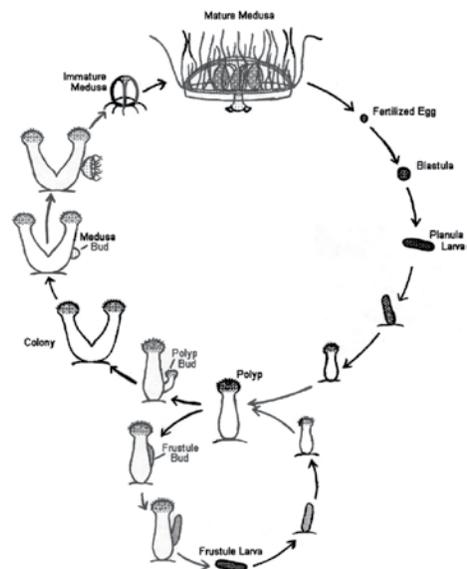
Although freshwater jellyfish are not native to Wisconsin, we don't know of any ecological impacts they've caused to Wisconsin Lakes. There is some speculation that since jellyfish consumes zooplankton (which are normally eaten by small fish), some negative impacts may be taking place.



LIFE CYCLE

Freshwater jellyfish exhibit a varied life cycle comprised of three primary stages: egg, polyp, and medusa. Two kinds of larvae and a cyst stage also form.

Female Medusae (top) produce **eggs** (arrow, top right). These are fertilized by the sperm of a male medusa (not shown), each egg hatches into a tiny, flat larva called a **planula**. It swims for a few days before settling down on an underwater plant, log, rock, or piece of sediment. The planula then becomes a **polyp**. The polyp looks like a miniature hydra without tentacles. Like hydra, the polyp does bear stinging cells (nematocysts) to stun prey. The tiny polyp soon forms a bud (bottom left) near its base that stays attached and develops into a second polyp, forming a polyp colony. The two polyps are identical twins, having formed asexually. Soon, the twins form yet more fixed buds, which become polyps



that also stay attached and expand the polyp colony. After a few weeks, the colony has as many as 2-10 (sometimes 12) polyps—all so small you'd need a hand lens or, better yet, a microscope to study them. Now and then, jellyfish polyps form a second kind of bud (bottom): a detachable bud. Each of these side buds develop into a tiny, cigar-shaped larvae called frustule larvae. The larvae free itself from the parent polyp and either crawl a few inches away or are carried off by water flow. They then settle down to become polyps themselves . . . ones that form fixed buds to produce a new colony of polyps. So far, our life cycle involves asexual reproduction: polyps forming buds that become either attached polyps or larvae that detach to become a new polyp colony. In some years, especially during hot summers in Wisconsin, the polyp colony produces medusa buds (left, middle). Each of these top buds becomes either a male or female medusa. The developing medusa grows from nutrition supplied by the parent polyp. After a week or two, and still quite small, the medusa leaves home to become free swimming. Another five weeks are needed for the medusa to mature. When full grown, the medusa has a nearly transparent body called a bell that dangles long, hair-like tentacles we all associate with jellyfish.

Sometimes just female medusae are formed. Sometimes just male medusae are formed. Why jellyfish would produce swarms of same-sex medusae, a seeming waste of energy, still remains a mystery. Only rarely in North America and Europe do both male and female medusae appear together. The female medusae produce eggs. When fertilized externally by male medusae, the eggs hatch into planula larvae. These sexually derived juveniles then swim away and eventually settle on sediments, plants, or other objects. Here, each larva turns upright and becomes a polyp . . . the start of a new polyp colony.

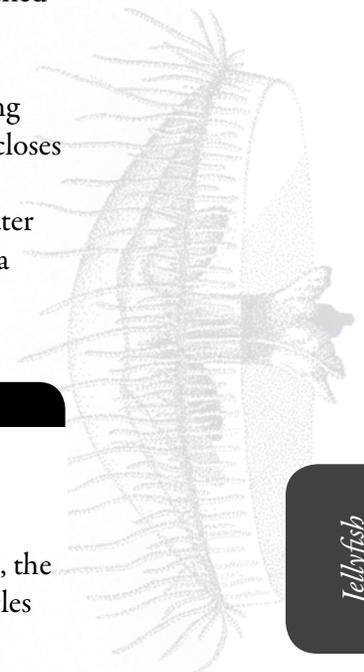
Both polyps and medusae feed on zooplankton. The polyps, hardly more than 1/8th inch long, eat protozoans, rotifers, copepods, and waterfleas. The medusae, pushing an inch across the bell, can use their tentacles to sting these same critters and capture even larger prey, such as water mites and insect midge larvae. Only rarely do they stun newly hatched fish fry.

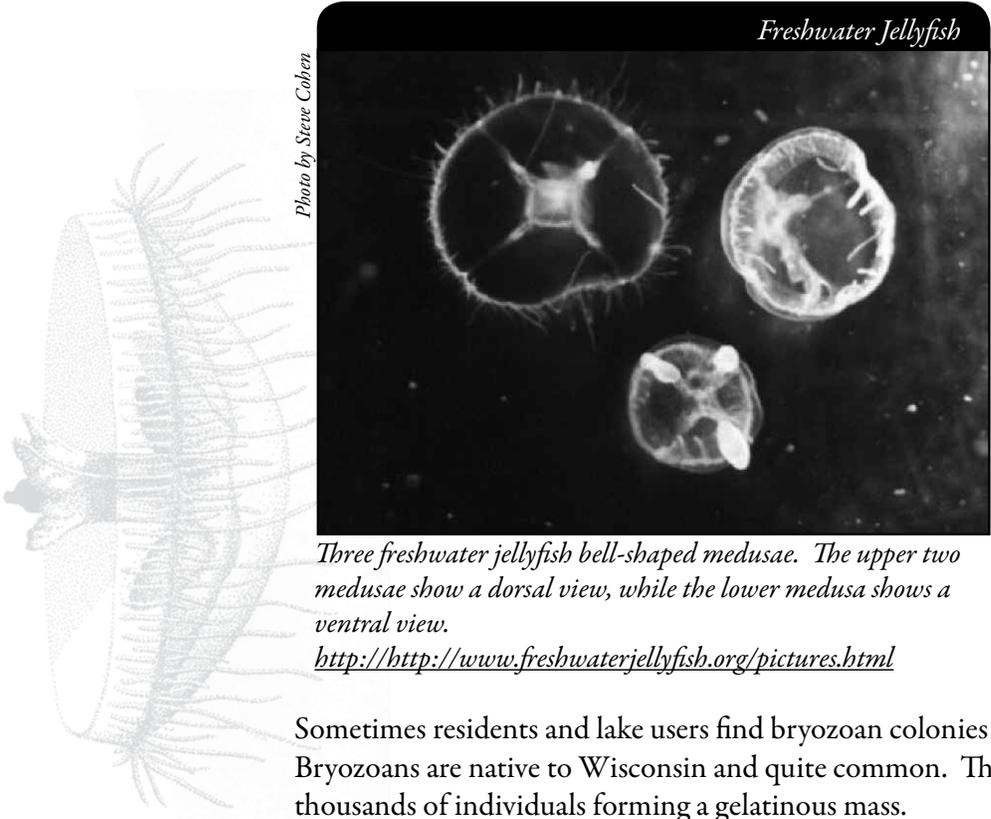
The medusae live but a few weeks, release eggs, and die. The polyps can live from spring until fall, when they may roundup into cysts. Covered with a chitinous "skin" that encloses fairly dry cells, the cysts are able to survive drought and cold. In Wisconsin, the cysts survive on the bottoms of ice-covered ponds, lakes, and quiet river pools where the water is slightly above freezing. But the cysts are more than a winter resting stage. They are a vehicle for jellyfish to spread north of their home range and colonize new waters.



IDENTIFICATION

Seeing the medusa stage is how most people identify freshwater jellyfish. At this stage, the medusae have a nearly transparent body called a bell that dangles long, hair-like tentacles we all associate with jellyfish. Before they are full grown, the medusae are so tiny and transparent that hardly anyone - even a dedicated jellyfish watcher - would notice them.





Only when the medusae are fully grown, densely packed on the water surface, and perhaps yellowed with eggs do they draw attention. The jellyfish will gently float or swim just below the surface of the water. They are easily seen by the naked eye. They often surface in large numbers called “blooms”.

Three freshwater jellyfish bell-shaped medusae. The upper two medusae show a dorsal view, while the lower medusa shows a ventral view.

<http://http://www.freshwaterjellyfish.org/pictures.html>

Sometimes residents and lake users find bryozoan colonies and think they have jellyfish. Bryozoans are native to Wisconsin and quite common. The bryozoan colonies contain thousands of individuals forming a gelatinous mass.



When doing the identification you can ask yourself several simple questions to aid in distinguishing freshwater jellyfish from bryozoans.

- How big is it?
 - ▶ The jellyfish medusa is the size of a dime or quarter.
 - ▶ Colonies of bryozoans can be the size of a football
- Is it swimming on its own?
 - ▶ The jellyfish medusa will swim on its own
 - ▶ Colonies of bryozoans are attached to plants, stick, docks, etc.
- Is it up on shore?
 - ▶ The jellyfish medusae are found out in the lake’s water column
 - ▶ Colonies of bryozoans sometimes break free and wash up on shores.



FRESHWATER JELLYFISH MONITORING

DNR does not have a formal monitoring program for freshwater jellyfish. If staff see freshwater jellyfish while conducting lake monitoring, they send in the data to a central location for documentation. Similarly, the Citizen Lake Monitoring Network is asking volunteers to look for the presence of freshwater jellyfish while you are recreating on Wisconsin lakes.

Finding jellyfish in a pond, lake, or river slough can be an unforgettable experience! But keeping a “jellyfish watch” can become boring. That’s because medusae - not to mention the microscopic polyps - occur sporadically and unexpectedly. Still, here are some tips for limiting your search.

WHEN TO LOOK FOR JELLYFISH

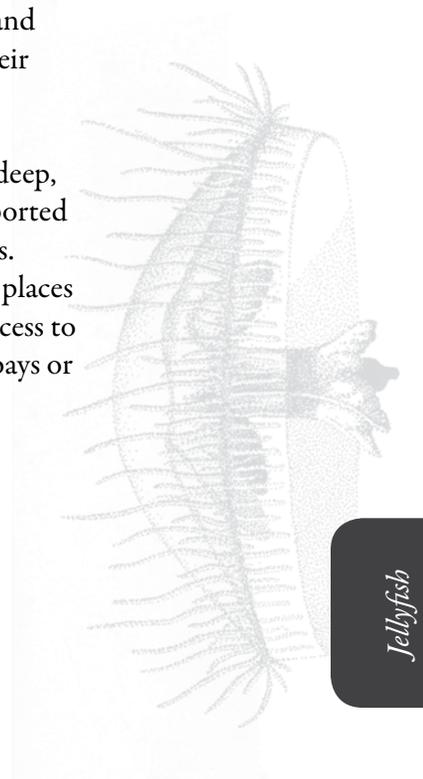
In Wisconsin, look for jellyfish medusae during dry and hot summers, typically from early August to mid-September. Sunny days are especially good for spotting jellyfish.

WHERE DO I LOOK FOR JELLYFISH?

Look for jellyfish just below the surface of the water where they will be gently floating or swimming. They often surface in large numbers called “blooms”.

The medusae are restricted to a narrow band of 65-75 Fo water. If the water surface of a lake becomes warmer than 75 Fo, as many of our lakes do during afternoons (and evenings), the medusae congregate in the lower epilimnion where they can find their preferred temperature range.

Although medusae can swim in almost any type of water - big or little, shallow or deep, hardwater or softwater - they are not found everywhere. They have rarely been reported from bogs or marshes. Nor are they easy to spot in swift-flowing streams and rivers. Look for them in ponds and lakes with a mix of hard bottoms and soft sediments: places where polyps can attach, yet not become smothered, and where the polyps have access to rotifers and other small prey. In large lakes, medusae may mob (“swarm”) certain bays or shorelines. These are areas where their parent polyps are most common.



HOW TO MONITOR

Look for jellyfish medusae while you are recreating on Wisconsin lakes. If you find jellyfish medusae, follow the instructions in the 'What to do if you Find Freshwater Jellyfish' section.



One word of caution. If you do find jellyfish medusae, you may become hooked into a life of jellyfish watching! You may even start searching lake beds in shallow water for the tiny polyps and their cysts, though you would need a dissecting microscope to search among samples of bottom gravel, sticks, plants, and sediments.

EQUIPMENT NEEDED

- A copy of appropriate report form(s) (found at the end of this section and at <http://dnr.wi.gov/lakes/monitoring/forms.aspx>), depending on the type of monitoring you are doing:
 - ▶ Aquatic Invasives Surveillance Monitoring Report, Form 3200-133
 - ▶ Aquatic Invasive Animal Incident Report Form, 3200-126

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 areas.

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 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.

REPORTING

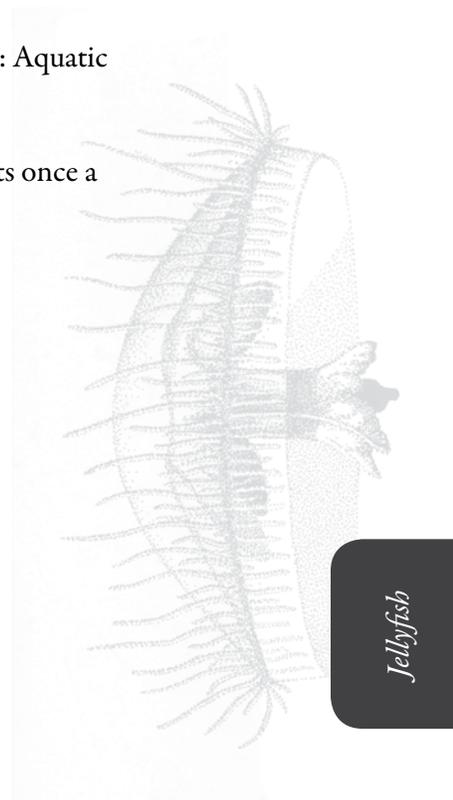
What would all the work that goes into gathering accurate information be worth if others could not read, review and act it? Reporting is one of the most important parts of monitoring for invasive species. Knowing where species are not, as well as where they are, is extremely important in being able to 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 information that is reported through the Citizen Lake Monitoring Network 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 who 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.

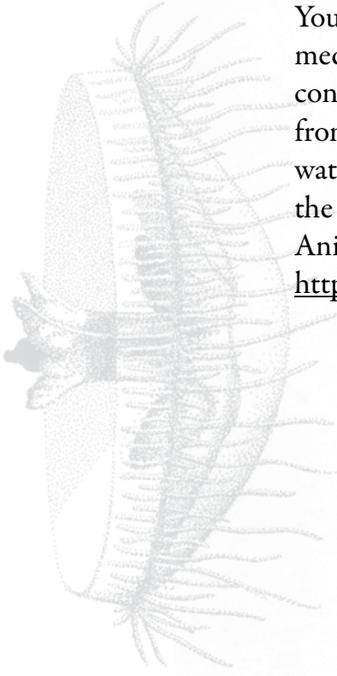
- For prevention monitoring, report your results using the: Aquatic Invasives Surveillance Monitoring Report, Form 3200-133.
- If you find jellyfish for the first time on your lake, report your results using the: Aquatic Invasive Animal Incident Report, Form 3200-126.

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.



WHAT TO DO IF YOU FIND FRESHWATER JELLYFISH

Grab a jar or plastic bag and collect a small sample of the medusae. You can keep them alive for a few days in your refrigerator. They may live a bit longer in an aerated aquarium. You can also preserve a few medusae for later study and identification. Spoon-out some medusae from your jar or bag and place them in a small jar, such as a glass or plastic vial, containing 70% rubbing (isopropyl) alcohol. You can purchase the alcohol ready-made from pet shops, hardware stores, and department stores. Label the jar with the date, waterbody name, and specific site on the water where the medusae were collected. Take the sample to a local DNR office for verification, along with a completed Aquatic Invasive Animal Incident Reporting Form, #3200-126 (found at the end of this section and at <http://dnr.wi.gov/lakes/monitoring/forms.aspx>)



PREVENTION STARTS WITH US

Water gardens and the mud in the pots of water plants may house the polyp stage of freshwater jellyfish. Please do not discharge your pond's water to a lake or river or plant "water garden" plants into lakes or rivers. By encouraging others to do the same, you can help protect Wisconsin lakes from organisms like the freshwater jellyfish.



ADDITIONAL MATERIALS AND SUPPORTING DOCUMENTATION

REPORTING FORMS

AQUATIC INVASIVES SURVEILLANCE MONITORING REPORT

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

AQUATIC INVASIVE ANIMAL INCIDENT REPORT

**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
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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)
----------------	---------------	--------	--

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...

Did you...

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
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Additional Data Collectors

Date and Time

Date	Start Time	End Time
------	------------	----------

Waterbody	County	Township	Record one of the following:			Y=Yes N=No N/A = Didn't Look For		Did you find?											
			Did you monitor?	Did you?	Did you?	Did you find?	Did you find?	Did you find?	Did you find?	Did you find?	Did you find?	Did you find?	Did you find?	Did you find?	Did you find?	Did you find?	Did you find?		
			Boat Landing (if you only monitor at boat landings)?	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
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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? 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: _____

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, %
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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?
 Dock/pier Dam Rocks Plants Boats or Gear Plate Sampler(s) Logs, acorns, pine cones or other woody structure
 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?
 Rhinelander Spooner Green Bay Oshkosh Did not take sample to a DNR office
 Fitchburg Waukesha Eau Claire Superior 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: _____ <small>(for list see http://dnr.wi.gov/invasives/aquatic/whattodo/staff/AisVerificationExperts.pdf)</small>	
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.

Aquatic Invasive Animal Incident Report

Form 3200-126 (R 02/10)

Page 2 of 2

Length of Zebra or Quagga Mussels from Sample (if applicable)

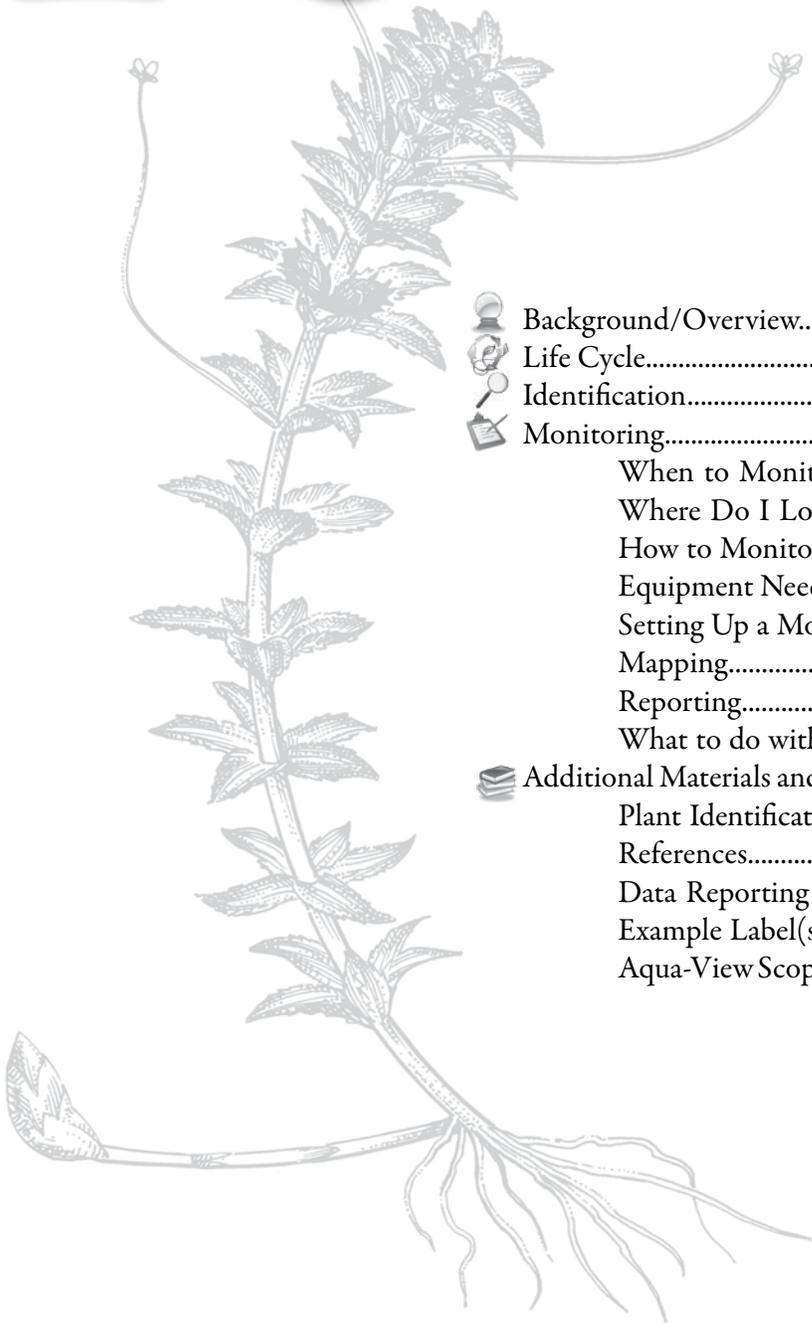
If more than 20 zebra or quagga mussels are found, measure 20 mussels chosen randomly from the sample. If less than 20 mussels are found, measure all mussels.

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.

10

MONITORING PROTOCOL



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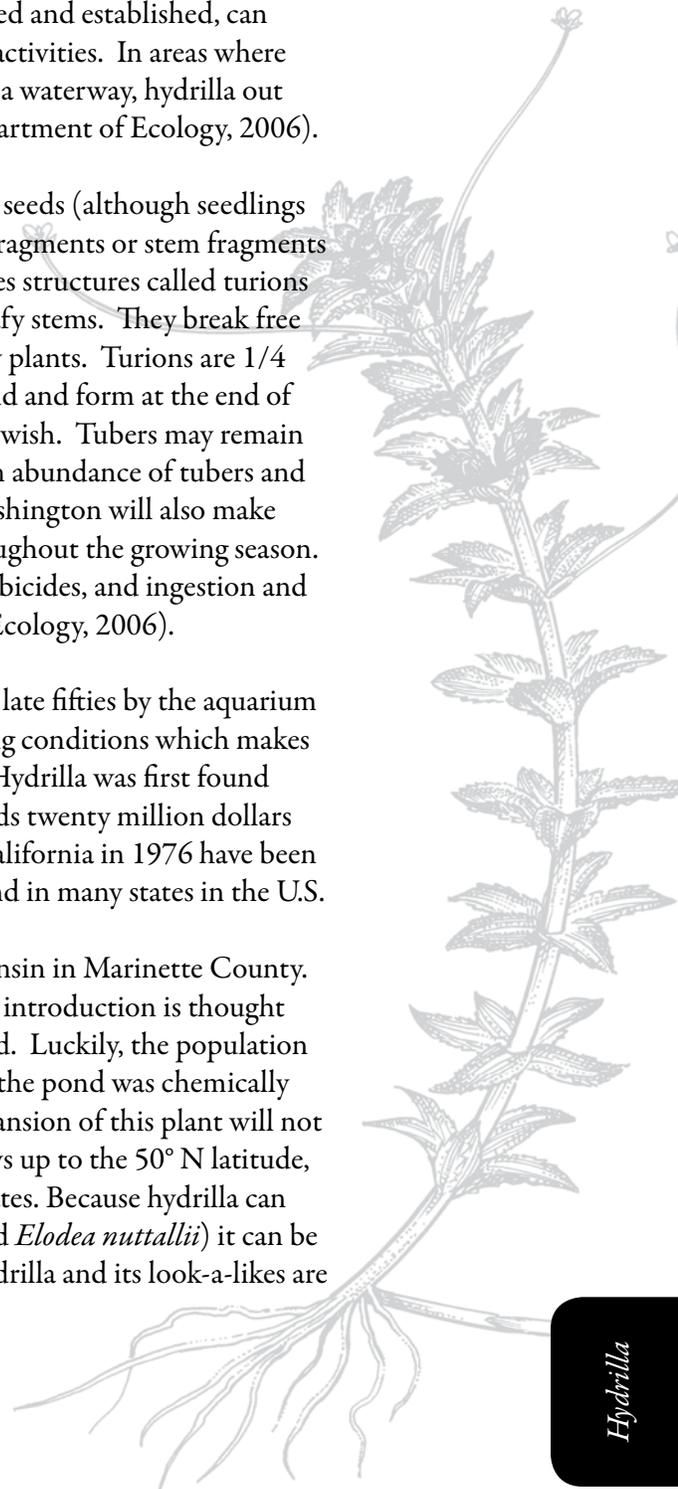
BACKGROUND/OVERVIEW

Hydrilla is a submerged aquatic plant native to Asia and northern Australia and is considered to be the most problematic aquatic plant in the United States. In areas of North America where hydrilla has been introduced it has formed dense canopies that shade out native vegetation and destroy fish and wildlife habitat. The hydrilla canopy has detrimental impacts on fisheries as well as recreation and creates harsh conditions for other species by decreasing oxygen under the canopy mats and increasing water temperature and pH. The plant can grow several inches a day and once introduced and established, can easily spread to other waterbodies through boating and fishing activities. In areas where hydrilla, Eurasian water-milfoil and Brazilian elodea co-exist in a waterway, hydrilla out competes the other two noxious weeds (Washington State Department of Ecology, 2006).

Hydrilla has very effective methods of reproducing. It produces seeds (although seedlings are rarely seen in nature) and can sprout new plants from root fragments or stem fragments containing as few as two whorls of leaves. Hydrilla also produces structures called turions and tubers. Turions are compact “buds” produced along the leafy stems. They break free of the parent plant and drift or settle to the bottom to start new plants. Turions are 1/4 inch long, dark green, and appear spiny. Tubers are underground and form at the end of roots. They are small, potato-like, and are usually white or yellowish. Tubers may remain dormant for several years in the sediment. Hydrilla produces an abundance of tubers and turions in the fall. The hydrilla variety found in the state of Washington will also make tubers in the spring and will produce nondormant turions throughout the growing season. Hydrilla tubers and turions can withstand ice cover, drying, herbicides, and ingestion and regurgitation by waterfowl (Washington State Department of Ecology, 2006).

Hydrilla was first introduced to the United States in the mid to late fifties by the aquarium trade. This hardy, tolerant plant does well in a variety of growing conditions which makes it a perfect plant to sell in the nursery and aquarium industry. Hydrilla was first found in a waterway in south Florida in 1960. Currently Florida spends twenty million dollars annually on hydrilla control. Introduction to small ponds in California in 1976 have been traced to a contaminant of waterlily shipments. Today, it is found in many states in the U.S.

In 2007, hydrilla was discovered in a man-made pond in Wisconsin in Marinette County. It is the only known occurrence of the plant in Wisconsin. The introduction is thought to have been by nursery stock that was introduced into the pond. Luckily, the population was caught early and it is believed to have been eradicated after the pond was chemically treated, drained and allowed to freeze over the winter. The expansion of this plant will not be restricted by the Wisconsin climate. In Russia the plant grows up to the 50° N latitude, which is equivalent to the border of Canada and the United States. Because hydrilla can be easily confused with our native elodea (*Elodea canadensis* and *Elodea nuttallii*) it can be easily overlooked. Volunteers trained in the identification of hydrilla and its look-a-likes are essential to prevent the spread of this non-native plant.



Hydrilla continues to be sold through aquarium supply dealers and over the internet even though the plant is on the U.S. Federal Noxious Weed List. Commercially, it is often named “anacharis.”

Eradication of established populations of hydrilla is very difficult and may be impossible.



LIFE CYCLE

Hydrilla is a submersed perennial that looks a great deal like our native elodea. This close resemblance makes monitoring for hydrilla difficult. Another factor that makes identification difficult is that hydrilla can be either monoecious (both male and female flowers on the same plant) or dioecious (male and female flowers on different plants). Each has unique growth characteristics. The monoecious plants tend to be more delicate and grow laterally and spread, carpeting the bottom before lifting to the surface. In the U.S., monoecious plants tend to be north of the Carolinas. It is believed that the Wisconsin plant is the monoecious form. In the monoecious form, female flowers are solitary and white and float on the surface with threadlike stalks. Male flowers are tiny, greenish and attached to leaf axils toward the stem tips. Flowers are not always found on the plant.

Hydrilla forms a dense canopy, 80% of the biomass of the plant is in the upper two feet of the water column. While it does provide structure and food for insects and other macroinvertebrates, it also creates vast monotypic stands and can out-compete native aquatic plants.

Hydrilla grows rooted to the bottom, submersed in either still or flowing water. Sometimes fragments will break loose and the plant will survive in a free floating stage. The depth of growth depends on substrate and water clarity, but it can grow in a few inches of water or in water more than twenty feet deep. Stem lengths of up to 30 feet have been found in Florida. It will grow in low or high nutrient conditions.

Hydrilla has great reproductive potential. The plant spreads readily through fragmentation but it also reproduces by growth of turions and subterranean tubers. The tubers can remain viable for more than four years. Southern U.S. populations overwinter as perennials while northern U.S. populations overwinter and re-grow from tubers. Research suggests that the monoecious strain is better adapted to the temperate climate because it can form tubers quickly during short photoperiods (Spencer and Anderson, 1986; Van, 1989) and also during long photoperiods (Van, 1989).

New plants can sprout from stem fragments. Langeland and Suttin (1980) found that more than 50% of fragments with three whorls of leaves can sprout and grow a new plant which in turn can start a new population. In fact almost 50% of hydrilla fragments that have a single whorl of leaves can sprout and grow a new plant. This means that small amounts of hydrilla on boat trailers, bait buckets, draglines, and from aquariums can grow into new plants, spreading the plant from place to place.



IDENTIFICATION

In your packet you will find a fact sheet called “Have you seen this plant” (DNR PUB WT-884) as well as an identification card on hydrilla and egeria (*Brazilian elodea*) as well as a drawing of hydrilla, elodea and egeria.

Hydrilla (*Hydrilla verticillata*, pronounced hi-DRILL-ah ver-TI-si-LAH-ta) closely resembles our native elodea species (*Elodea canadensis* and *Elodea nuttallii*) and Brazilian elodea (*Egeria densa*) which is native to South America.

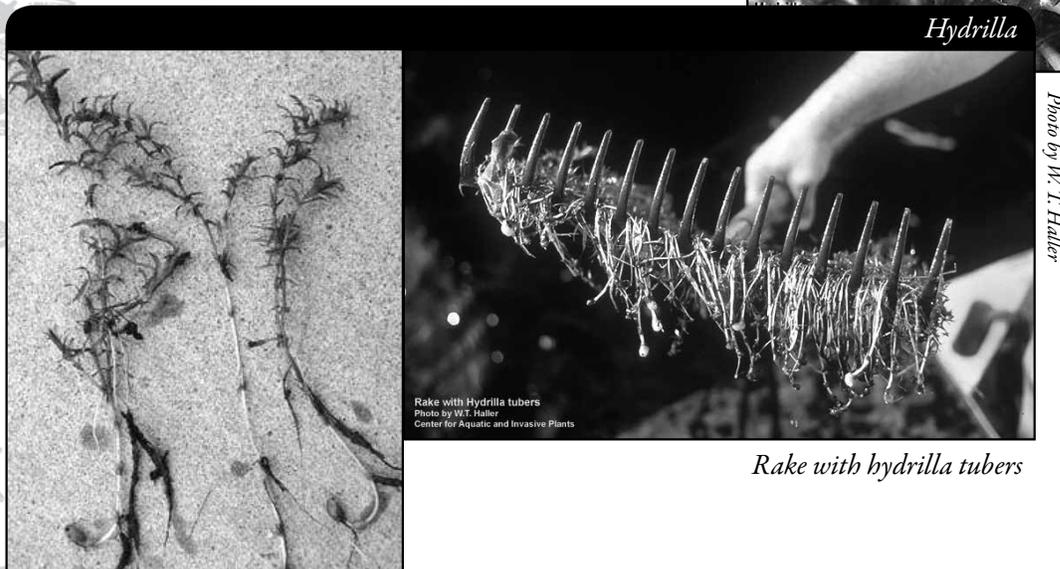
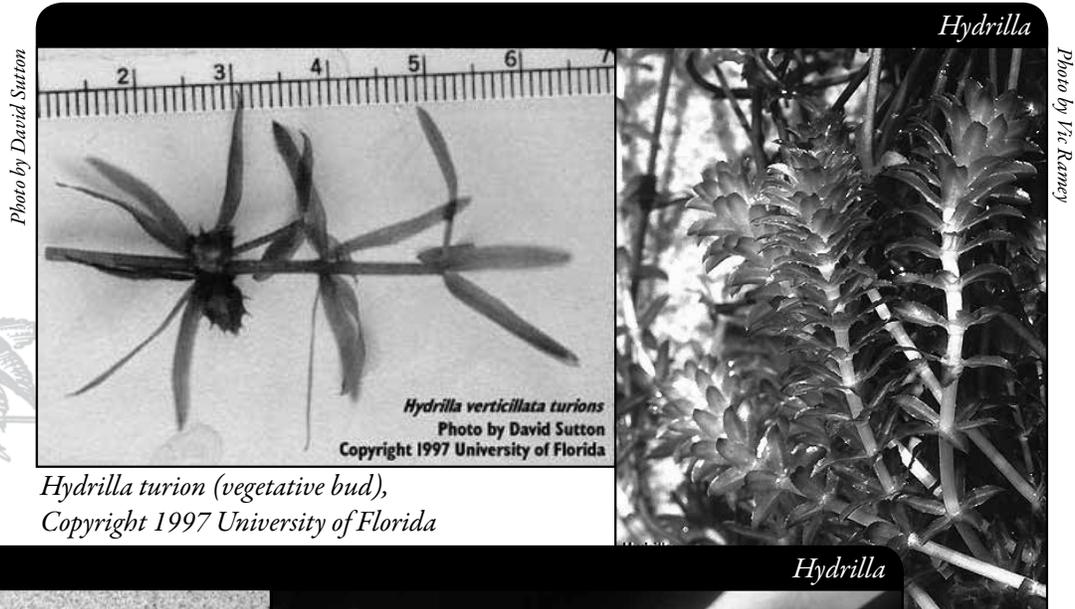
Refer to the pictures below as well as reference materials in your packet to see the characteristics listed below:

HYDRILLA (*HYDRILLA VERTICILLATA*) CHARACTERISTICS

- Submersed stems are slender ($\frac{1}{32}$ inch thick) and can be up to 30 feet in length.
- Small green leaves ($\frac{1}{2}$ to $\frac{3}{4}$ inches long) with pointed tips.
- Leaves are normally arranged in whorls of 4 to 8. Leaves have been found in whorls with as few as 3 and as many as 12 leaves. If the plant is growing very quickly, there may be significant distances between whorls – this allows it to reach the surface of the water more quickly.
- Leaves are attached directly to the stem.
- Toothed margins of leaves usually visible without magnification – (on some plants this is only obvious on the lower parts of the plant).
- Leaf axils (junction of the leaf stalk and stem) have pairs of minute scales (squamulae intravaginales) up to 0.5 mm long, fringed with finger-like orange brown hairs. These are visible with magnification on some mature leaves and branch points.
- Midrib (on the back of leaf) is often red.
- Often there are one or more sharp teeth along the midrib of the leaf, making the plant feel rough.
- Female flowers are solitary, tiny and white. They float on the surface on long (up to 4 inch) threadlike stalks. The stalks are attached at leaf axils near the stem tips.
- Male flowers are tiny and green. They are closely attached to leaf axils toward the stem tips until they break loose and rise to the surface where they float free. The male flowers fertilize the female flowers by bumping into them.
- Adventitious roots develop only at nodes with dormant axillary buds or branches.
- Plants often produce a mat of creeping above and below ground stolons that develop subterranean turions at the tips (referred to as tubers). Tubers are tough, whitish to brown-black, plump, ovoid, 4-15 mm long, and remain attached until parent stolon decomposes.



- Plant produces turions. Turions are compact buds produced in the leaf axils. The turions are dark green, cylindrical, up to ¼ inch round (see photo below), and appear shiny. Turions survive near freezing temperatures. Suddenly removing dense canopies of hydrilla by mechanical harvesting or herbicide treatment may stimulate turion germination.
- The monoecious form of hydrilla has a complete die-back in winter.
- The monoecious form that grows north of the Carolinas has a growth habit similar to native elodea. It tends to grow carpet-like, along the bottom of the lake.



Hydrilla plant and tubers

Rake with hydrilla tubers

ELODEA CANADENSIS (NATIVE) CHARACTERISTICS

This is an aquatic plant native to Wisconsin that can easily be confused with hydrilla.

- Submersed stems are slender and up to three feet in length.
- Small, dark green, lance-shaped leaves (6-17 mm long, 1-5 mm wide)
- Leaves usually peppered with large dark cells (visible with low magnification)
- Leaves are most often arranged in whorls of three. Occasionally you will find leaves in whorls of two near the base of the plant. On occasion you may find leaves in whorls of four. Leaves tend to be more crowded toward the stem tip.
- Leaves are attached directly to the stem

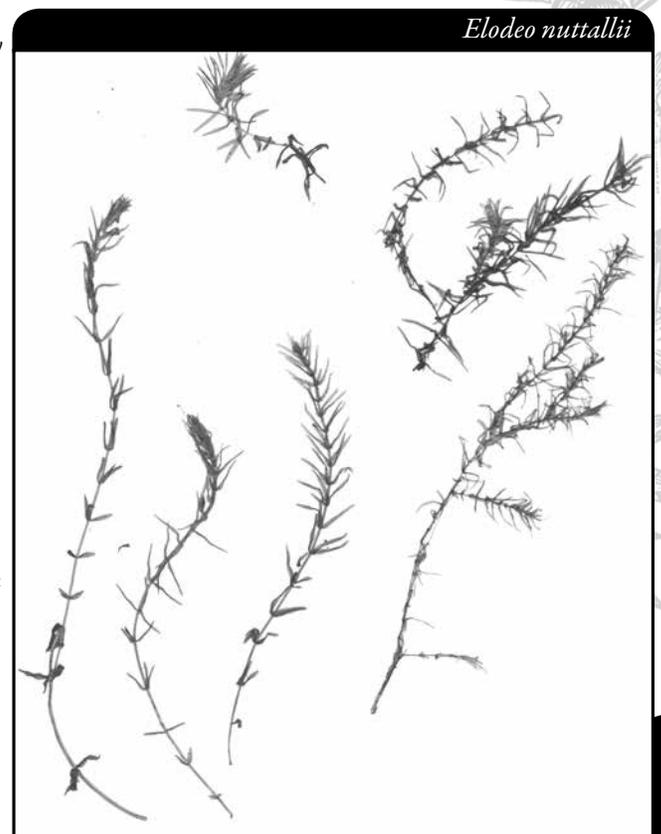
- Leaf margins not visibly saw-toothed
- Midrib (on the back of the leaf) is green.
- Midrib does not have spines (hydrilla has spines)
- Male and female flowers are on separate plants. Female flowers have three small white petals with a waxy surface. Flowers are raised to the surface of the water on a long, slender stalk
- Adventitious roots develop only at nodes with dormant axillary buds or branches
- Roots in substrate are more wiry than those of hydrilla or Brazilian elodea
- Reproduces by stolons, stem fragments and terminal turions (turions produced at the end of the growing stem)
- Does not produce tubers (underground vegetative structures)
- Overwinters as an evergreen plant.



ELODEA NUTTALLII (NATIVE) CHARACTERISTICS

This is an aquatic plant native to Wisconsin that can easily be confused with hydrilla. One needs to look closely at Elodea nuttallii to distinguish it from Elodea canadensis. E. nuttallii is more delicate in structure with finer stems and narrower leaves.

- Submersed stems are slender and up to three feet in length
- Small, pale to dark green, lance-shaped leaves (6-13 mm long and less than 1.5 mm wide); leaf tip is tapered to a slender point
- Leaves are most often arranged in whorls of three. Occasionally you will find leaves in whorls of two near the base of the plant. On occasion you may find leaves in whorls of four. Leaves tend to be more evenly spread out on the plant as compared to *E. canadensis*
- Leaves not densely overlapping toward stem tip as seen in *Elodea canadensis*
- Leaves are attached directly to the stem
- Leaves very finely toothed along the edges, but evident only with magnification

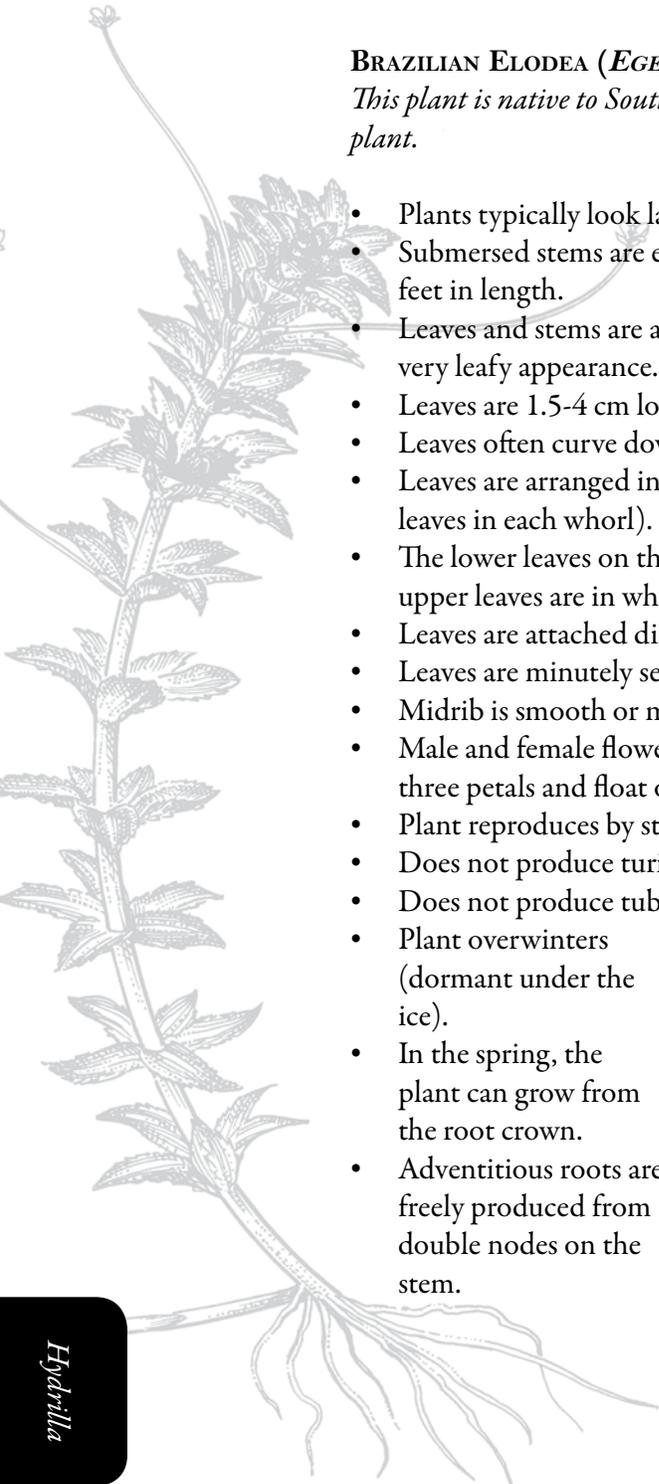


- Midrib (on the back of the leaf) is green
- Midrib does not have spines (hydrilla has spines)
- Male and female flowers are on separate plants. Female flowers have three small white petals with a waxy surface. Flowers are raised to the surface of the water on a long, slender stalk. Male flowers more common in *E. nuttallii* and in *E. canadensis*
- Adventitious roots develop only at nodes with dormant axillary buds or branches
- Roots in substrate are more wiry than those of hydrilla or Brazilian elodea
- Reproduces by stolons, stem fragments and terminal turions (turions produced at the end of the growing stem)
- Does not produce tubers (underground vegetative structures)
- Overwinters as an evergreen plant

BRAZILIAN ELODEA (*EGERIA Densa*) (NON-NATIVE) CHARACTERISTICS

This plant is native to South America and was brought to the United States as an aquarium plant.

- Plants typically look larger and leafier than hydrilla or common elodea.
- Submersed stems are erect, cylindrical, and frequently branched. Stems can reach 15 feet in length.
- Leaves and stems are a bright green. Short internodes between leaves give the plant a very leafy appearance.
- Leaves are 1.5-4 cm long, up to 5 mm wide.
- Leaves often curve downwards.
- Leaves are arranged in whorls of four to six leaves (some references say three to eight leaves in each whorl).
- The lower leaves on the plant are often opposite or in whorls of 3, while the middle and upper leaves are in whorls of 4 to 6.
- Leaves are attached directly to the stem.
- Leaves are minutely serrated.
- Midrib is smooth or minutely toothed.
- Male and female flowers are on separate plants. The 18-25 mm white flowers have three petals and float or rise above the surface of the water on thread like stems.
- Plant reproduces by stolons and stem fragments
- Does not produce turions.
- Does not produce tubers.
- Plant overwinters (dormant under the ice).
- In the spring, the plant can grow from the root crown.
- Adventitious roots are freely produced from double nodes on the stem.



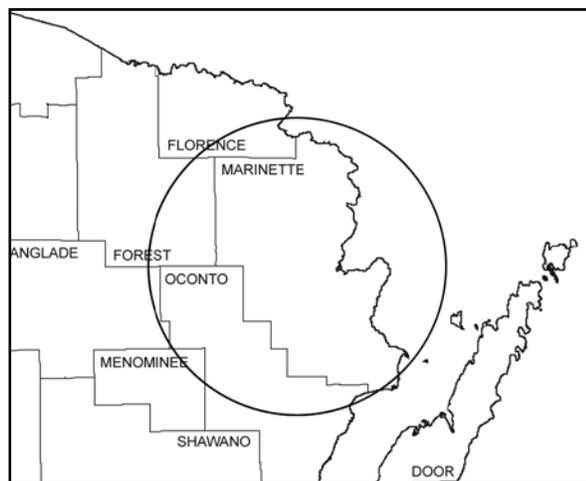
MONITORING

There is only one known established population of hydrilla in Wisconsin. Eradication efforts are underway on this population and appear likely. The focus of monitoring in Wisconsin is prevention monitoring.

PREVENTION MONITORING

Citizen lake monitors are going to play a huge role in keeping Wisconsin free of hydrilla. Since there is only one known established population, it is important to educate as many people as possible about hydrilla and how to identify it. We have learned from Eurasian water-milfoil, curly-leaf pondweed and other aquatic invasives and need to be pro-active. We are asking volunteers to learn about hydrilla and regularly monitor their lake for it. It is important to know which lakes are being monitored, even if no hydrilla is found.

Volunteer monitors are welcome throughout the state, but monitors are especially needed in a target area that includes every lake within a 32-mile radius of the pond in Marinette County where hydrilla was found. Lake managers are attempting to eradicate hydrilla from this pond and keep it from spreading to other waterbodies. Tubers and turions are a major mode of reproduction and were present in the pond before the infestation was discovered. Turions and tubers can be moved by both wildlife and recreational users. Chemical treatment will not destroy the turions or tubers.



Lakes within this target area are in particular need of hydrilla watch volunteers.



Hydrilla



HYDRILLA MONITORING

WHEN TO MONITOR

PREVENTION MONITORING

Volunteers should try to monitor once a month from ice-off to mid-September. It is important to find hydrilla early so there may be adequate time to plan and implement a first response yet that season. Hydrilla can thrive in lower light conditions – that means it can expand quicker than most other species. Looking early in the season is helpful. Given the lag time from discovery to a first response, monthly monitoring is very prudent.

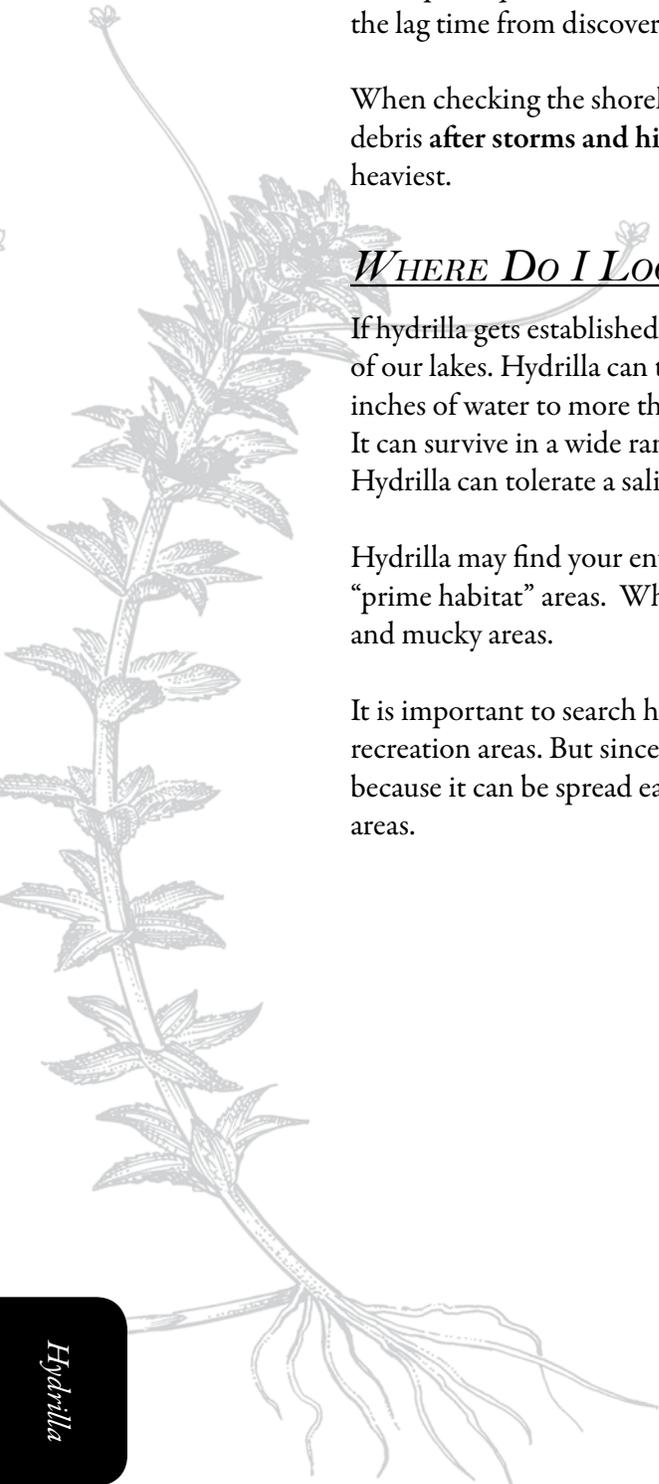
When checking the shorelines, it is especially important to check piles of plants and debris **after storms and high boat traffic times**, as this is when plant fragments will be the heaviest.

WHERE DO I LOOK FOR HYDRILLA?

If hydrilla gets established in Wisconsin, it probably has the capability to survive in all of our lakes. Hydrilla can tolerate a wide range of conditions and can grow in a couple of inches of water to more than 20 feet. It can tolerate eutrophic or oligotrophic conditions. It can survive in a wide range of pH, although it does best when the pH is around 7. Hydrilla can tolerate a salinity of 7%.

Hydrilla may find your entire lake suitable for growth – do not rely on monitoring just the “prime habitat” areas. When looking for rooted plants, check for hydrilla in both sandy and mucky areas.

It is important to search high traffic areas – boat ramps, near resorts, and popular recreation areas. But since hydrilla can thrive in so many different habitat types, and because it can be spread easily by waterfowl, please don't limit watch efforts to high traffic areas.



HOW TO MONITOR

PREVENTION MONITORING

Shorelines

When looking for plant fragments, go to areas where you have seen piles of plants and debris, especially after storms and high traffic times – this is when plant fragments will be the heaviest. Check beach areas, inlets, boat launches, high use area and the perimeter of the lake.

Deeper Water Areas

Once you have monitored a variety of near shore areas, go out in your boat and begin to search for and collect plants in deeper water areas. It will be easiest to see the plants if you are wearing polarized sunglasses and/or using an Aqua-View scope. Make sure the weather will allow for successful and safe sampling. Clear, calm weather is the best for seeing plants in the water. Sunny skies make it easier to see into the water.

Later in the season, there tends to be more suspended algae in the water column and it may be more difficult to see the plants so you may need to adjust the depth of monitoring.

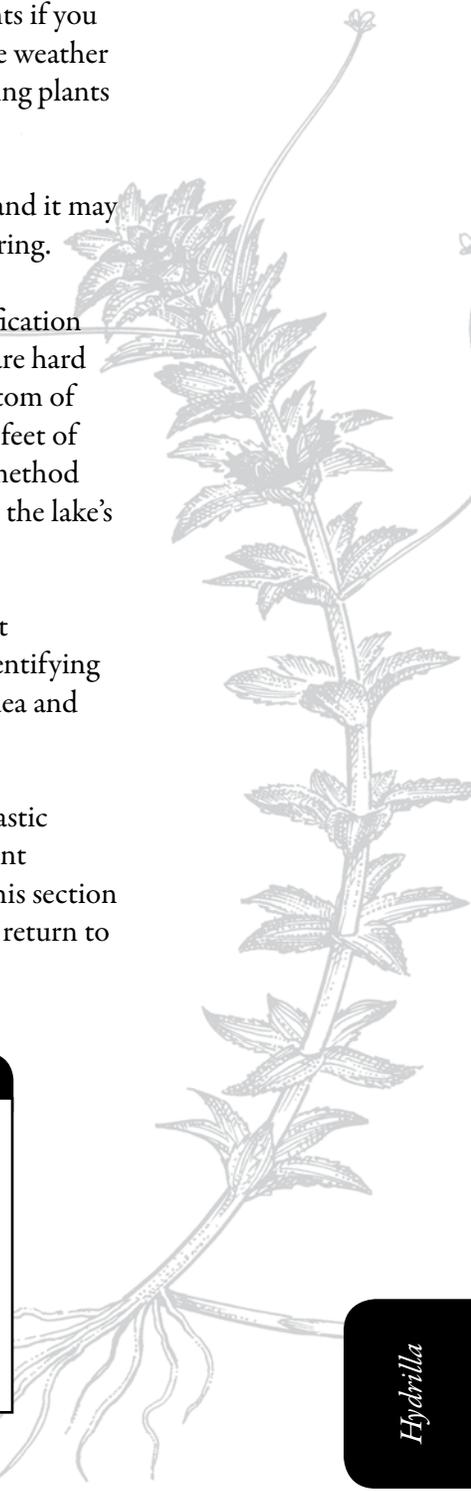
Since hydrilla looks so similar to elodea it probably isn't feasible to rely on identification without having the plant in hand. Use a long-handled rake to collect plants that are hard to reach or difficult to identify. In deeper areas, you can lower the rake to the bottom of the lake and drag the rake along. Pull the rope so that the rake pulls along several feet of the lake bed. This makes for relatively easy monitoring of deep water areas. This method will also help you pull up roots and collect plants that are not readily visible from the lake's surface. Be sure to monitor over sand as well as muck areas.

If your lake has large mats of elodea plants, be sure to check these mats and collect samples to look at. Count the number of leaves in the whorl and look at other identifying characteristics. It is important that we look carefully at plants we assume are elodea and make sure they are not hydrilla.

If there is any doubt about a plant that you are looking at, collect a sample in a plastic ziplock bag and take it to your local CLMN contact or Aquatic Plant Management Specialist for identification (see 'What to do with Suspect Plants' at the end of this section for more information). Make sure to mark the location on a map so that you can return to the same area if necessary.



Please do not throw plants that you collect back into the lake. Instead, dispose of them on shore or take them for mulch or compost for your garden. If you toss back plants, you may inadvertently spread plants to different locations on the lake. Since it's sometimes difficult to know which plants are native and which are non-native, it is best not to throw any plants back into the lake.



Hydrilla

OTHER INFORMATION YOU MAY WANT TO COLLECT

Sample Location

Record the sample GPS position.

Depth

Measure depth at each sampling site regardless of whether vegetation is present. A variety of options exist for taking depth measurements, including SONAR guns, depth finders that attach to the boat, or an anchor attached to a line with depth increments.

Dominant Sediment Type

Record sediment type (based on how the rake feels when in contact with the bottom) at each site where plants are sampled as: (a) mucky, (b) sandy, or (c) rocky.

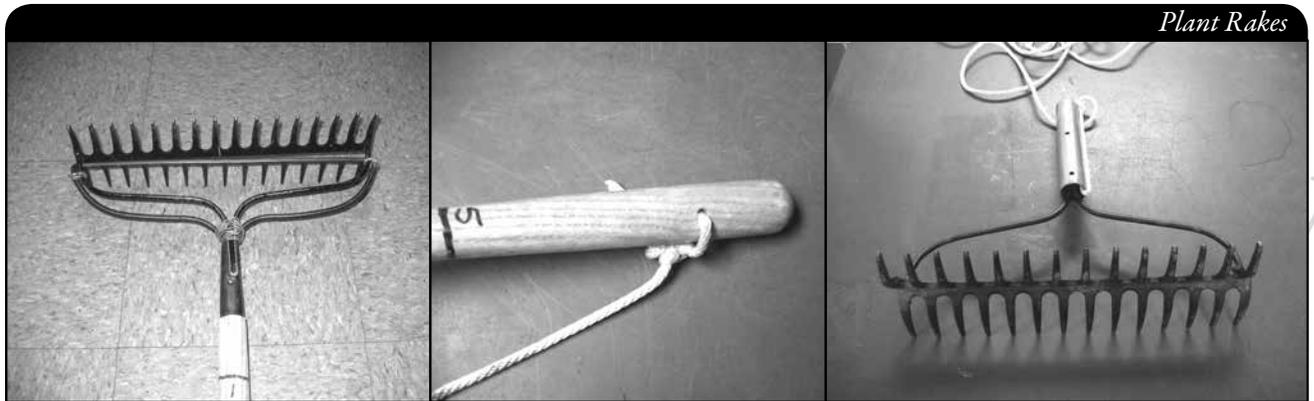
EQUIPMENT NEEDED

- Boat (canoe, kayak, fishing boat, paddle boat, etc.)
- Personal Floatation Device (PFD)
- Long handled rake with attached rope (see description and pictures on the next page)
- Lake map for marking suspect hydrilla beds and keeping track of where you have been.
- Pencil for marking on map
- Clip board or other hard surface for writing
- Ziploc bags
- Waterproof sharpie pen (to write on Ziploc bags)
- Cooler to keep plants in
- GPS unit (optional)
- Polarized sunglasses (optional)
- Aqua-View Scope (optional). To build your own Aqua-View Scope, see construction directions at the end of this section.
- A copy of appropriate report form(s) (found at the end of this section and at <http://dnr.wi.gov/lakes/forms>) depending on the type of monitoring you are doing:
 - ▶ Aquatic Invasives Surveillance Monitoring Report, Form 3200-133
 - ▶ Aquatic Invasive Plant Incident Report Form, 3200-125
 - ▶ Plant Bed Density Reporting Form, 3200-132

PLANT RAKES

Since it is sometimes difficult to identify plants under water, volunteers use rakes to sample plants. When the rake is thrown into the water, it settles to the bottom of the lake. When the rake is hauled back into the boat, aquatic plants come with it making for easier identification. A thatching rake can be used, or you can make a “2-headed” garden rake by purchasing 2 garden rakes (try looking at garage sales). Disconnect the head from one rake and wire or weld the rake heads together (teeth facing out). To monitor in deeper water, drill a hole in the end of the handle and tie a rope to it. With the two heads, no matter which way the rake falls to the lake bed, the teeth will catch the roots of the plants making plant collection a lot easier. If you need to make the rake heavier, you can use cable ties to attach duck decoy weights, a small brick or other weights. Some volunteers do not like to

deal with a rake handle in deeper water, so they cut off the rake handle and attach the rope directly to the rake heads. If you use this type of rake, it is essential that you weigh the rake by using the decoy weights, a small brick, hand weights, etc. No matter which rake is used, please be sure to tie the loose end of the rope to the boat. This way you will not lose your sampling rake.

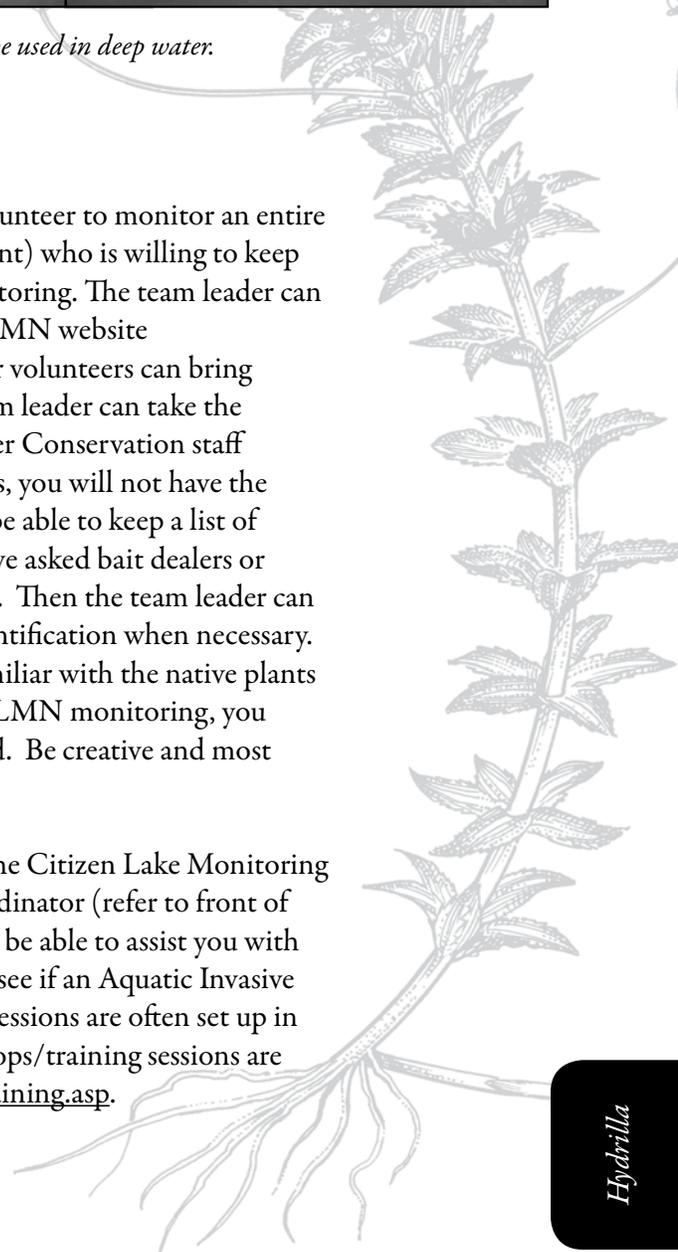


A rope is tied to the handle of this “2-headed” garden rake, so it can be used in deep water.

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 hydrilla. 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 for vouchering. By having the team leader take in suspect plants, you will not have the confusion of every team member taking in plants and you will be able to keep a list of what plants have been taken in and identified. Some groups have asked bait dealers or other businesses to “hold” suspect plants bought in by residents. Then the team leader can collect the plants from the bait dealers and take them in for identification when necessary. By the end of the summer, your team leader should be quite familiar with the native plants in your lake. If you are mapping native plants as part of your CLMN monitoring, you will probably not have to submit all your plants to be vouchered. Be creative and most importantly, do not burn out your team leaders!

Consider having a mini-plant training session for your team. The Citizen Lake Monitoring Network Coordinator or the Aquatic Plant Management Coordinator (refer to front of manual and <http://dnr.wi.gov/lakes/contacts>) in your area may be able to assist you with a training session. If not, 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>.



Hydrilla

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 plant communities, recreational and habitat use areas, and more. At the end of the season, you can map all of the sites visited.

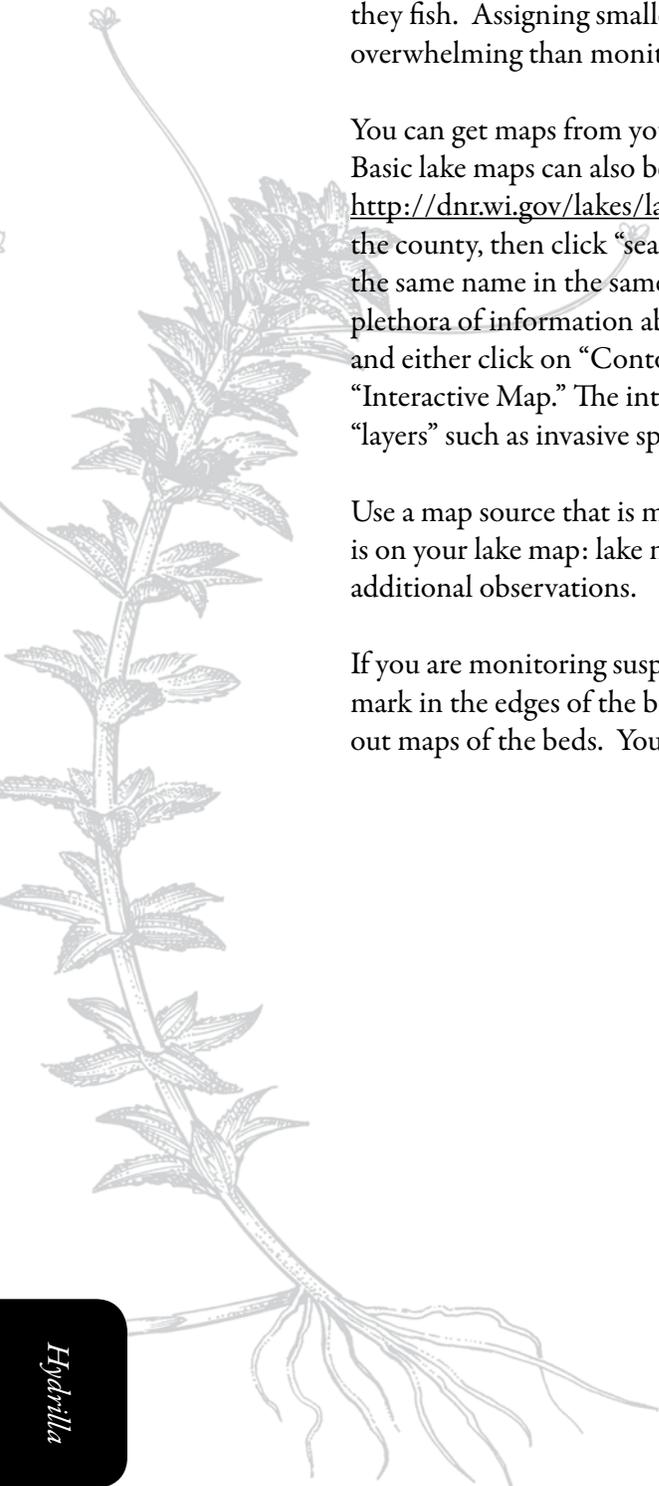
If you have a team of monitors, a map will also assist your team in deciding who will monitor where. Once you have your “team” together, print out a map so that you can mark which areas each volunteer is monitoring. Your team leader should keep the master copy of the map. It may be easiest to have volunteers monitor the areas by their homes or where they fish. 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 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 are monitoring suspect beds of hydrilla and you have a GPS unit, you may want to mark in the edges of the beds, and then load this data into a mapping program and print out maps of the beds. You may also want to mark other locations 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 information that is reported through the Citizen Lake Monitoring Network 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.

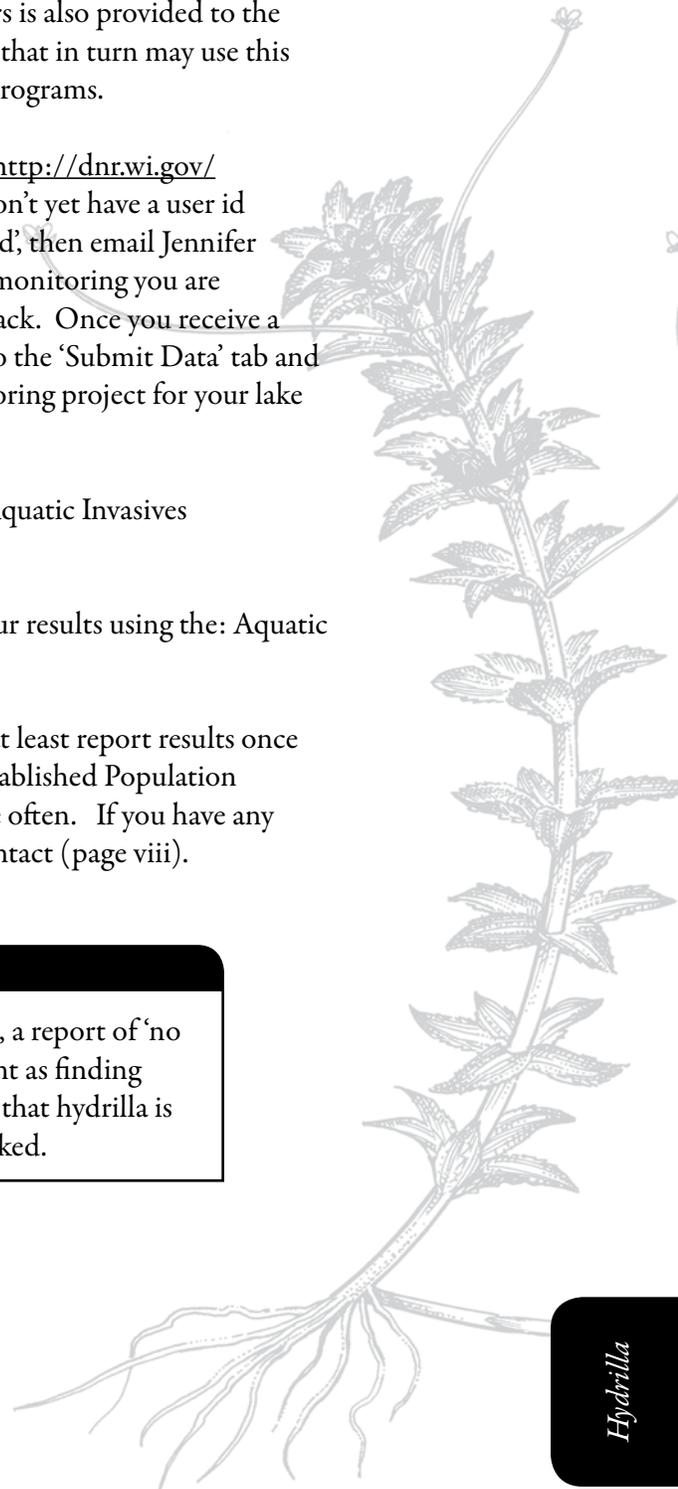
You can enter your monitoring results on the CLMN website: <http://dnr.wi.gov/lakes/CLMN> (click “Enter Data” on the left side bar). If you don’t yet have a user id and password, click ‘Request a Wisconsin User ID and Password’, then email Jennifer at jennifer.filbert@wisconsin.gov with your User ID and what monitoring you are involved in. Jennifer will set up your accounts and email you back. Once you receive a confirmation email, 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.
- If you find hydrilla for the first time on your lake, report your results using the: Aquatic Invasive Plant Incident Report, Form 3200-125.

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 more often. If you have any questions about reporting, contact your local DNR CLMN contact (page viii).



Remember, for prevention monitoring, a report of ‘no hydrilla’ at a location is just as important as finding hydrilla. One cannot confidently state that hydrilla is not present in an area if no one has looked.



WHAT TO DO WITH SUSPECT PLANTS

Note the “suspect” plant’s location on your map, making sure you can find the spot(s) again. Fill out the Aquatic Invasive Plant Incident Report (Form 3200-125) (found at the end of this section, and at <http://dnr.wi.gov/lakes/monitoring/forms.aspx>, and deliver it with the suspect plant to your team leader or local DNR CLMN contact. Suspect plants need to go to a herbarium for vouchering. DNR staff can transport plants to the herbarium for the lake group.

To collect a specimen of the plant:

- Gently pull the plant from the lake bottom. Be sure to collect as much of the plant as possible, paying special attention to getting the leafy and flowering portion, if present. Try not to break up or rip the plant as the pieces of the plant can float away and start new plants.
- Use a permanent marker and record the following information on a plastic bag:
 - a. Date
 - b. Water body
 - c. Description of where the sample was found.
- Put the sample in the plastic bag and keep it in a cool place (a cooler in your car or refrigerator at home). Take the specimen to your team leader, your local CLMN contact, your local Land and Water Conservation Department, UW-Extension office or the local DNR contact for identification. If you found hydrilla in a lake, it is important to get the plants verified and vouchered (usually by an herbarium botanist) ASAP, so that control can take place in a timely manner. Your local CLMN contact will get the plant to the DNR or local herbarium.
- If you cannot bring the plant in to your team leader or other contact:
 - ▶ Rinse the plant under running tap water or in a large pan of water. This will slow the rotting process.
 - ▶ Blot the plant dry with a paper towel.
 - ▶ Spread the plant out on a dry paper towel or newspaper. Try to spread the leaflets apart to help with identification.
 - ▶ Cover with a dry paper towel and press in a catalog or phone book for about a week.
 - ▶ Complete a label (see example at the end of this section) and the Aquatic Invasive Plant Incident Report (Form 3200-125) (found at the end of this section and at <http://dnr.wi.gov/lakes/monitoring/forms.aspx>).
 - ▶ When the plant is dry, place it between sheets of thin cardboard (like a cereal box). Mail the plant, map and the reporting form to your local CLMN contact.
 - ▶ Remember to make a copy of your map and reporting forms for your records.

Remember if you find “something,” don’t give up; there are a variety of control and management options to address invasive species on your lake. Early detection is the key to controlling the situation!



PREVENTION STARTS WITH US

Whether you are out monitoring, or just boating for fun, 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 hydrilla.



Photo by Wilfredo Robles, Mississippi State University



Hydrilla



Hydrilla



ADDITIONAL MATERIALS AND SUPPORTING DOCUMENTATION

PLANT IDENTIFICATION AND INFORMATION SOURCES

REFERENCES

REPORTING FORMS

AQUATIC INVASIVES SURVEILLANCE MONITORING REPORT

- **SINGLE LOCATION, MULTIPLE DATES**

- **MULTIPLE LOCATIONS, ONE DATE**

AQUATIC INVASIVE PLANT INCIDENT REPORT

PLANT BED DENSITY REPORT

PLANT LABELS

AQUA-VIEW SCOPE CONSTRUCTION DIRECTIONS



Hydrilla

PLANT IDENTIFICATION AND INFORMATION SOURCES

UWEX – Lakes

<http://www.uwsp.edu/cnr/uwexlakes/CBCW/Pubs/HydrillaFactsheet09.pdf>

Wisconsin Department of Natural Resources

<http://dnr.wi.gov/invasives/fact/hydrilla.htm>

Michigan Sea Grant

<http://www.miseagrant.umich.edu/photos/ais/index.html>

Langeland, K.A. 1996. *Hydrilla verticillata* (L.F.) Royle (Hydrocharitaceae), “The Perfect Aquatic Weed”. *Castanea* 61:293-304. <http://www.se-eppc.org/manual/HYVE.html>

Center for Aquatic and Invasive Plants, University of Florida, IFAS,

<http://aquat1.ifas.ufl.edu/>

REFERENCES

Non-Native Freshwater Plants, Washington State Department of Ecology. 2006

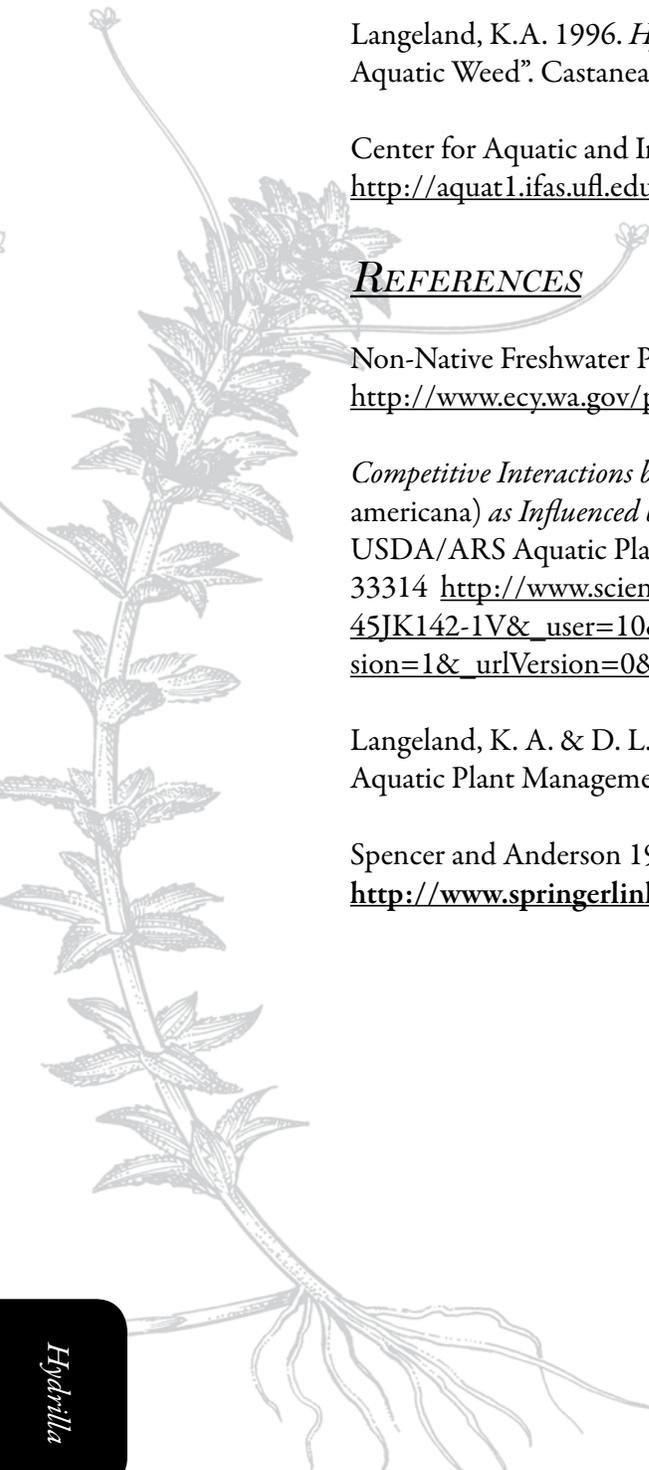
<http://www.ecy.wa.gov/programs/wq/plants/weeds/>

Competitive Interactions between hydrilla (Hydrilla verticillata) and Vallisneria (Vallisneria americana) as Influenced by Insect Herbivory^{*1} T. K. Van, G. S. Wheeler and T. D. Center, USDA/ARS Aquatic Plant Research Unit, 3205 College Avenue, Ft. Lauderdale, Florida, 33314 http://www.sciencedirect.com/science?_ob=ArticleURL&_udi=B6WBP-45JK142-1V&_user=10&_rdoc=1&_fmt=&_orig=search&_sort=d&view=c&_version=1&_urlVersion=0&_userid=10&md5=5ff75ca909b6d2df8fc8a92bdf86459b

Langeland, K. A. & D. L. Sutton, 1980. *Regrowth of Hydrilla from axillary buds*. *Journal of Aquatic Plant Management*. 18: 27–29.

Spencer and Anderson 1986

<http://www.springerlink.com/content/u31un285q3436570/>



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...

Did you...

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>

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 plant 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)

Date and Time of Monitoring or Discovery

Monitoring Date	Start Time	End Time
-----------------	------------	----------

Information on the Aquatic Invasive Plant Found (Fill out one form for each species found.)

Which aquatic invasive plant did you find?:
 Curly-leaf Pondweed Eurasian Water-milfoil Purple Loosestrife
 Brittle Naiad Hydrilla Brazilian Waterweed Yellow Floating Heart

Where did you find the invasive plant?

Latitude: _____ Longitude: _____

Approximately how large an area do the plants occupy?
 A Few Plants One or a few beds Many beds A Whole Bay or Portion of Lake
 Widespread, covering most shallow areas of lake Don't know (e.g. didn't check the whole lake)

Was the plant floating or rooted?
 Floating Rooted

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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Voucher Sample

Did you collect a sample of the plant (a voucher specimen) and bring it to your local DNR office? If so, which office?

Rhinelander Spooner Green Bay Oshkosh Did not take plant sample to a DNR office
 Fitchburg Waukesha Eau Claire Superior Other Office _____

Please collect up to 5-10 intact specimens. Try to get the root system, all leaves as well as seed heads and flowers when present. Place in ziplock bag with no water. Place on ice and transport to refrigerator. Bring samples, a copy of this form, along with a map showing where you found the suspect plants to your regional AIS or Citizen Lake Monitoring Coordinator at the DNR.

For DNR AIS Coordinator to fill out

AIS Coordinator(s) 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? Yes No If no, what was it?

Herbarium where specimen is housed: _____ Herbarium Specimen ID: _____

Have you entered the results of the voucher in SWIMS? Yes 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.

Use this form when you have verified that your lake has Eurasian Water-Milfoil or Curly-leaf Pondweed and you want to assess the densities of the bed(s). Please use one form per plant bed raked.

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, s. 19.32 - 19.39, Wis. Stats.

Primary Data Collector

Name	Phone Number	Email
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Monitoring Location

Waterbody Name	Township Name	County	Station Name
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Latitude of approx. center of plant bed	Longitude of approx. center of plant bed
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Method of obtaining Latitude and Longitude: GPS Online Surface Water Data Viewer
 Other Mapping Software Other _____

Date and Time of Monitoring

Monitoring Date	Start Time	End Time
-----------------	------------	----------

Estimated percent cover in the sample area (Optional)

Substrate cobble, %	Substrate muck, %	Substrate boulders, %	Substrate sand, %	Bottom covered with plants, %
---------------------	-------------------	-----------------------	-------------------	-------------------------------

Monitoring Results

Which aquatic invasive plant are you monitoring the density of?:
 Curly-leaf Pondweed Eurasian Water-milfoil Other _____

Plant Density Rating
 1-A few plants on rake head 2-Rake Head is about 1/2 full 3-Overflowing

Depth to lake bottom at edge of plant bed closest to shore (min depth) feet/meters (circle one)

Depth to lake bottom at edge of plant bed furthest shore (max depth) feet/meters (circle one)

Estimated Height of Plants (use marked-off rake handle to determine)
 0.5 - 1 foot 1 - 2 feet >2 feet

If monitoring Eurasian Water-Milfoil, did you notice any holes or damage to the stems that could possibly be weevil damage ?
 Yes No

PLANT LABELS

 **Project Name: Citizen Lake Monitoring Network**

(Scientific Name & authority)

Common Name:
Lake Name:
Water Body ID code#:
County:
Collected by:
Date:
Depth:
Location and Habitat:



 **Project Name: Citizen Lake Monitoring Network**

(Scientific Name & authority)

Common Name:
Lake Name:
Water Body ID code#:
County:
Collected by:
Date:
Depth:
Location and Habitat:



 **Project Name: Citizen Lake Monitoring Network**

(Scientific Name & authority)

Common Name:
Lake Name:
Water Body ID code#:
County:
Collected by:
Date:
Depth:
Location and Habitat:



Hydrilla

AQUA-VIEW SCOPE CONSTRUCTION DIRECTIONS

- 1 - 3 foot section of 4" diameter plastic pipe. We use ABS pipe because it is black and because it is lighter than PVC pipe. If you are unable to find ABS pipe, PVC pipe will work just fine. Your hardware store may have a short piece of pipe they will sell you. We bought a 10-foot piece of pipe and cut it.
- 1 or 2 - 5 ½" pull handles (we used one, it was easier to hold and guide)
- Screws if not supplied with handle
- 1 - 4" ABS coupler
- 1 - 4 3/8" diameter lexan disk – Lexan is non-breakable plexiglass that we had cut at our local glass repair shop. You can use plexiglass for the disk but it is difficult to cut the plexiglass in a circle.
- Clear silicone rubber sealant
- Drill and screw driver
- Weatherstripping for around the top of the aqua-view scope. Marine and automotive weatherstrip tape works well.

HOW TO MAKE AN AQUA-VIEW SCOPE (picture on next page)

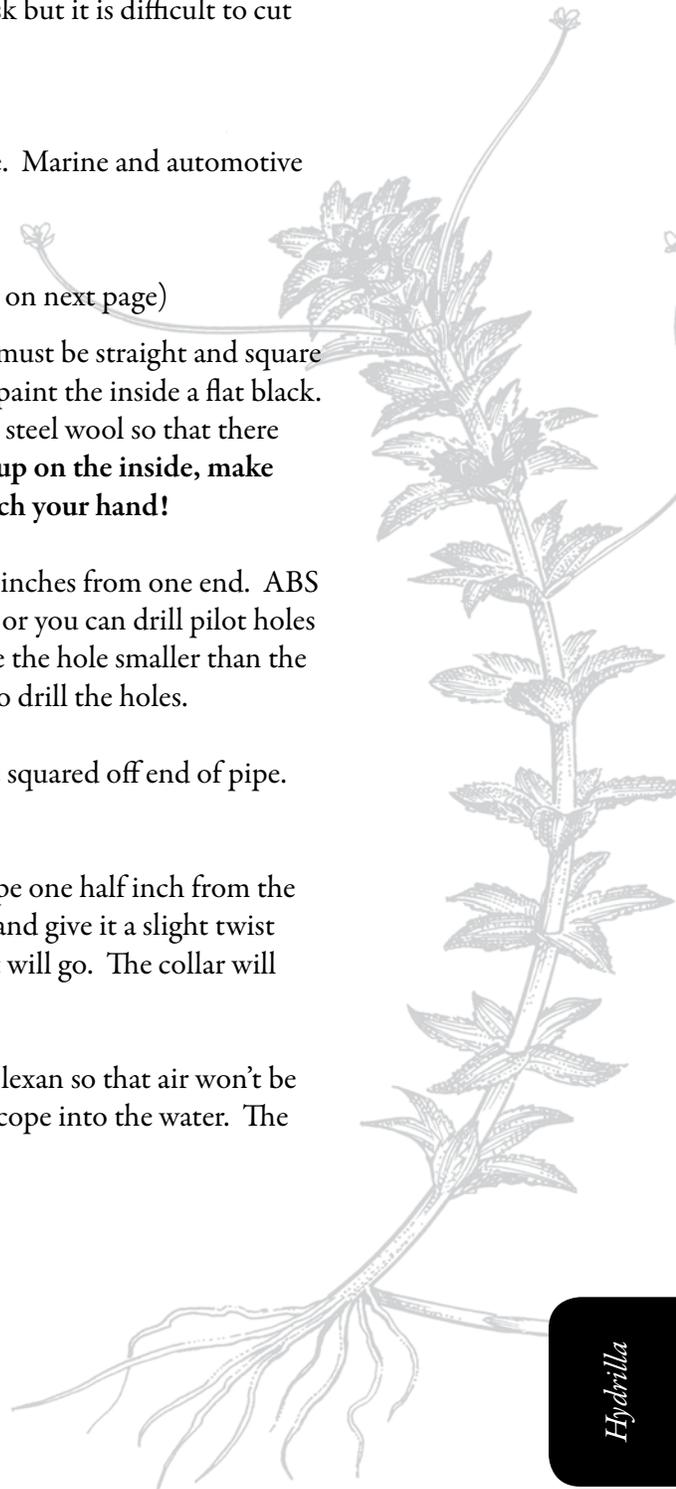
Cut a 3 foot section of 4" diameter ABS or PVC pipe. The cut must be straight and square to the pipe. If you can't find pipe with a black interior, you can paint the inside a flat black. If the pipe is shiny on the inside, rough it up using sandpaper or steel wool so that there won't be any glare inside the tube. **If you are going to rough it up on the inside, make sure to do that before you attach the screws so you don't scratch your hand!**

Attach one or two handles on either side of the pipe about four inches from one end. ABS pipe is fairly soft, you can use a screw driver to put the screws in or you can drill pilot holes and put the screws in. If you are using a drill, make sure to make the hole smaller than the screw so the screw will hold. If using PVC pipe, you will need to drill the holes.

Run a bead of clear silicone rubber sealant on the bottom of the squared off end of pipe. Place the lexan disk on the bead of sealant.

Smear a small amount of silicon sealant on the outside of the pipe one half inch from the end of the pipe with the lexan. Slide the coupling over the end and give it a slight twist to distribute the sealant evenly. Slide the coupling on as far as it will go. The collar will extend out beyond the lexan disk protecting it from scratching.

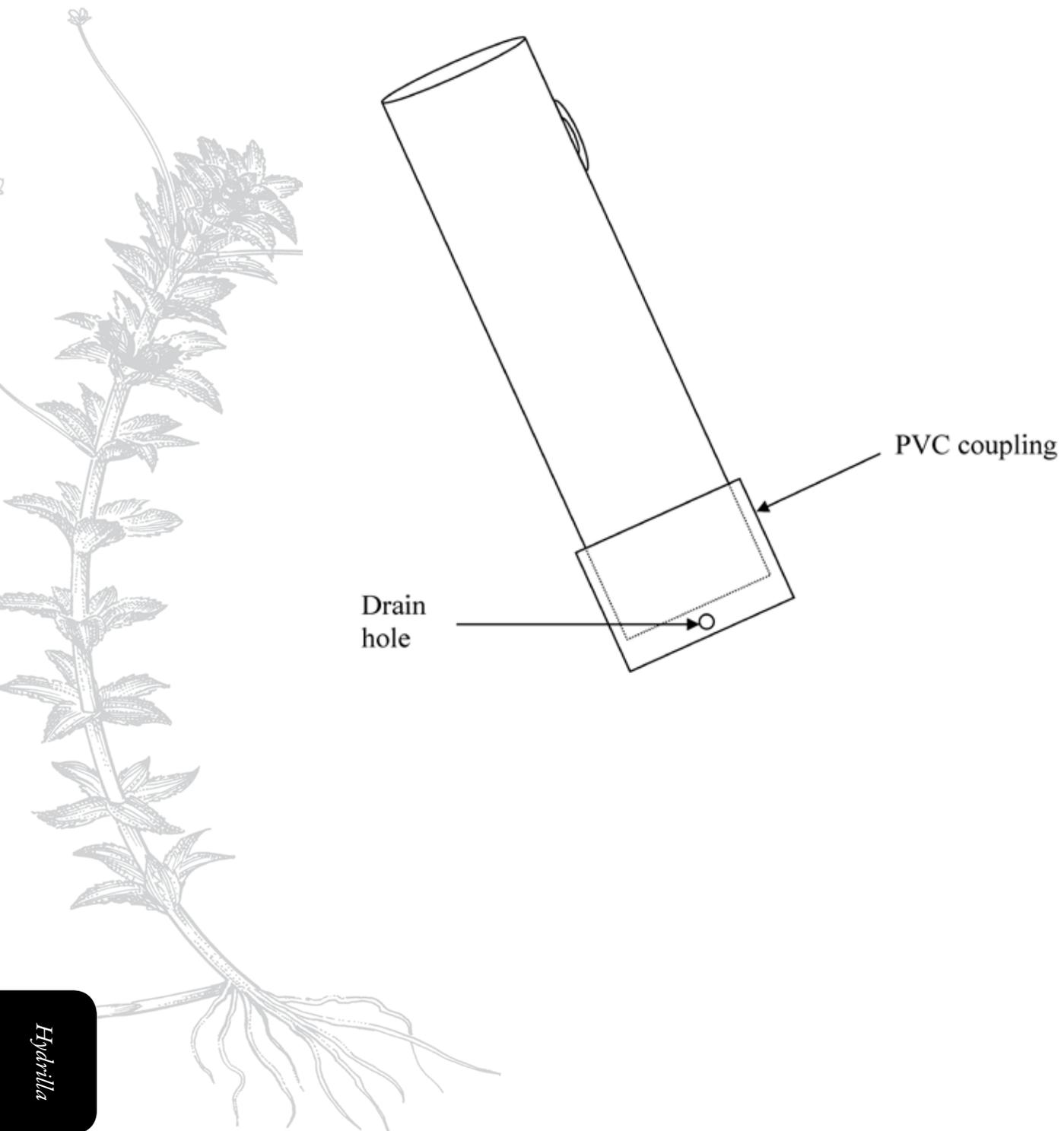
Drill two small (1/4") holes in the side of the collar close to the lexan so that air won't be trapped in the open end of the coupler when you put the view scope into the water. The holes should be drilled on opposite sides of the pipe.



Weatherstripping is placed around the top of the open end of the scope (the side you look into). Weatherstripping has a sticky side that sticks to the plastic and the foam makes it a little more comfortable for your face to rest against.

Aqua-view scope instructions adapted from those designed by Jeff Schloss, coordinator of New Hampshire Lakes Lay Monitoring Program (603) 862-3848.

AQUA-VIEW SCOPE DRAWING



NEW ZEALAND MUDSNAIL

11

MONITORING PROTOCOL



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To keep current on New Zealand mudsnail updates including disinfection protocols, visit <http://dnr.wi.gov> and type “New Zealand Mudsnail” in the search box.

Much of the information for this section was taken directly from the: National Management and Control Plan for the New Zealand Mudsnail (Potamopyrgus antipodarum). May 2007. Prepared for the Aquatic Nuisance Species Task Force by the New Zealand Mudsnail Management and Control Plan Working Group.



BACKGROUND/OVERVIEW

The New Zealand mudsnail (*Potamopyrgus antipodarum*, pronounced POT-a-mo-PIER-gus an-tee-poh-DAR-um) is indigenous to New Zealand and its adjacent islands. In New Zealand, the snails are found in nearly every aquatic habitat including large rivers, forested tributary streams, thermal springs, ponds, glacial lakes and estuaries. Over the past 150 years, New Zealand mudsnails have spread to three continents: North America, Europe, and Australia. In 2005 the New Zealand mudsnail was found in Lake Superior in the Duluth-Superior Harbor (St. Louis River harbor area). In 2007 ecologists at the Lake Michigan Biological Station discovered New Zealand mudsnails south of the Waukegan Harbor in Lake Michigan. The mudsnail populations in Lake Superior and Lake Michigan are the same clone as what has been found in the eastern United States. This clone (Clone 2) is not as prolific or problematic as the New Zealand mudsnail clones found in the western United States. This clone is speculated to have arrived in the US in ballast water from Europe.

Fall 2013, New Zealand mudsnails were found in a macroinvertebrate (insect) sample collected on Black Earth Creek in southern Wisconsin. This sample was collected in 2012 but not analyzed until 2013. 2014 monitoring has shown populations in a 4-mile stretch of Black Earth Creek. Additional monitoring in state streams is underway. No lake sampling is scheduled. Lake sampling will come later once we know the range of the Wisconsin streams population. The Black Earth Creek New Zealand mudsnails are the same clone (Clone 1) as is found out in western United States. This is the first known population of Clone 1 east of the Mississippi River. Clone 1 is more aggressive than Clone 2.

In western streams in the US, mudsnails have been found to reach a density of a half million per square meter, frequently comprising over 95% of the invertebrate biomass in a river. This has devastating consequences to native mussels and other invertebrates' populations as the mudsnails compete for the same food base and habitat. The mudsnails are "grazers" eating algae and periphyton normally eaten by native invertebrates. The mudsnails alter the primary production (food web) of the waterbody they are in. In waterbodies with these mudsnails, the insect diversity and abundance decrease. Even insects, such as caddisflies and mayflies, are impacted by the densities of the New Zealand mudsnails. These insects are normally a food base for fish so fish populations that depend on these natives as a food source are threatened as well. The mudsnails have little food value for fish.

On some Colorado streams, the population has gone from boom to bust, other populations have remained high. We do not yet know the environmental factors that impact the abundance and survival of New Zealand mudsnails.

The New Zealand mudsnails are nearly impossible to contain once they have invaded an aquatic ecosystem. Highly resilient, the snails can survive up to a month out of the water. They can close their operculum (trap door cover) and withstand being submerged in chemicals for almost a month – making control and containment complicated. New



Zealand mudsnails can withstand a wide range of temperatures, including 3-4 months of winter conditions. The US clones of New Zealand mudsnails females are born “pregnant”. They carry up to 230 neonates (juveniles) in brood pouches. These juveniles are released once the female mature (3 to 9 months depend upon water temperatures). Therefore, one female is sufficient to initiate a new population.

Densities of Clone 1 New Zealand mudsnails can fluctuate greatly. Densities fluctuate depending upon season, with higher numbers found in the summer months and lower numbers found in winter months. Densities also fluctuate between locations. Densities up to 500,000 snails/square meter have been found in western states.

While the snails can be transported to new waterbodies if they are attached to birds and other wildlife, human activities can play a major role in their spread. Biologists indicate that these organisms can be transported on boats and other watercraft, and on boots, waders, nets and other fishing gear.

Volunteers play an integral part in learning to recognize the New Zealand Mudsnail and checking local lakes, streams and rivers for the presence of this snail. Early identification of the mudsnail makes containment easier, and can help prevent the spread into other waterbodies. If you detect the invasives early enough, you may be able to prevent them from spreading throughout your lake system. At present, control of the New Zealand mudsnail is unlikely. Since the New Zealand mudsnails have been discovered in the Duluth-Superior Harbor, in the Waukegan Harbor in Lake Michigan, and in Black Earth Creek, volunteers are especially needed to monitor local lakes, streams and rivers in these portions of the state.



LIFE CYCLE

In New Zealand, the New Zealand mudsnail is dioecious (separate male and female sexes) and bears live young (Winterbourn 1970a, b, Wallace 1978). Female mudsnails in New Zealand may be either sexual or asexual. Asexual females develop eggs that can grow without fertilization and produce cloned genetically identical offspring. Therefore, one female is sufficient to initiate a new population. Although New Zealand mudsnails reproduce both sexually and asexually in New Zealand, introduced populations to the United States appear to be clonal (asexual). In the United States, the known populations of these tiny snails (up to ¼ inch) are almost all females. They are born “pregnant” and give birth to live young (no external eggs). Depending upon water temperatures, females each reproductive age anywhere from 3 to 9 months of age.

“The New Zealand mudsnail inhabits both brackish and fresh waters. It can be found in estuaries, lakes, rivers and streams. It survives in waters with high and low calcium content, on hard and soft substrates, in turbid or clear water, and among vegetation. It is capable of tolerating a wide range of temperatures with upper thermal limits of 83°F and lower thermal limits near freezing, allowing it to overwinter here in Wisconsin.” (MacFarland, 2008). The mudsnail does well in eutrophic (high nutrient) waterbodies.

The New Zealand mudsnail is both a grazer and a detritivore, preferring to eat diatoms, plant and animal detritus, and attached periphyton (algae that attaches to surfaces of plants, rocks, etc.).



IDENTIFICATION

In your packet is a card with a picture of the New Zealand mudsnail (*Potamopyrgus antipodarum*). One of the main identification features of the New Zealand mudsnail is their size. Adult snails are less than 1/4 inch in length. Shell length is measured from the lip of the shell to the tip of the whorl. Adult native snails are larger than the New Zealand mudsnail adults. New Zealand mudsnails have opercula (singular operculum), which are “trap doors” that can be closed. The mudsnail pulls its body back into the shell and closes its operculum to protect its soft body from danger. This operculum is solid in consistency and if the operculum is kept closed, the snail can live through dry conditions (and even in alcohol) for up to a month. With the operculum kept closed, the snail can pass through the digestive tract of fish unscathed. Since New Zealand mudsnails give birth to live young, you may find small snails inside of the adult females.

Refer to pictures below as well as reference materials in your packet to see the characteristics listed below:

New Zealand mudsnail characteristics:

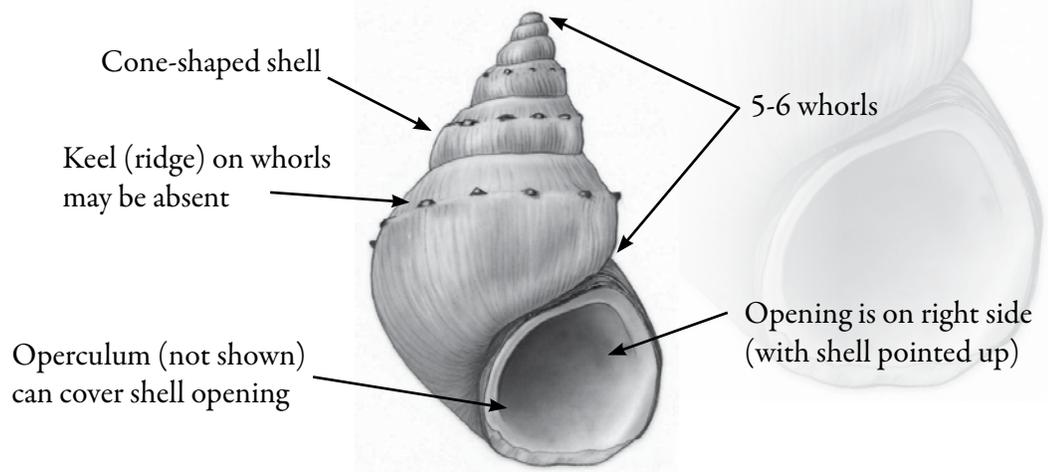
- Adult mudsnails normally range from 3 mm (1/10 inch) to 5 mm (2/10 inches) although Clone 1 (Wisconsin Clone) have been found to reach 6 mm (1/4 inch).
- Operculum (trap door) present.
- Shell ranges from light to dark brown
- The shell is cone shaped and has 5 to six whorls.
- Whorls are dextral (opening is on the right side – see drawing below).
- Some New Zealand mudsnails have raised keels on their shells (see drawing below).



Photo by Laura Hermann



Photo by Larry Meyer



Credit: U.S. Geological Survey



NEW ZEALAND MUDSNAIL MONITORING

Black Earth Creek, southern Wisconsin, is the first documented “inland” waterbody with Clone 1 New Zealand mudsnails. Clone 2 New Zealand mudsnails were discovered in the Duluth-Superior Harbor and in the Waukegan Harbor in Lake Michigan. Volunteers are especially needed to monitor lakes, streams and rivers in these areas.

WHEN TO MONITOR

PREVENTION MONITORING

The best time of the year to monitor for New Zealand mudsnails is late summer to early fall, but monitoring can take place anytime you are on the water.

WHERE DO I LOOK FOR NEW ZEALAND MUDSNAILS?

PREVENTION MONITORING

The New Zealand mudsnail inhabits both brackish and fresh waters. It can be found in estuaries, lakes, rivers and streams. It survives in waters with high and low calcium content, on hard and soft substrates, in turbid or clear water, and among vegetation. It is capable of tolerating a wide range of temperatures with upper thermal limits of 83°F and lower thermal limits near freezing, allowing it to overwinter here in Wisconsin.

Look for the mudsnails throughout the entire lake when you are recreating. Look for large numbers of tiny snails or shells along the shoreline. Shells of dead snails are often found near the high water mark of the lake, particularly on the downwind side of the lake. You may also want to look for them while boating. New Zealand mudsnails can be found in **shallow-water areas** and **deep-water areas**. Mudsnails can live in depths of 45 meters (150 feet).

HOW TO MONITOR

New Zealand mudsnails occur in a wide variety of water bodies and on a wide variety of substrates including sand, leaf litter, organic detritus, silt, algae, aquatic plants, gravel, cobbles, and boulders, as well as any other type of stable substrate (natural or artificial). With such a wide variety of habitats capable of being invaded, no single sampling method can be developed that is applicable in all situations. We have listed several monitoring techniques that can be used. Other methods may also be used. Make sure to note your sampling method on your reporting forms.

PREVENTION MONITORING

Shorelines

Even before looking for colonies of New Zealand mudsnails you will want to look for shells along the shoreline. Look in shallow water areas or along shorelines where piles of plant matter and shells wash up along the shoreline. It is especially important to visit

these areas after storms and high boat traffic times, as this is when shells will blow up along the shoreline. You can also conduct a 10 minute “rapid assessment” of the lake shoreline. Walk the shore and look for shells on the shoreline and in the shallow water area. Collect different size shells for identification. If you find/collect lots of “small” snails, there is no need to continue monitoring for the full 10 minutes. If you find lots of tiny shells, you will want to preserve some of them and bring them in for identification.

Shallow-water Areas

Boat or walk around the shoreline of your lake and look for snails in the shallow water areas. Remember they colonize quickly and become dense (thousands per square meter). You can collect snails/shells with a long handled net (net needs to have very fine mesh) if you cannot reach the shells by hand.

If your group is monitoring macroinvertebrates from the streams near your lake, consider looking through these samples for the mudsnails. Many river groups use a surber square or kick net for this sampling. You can find more information on the square at http://www.adopt-a-stream.org/pdf/monitoring_tools/the_surber_sq_ft_sampler.pdf. You can find more information on kick nets at <http://www.lamotte.com/pages/common/pdf/instruct/3-0021-p.pdf>. Kick nets can be used to collect snails. The kick nets need to be fine meshed (0.3- 0.5 mm mesh) so that the snails are collected.

Deep-water Areas

Some groups collect sediment through the use of bottom samplers (Eckman dredges, ponar dredges, etc.). You can sort through the materials pulled up by the dredge but this sampling will only sample/monitor a small area of the lake bed. You can also look for colonies of small snails when you snorkel or scuba dive.

OTHER INFORMATION YOU MAY WANT TO COLLECT

Sample Location

Record the sample GPS position.

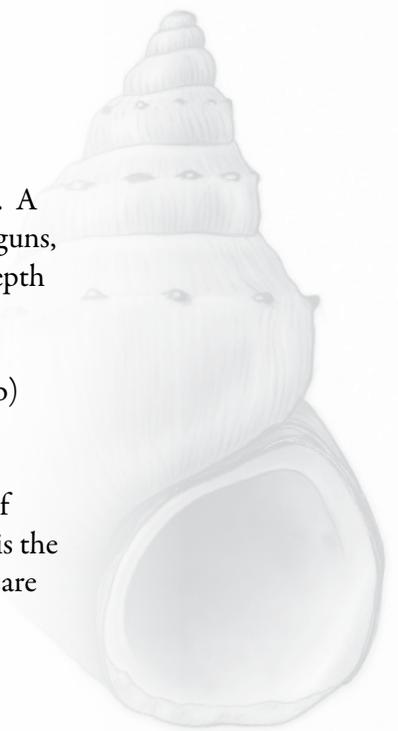
Depth

Measure depth at each sampling site regardless of whether snails are present. A variety of options exist for taking depth measurements, including SONAR guns, depth finders that attach to the boat, or an anchor attached to a line with depth increments.

Dominant Sediment Type

Record sediment type at each site where snails are sampled as: (a) mucky, (b) sandy, or (c) rocky.

The goal of the Citizen Lake Monitoring Network is to collect any and all records of New Zealand mudsnails in Wisconsin lakes. As of spring 2014, Black Earth Creek is the only documented inland waterbody with New Zealand mudsnails. No inland lakes are documented as having New Zealand mudsnails.



EQUIPMENT NEEDED

- Lake map for marking suspect mudsnail locations and keeping track of where you have been
- Pencil for marking on map
- Clip board or other hard surface for writing
- Ziploc bags
- Waterproof sharpie pen (to write on Ziploc bags)
- Cooler to keep snails in
- GPS unit (optional)
- Polarized sunglasses (optional)
- Sampling gear you plan to use.
- A copy of appropriate report form(s) (found at the end of this section and at <http://dnr.wi.gov/lakes/monitoring/forms.aspx>), depending on the type of monitoring you are conducting:
 - ▶ Aquatic Invasives Surveillance Monitoring Report, Form 3200-133
 - ▶ Aquatic Invasive Animal Incident Report Form, 3200-126

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 for vouchering. Be creative and most importantly, do not burn out your team leaders!

Consider having a mini-training session for your team. The CLMN Coordinator for your area may be able to assist you with a training session. If not, 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 plant communities, 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 fish. 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 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.

REPORTING

What would all the work that goes into gathering accurate information be worth if others could not read and review 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.



There is a note of caution on “not finding New Zealand mudsnails”. With the snails being so small, we have to be cautious in our assumptions that if we do not find them, they are not there. One may miss a newly established population if the population is in the early stage and the numbers are small.

The DNR, lake managers, researchers, and others use the information that is reported through the Citizen Lake Monitoring Network 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 who 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.
- If you find what you believe to be New Zealand mudsnails on your lake, report your results using the: Aquatic Invasive Animal Incident Report, Form 3200-126. Be sure to take extra decontamination/preventative measures to ensure you do not spread the New Zealand mudsnails to other locations. <http://dnr.wi.gov/topic/invasives/fact/pdfs/NZMFactsheet.pdf>

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 have any questions about reporting, contact your local DNR CLMN contact (*page viii*).

WHAT TO DO WITH SUSPECT SNAILS

Collect up to 10 of the suspect snails. Place them directly into a container of 70-95% ethanol (rubbing alcohol will also work) and place vials in the freezer. The easiest “sure way” to kill the mudsnails is to freeze them for at least 8-hours. All monitoring equipment and gear needs to be decontaminated. If you clean your equipment, the wash water that came in contact with the mudsnails should also be frozen. Note the “suspect” snail’s location on your map, making sure you can find the spot(s) again. Fill out the 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> and deliver the report form along with the suspect snails to your team leader or local DNR CLMN contact. It is illegal to mail alcohol, so please arrange delivery or pick-up of the sample(s). Suspect snails need to go to a snail identification expert for vouchering. DNR staff can arrange for transportation of the snails to the appropriate taxonomist for the lake group. Remember to make a copy of your map and reporting forms for your records.

Remember if you find “something,” don’t give up; early detection is the key to controlling the situation!



PREVENTION STARTS WITH US

- If you have an aquarium at home or your child brings home a snail from school, a lake, or a river, please do not release the snail into the environment. The snail could be an invasive species. Female New Zealand mudsnails reproduce asexually (clone themselves) so even adding one snail may cause problems.
- 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. Snails, mussels and other organisms are often found attached to plants that have been removed from boating equipment. By removing aquatic plants and animals from boating equipment and encouraging others to do the same, you can help protect Wisconsin lakes from New Zealand mudsnails.
- Drain lake or river water from boats. Rinse gear with hot water (113°F/45°C) or freeze gear before reuse.
- Anglers need to wash waders, hip boots, and other gear before transporting from one water body to another.
- Fishermen are encouraged not to use felt bottom wading boots as they are more likely to harbor mudsnails and other invasive species.
- Make sure your lake group purchases fish and aquatic plants from reputable dealers if your lake groups stocks fish or plants in your lake. Work with local DNR staff to acquire proper permits.
- Do not plant water garden plants in your lake. Work with your local DNR staff if you are going to add plants to your lake
- <http://dnr.wi.gov/topic/invasives/fact/pdfs/NZMFactsheet.pdf>





ADDITIONAL MATERIALS AND SUPPORTING DOCUMENTATION

SNAIL IDENTIFICATION AND INFORMATION SOURCES

REFERENCES

REPORTING FORMS

AQUATIC INVASIVES SURVEILLANCE MONITORING REPORT

- SINGLE LOCATION, MULTIPLE DATES

- MULTIPLE LOCATIONS, ONE DATE

AQUATIC INVASIVE ANIMAL INCIDENT REPORT

ZEBRA AND QUAGGA MUSSEL SUBSTRATE SAMPLER

CONSTRUCTION DIAGRAM

SNAIL IDENTIFICATION AND INFORMATION SOURCES

http://www.wisconsinrivers.org/documents/AIS/New Zealand Mudsnail_WT903_Final.pdf

http://www.seagrant.umn.edu/ais/newzealand_mudsnail

http://el.erdc.usace.army.mil/ansrp/potamopyrgus_antipodarum.pdf

REFERENCES:

National Management and Control Plan for the New Zealand Mudsnail (Potamopyrgus antipodarum), May, 2007. Prepared for the Aquatic Nuisance Species Task Force by the New Zealand Mudsnail Management and Control Plan Working Group.

MacFarland, Laura, et al. 2008. *New Zealand mudsnail factsheet*.

<http://dnr.wi.gov/topic/invasives/fact/pdfs/NZMFactsheet.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)

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...	Did you...
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
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
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>

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
-----------------	------------	----------

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: _____

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?
 Dock/pier Dam Rocks Plants Boats or Gear Plate Sampler(s) Logs, acorns, pine cones or other woody structure
 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?
 Rhinelander Spooner Green Bay Oshkosh Did not take sample to a DNR office
 Fitchburg Waukesha Eau Claire Superior 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.

Aquatic Invasive Animal Incident Report

Form 3200-126 (R 02/10)

Page 2 of 2

Length of Zebra or Quagga Mussels from Sample (if applicable)

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

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.

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NATIVE WATER-MILFOIL WEEVIL

12

MONITORING PROTOCOL



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Protocol drafted by Aubrey Maccoux, 2007. Modified by Laura Herman, 2009.



BACKGROUND/OVERVIEW

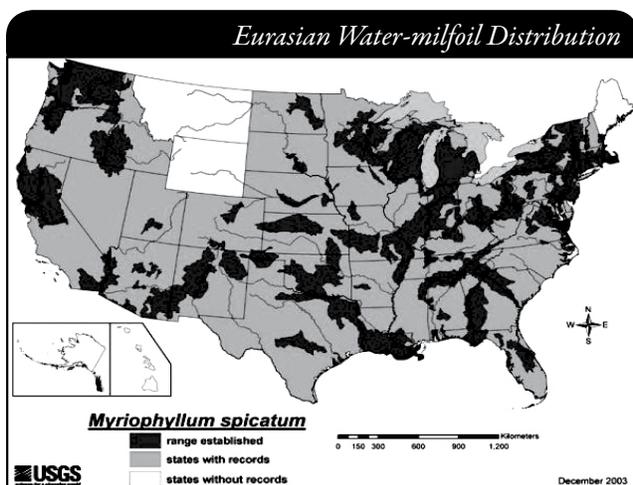
EURASIAN WATER-MILFOIL

Eurasian water-milfoil (EWM) is a submerged aquatic plant that poses a serious threat to a lake's native aquatic plants and the animals that depend on these diverse ecosystems. Since it is not native to Wisconsin or the United States, it has very few natural predators. EWM can form thick underwater stands of tangled stems and vast mats of vegetation at the water's surface. It can crowd out native plants and become so thick that the larger fish cannot swim through the tangled mats. When EWM mats get well established, channels are needed to allow access from the shoreline out into deeper water areas. EWM is now one of the most troublesome submerged aquatic plants in Wisconsin.

There are 11 native water-milfoil species in North America. Of these 11 native species, seven are native to Wisconsin. The native water-milfoils are not as aggressive as the exotic water-milfoil and they have natural predators. Some Wisconsin species of water-milfoil are quite rare and are on the Wisconsin Threatened and Endangered species list.

EWM is native to Europe, Asia and northern Africa. It may have been brought in to the United States via aquaculture and the aquarium trade. The first authenticated record of EWM in the United States was in 1942 in a Washington D.C. pond. In 2007 it was found in 48 of the 50 states. EWM was first documented in Wisconsin in the 1960's. The list of waterbodies in Wisconsin where EWM has been verified can be found at <http://dnr.wi.gov/lakes/invasives/>.

Volunteers play an integral part in learning to recognize the plant and checking local lakes for the presence of EWM. Early identification of the plant makes control much easier, and can help prevent the spread into other waterbodies. If you detect the invasives early enough, you may be able to prevent them from spreading throughout your lake system. It is cheaper to control small patches of invasives than to control invasives that have taken over an entire lake system. Once invasives are established in a lake, they are nearly impossible to eradicate.



USGS - December 2003





LIFE CYCLE

EURASIAN WATER-MILFOIL

EWM is an evergreen plant. The plant remains alive over the winter and starts growing when water temperatures reach 50° F (Bode, J. et al. 1992). EWM begins growing earlier in the season than the native water-milfoils. This makes early spring chemical treatment an option for control of EWM as it is more selective for EWM than late spring or summer treatments. In spring and summer, EWM can grow up to two inches a day. If EWM plant growth reaches the surface of the lake, the plant will continue to grow and can form a canopy over the surface of the lake often making the area nearly impassable with a motor boat. This canopy can also shade out native plants. Excessive growth affects recreational use by interfering with swimming, fishing, and boating and reducing the aesthetics of the lake. EWM grows in water depths ranging from less than one-foot to over 20-feet. Thick beds can form in water depths from 3 to 20 feet deep (Smith, C and J. Barko, 1990), but most commonly reach nuisance levels in water depths of 6-15 feet. It has the capability to survive in the cleanest lakes to lakes with very high nutrient levels, but does best in moderately fertile lakes.

EWM produces seeds and runners, but the main method of spread is through plant fragmentation (vegetative propagation) by boats and wave action. In the late summer and early fall, auto fragmentation may occur. Auto fragmentation is when the plant “breaks itself into smaller pieces”. Plant cells at leaf nodes and side-branch connections become weak, die and break off. These newly formed fragments float to new locations where they fall to the substrate, root and establish new beds of EWM.

WHAT INSECTS ARE KNOWN TO EAT EURASIAN WATER-MILFOIL?

Eubrychiopsis lecontei: Eggs are laid in the tips of the plants; larvae feed on the tips of the stem and burrow into the stem eating the vascular material; pupae chambers are inside the stem; and adults eat the leaves of the water-milfoil. The weevil monitoring through CLMN will focus on *Eubrychiopsis lecontei*.

Phytobius species: *Phytobius* is a weevil that looks a lot like *Eubrychiopsis* and the two are often confused. One needs to look at the leg characteristics as well as the “bumps” on the back of the insect to distinguish these two species. Eggs are laid on the flowers; larvae feed on the flowers; pupae chambers are “wart-like” bubbles on the outside of the stem; and adults feed on the flowers. *Phytobius* has been documented in Wisconsin (Amy Thorstenson, personal contact 2008). If weevils are found on your lake, the samples will be collected and research folks will identify and determine which weevil is found. *Phytobius* does not seem to be as successful in controlling EWM as *Eubrychiopsis*.

Acentria species: There is a moth species in which the larvae lives in the water and eats Eurasian water-milfoil. Not a lot is documented about this moth as it does not “control” Eurasian water-milfoil as well as *Euhrychiopsis* and *Phytobius*. There are native *Acentria* species in Wisconsin.

Cricotopus species: This chironomid midge larvae will feed on Eurasian water-milfoil. Not a lot of documentation has taken place on *Cricotopus* as this midge does not “control” Eurasian water-milfoil. There are native *Cricotopus* species in Wisconsin.

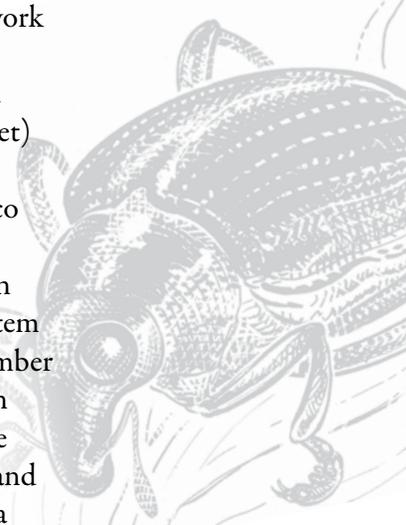


OVERVIEW AND LIFE CYCLE

EUHRYCHIOPSIS LECONTEI (WATER-MILFOIL WEEVIL)

Euhrychiopsis lecontei, an aquatic water-milfoil weevil, is a water-milfoil specialist native to northeastern US, upper Midwestern US, and western Canada/northwestern US. The weevil feeds solely on water-milfoil with northern water-milfoil being its primary native food base. The weevils have also been found to eat Eurasian water-milfoil. The weevils over-winter in organic matter (leaves and debris) on the shore and fly or swim back out to water-milfoil beds in spring. Adults feed on water-milfoil leaves and spend the majority of their lives clinging to plants in water. Weevils have wings but do not fly or swim well (Jester 1998). It's believed that weevils fly only at the end of the summer to overwinter on shoreline habitat. Because in the fall there are no water-milfoil flowers above water to climb on and dry wings, it is more probable that weevils swim/crawl along the water-milfoil mats to the shore. The weevil's overwintering habitat consists of natural vegetation near the water. It seems most plants will do, but weevil populations are higher where the shoreline includes more than five feet of bushes and trees creating a natural buffer zone to human development.

After flying back to the water in spring, a female weevil lays 1-2 eggs per day on the leafy apical meristem (tips) of water-milfoil (about 562 eggs in lifetime in captivity). Adults can live up to 162 days (Cofrancesco and Crosson 1999). The eggs are cream-colored ellipses about 0.5mm long (a pencil tip or half the size of a BB) and are difficult to see with the naked eye. Eggs hatch in 3-6 days in temperatures of 20-25°C (68-77°F) (Cofrancesco and Crosson 1999). Eggs are found in higher percentages in warmer summer temperatures (Jester 1999). When eggs hatch into larvae, the larvae feed on the tips of EWM and work their way down the stem feeding on vascular tissues. The larvae look like little grubs. They are only 1/8 inch long and cream colored with a dark head (some may also have a dark body). Weevil larvae will eat the EWM and burrow in and out of top meter (3-feet) of the stem. Larvae will make pin holes in the stem while entering and exiting during feeding. Development of the larvae takes 8-15 days in 20-25°C (68-77°F) (Cofrancesco and Crosson 1999). Weevil feeding behavior makes the stems less buoyant and they eventually wither and collapse (Cofrancesco and Crosson 1999). Pupae cannot be seen directly because they are in the lower stem of EWM (where the stem is thicker). The stem will have a dark chamber with something inside. When held up to light, the pupa chamber may seem to contain a dark little worm. This is the pupa. A fingernail or safety pin can be gently pushed down to feel if something firmer is inside. Be careful not to injure the pupa! Development in this stage takes 9-12 days at 20-25°C (68-77°F) (Cofrancesco and Crosson 1999). The pupa develops into the adult and the adult emerges from the pupa



chamber through a “blast hole.” Blast holes are much larger than the larval entrance holes (Skawinski). The complete life cycle of a weevil takes 23-27 days, so three generations may be produced in one summer (Cofrancesco and Crosson 1999).



IDENTIFICATION

EUHRYCHIOPSIS LECONTEI (WATER-MILFOIL WEEVIL)

In your packet is a laminate with pictures of *Eubrychiopsis* eggs, larvae, adults, pupae chamber and weevil damage. Refer to pictures below, and on the next page, as well as the laminates in your packet to see the characteristics listed below:

- Adult weevils grow to only 2-3mm. They have long, distinguishing snouts that other aquatic insects lack. They may have yellow and black stripes along their backs or be a solid color with a light ventral side.
- The eggs are cream-colored ellipses about 0.5mm long (a pencil tip or half the size of a BB) and are difficult to see with the naked eye.
- The larvae look like little grubs. They are only 1/8 inch long and cream colored with a dark head, (some may also have a dark body).
- When held up to light, the pupa chamber may seem to contain a dark little worm. This is the pupa.
- The pupa develops into the adult and the adult emerges from the pupa chamber through a “blast hole.” Blast holes are much larger than the larval entrance holes (Skawinski).



Photo by Laura Herman



Photo by Paul Skawinski

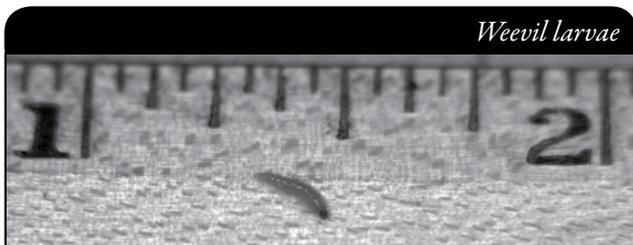


Photo by Paul Skawinski

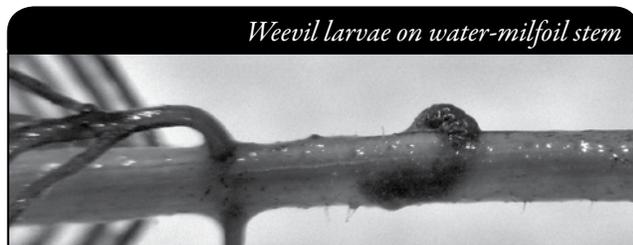


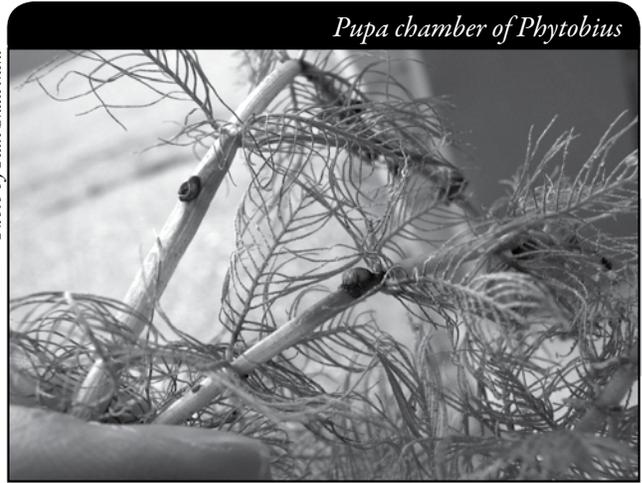
Photo by Paul Skawinski

Photo by Paul Skawinski



Pupa chamber of Euhrychiopsis

Photo by Paul Skawinski



Pupa chamber of Phytobius

EWM Weevil

Weevil damaged plants will have a darkened and hollowed stem contrasting with healthy light or green stems (see photo below). Occasional small holes should also be present in the darkened stems. The larvae will mine from the tip of the plant downward. Sometimes only the tip of the plant is affected or several feet can be affected.



Weevil damage

Photo by Robert Korth



Broken EWM stem - NOT weevil damage

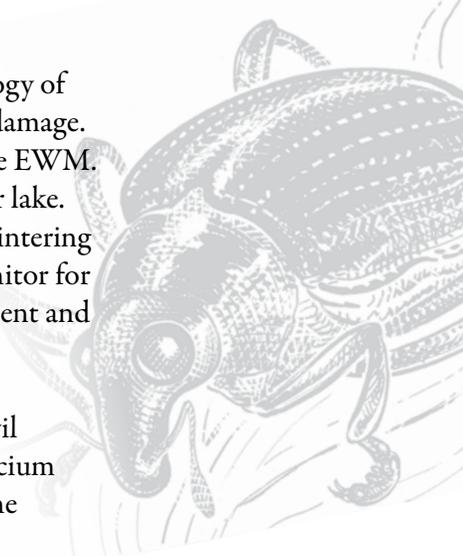
Photo by Robert Korth

Compare this photo at the left of weevil damage (darkened stem) to the photo on the right, which shows a broken Eurasian water-milfoil stem (healed-over scar, stem is still green).

WHY STUDY WEEVILS AND HOW CAN THEY IMPACT EWM DENSITIES?

This weevil study is being conducted to obtain a better understanding of the ecology of weevil populations and when water-milfoil populations are susceptible to weevil damage. Some lake groups will monitor for the weevil even though their lake does not have EWM. They want to know if the weevil is present “in case” EWM is introduced into their lake. These folks will also monitor the shoreline of the lake to ensure that weevil overwintering habitat is present and maintained on their shorelines. Other lake groups will monitor for the weevil “because” their lake has EWM. They want to know if the weevil is present and what impact the weevil is having on the EWM.

Early research by the Wisconsin Cooperative Fishery Research Unit showed weevil populations are negatively affected by cold water temperatures, fish predation, calcium carbonate deposits, some nutrients/chemicals, and a lack of natural shorelines. The



weevils burrow into water-milfoil stems and eat the water-milfoil leaves and vascular tissue (depending on the weevil life cycle stage). Most of the feeding is confined to the upper portions of the water-milfoil, so it doesn't completely collapse in the water column but does lose buoyancy (Jester 1999). Shorter EWM would allow native plants to compete. Damage also prevents water-milfoil from flowering (Jester 1999). Under ideal conditions, weevils have been known to decrease native and non-native water-milfoil populations to the extent that they do not spread further and do not reach the surface of the lake.

As for the use of *Eubrychiopsis lecontei* weevils as a biological control against EWM, not enough research has been done to determine the effects of stocked populations. For now, Laura Jester and Michael Bozek of the Wisconsin Milfoil Weevil Project predict more weevils can be found in "large, shallow water-milfoil beds and areas of natural shoreline," and these water bodies may have the greatest vulnerability to weevil control in addition to those experiencing large-scale decline. Currently, it's unknown if weevil densities will remain high enough to keep EWM at bay, or whether natural fluctuations in the weevil populations will allow EWM to rebound. Perhaps, weevil stocking can be best used in conjunction with mechanical and chemical controls.



MONITORING

EUHRYCHIOPSIS LECONTEI (WATER-MILFOIL WEEVIL)

The timing for the monitoring will vary from year to year. In a normal year, you would begin seeing signs of the larvae and pupae in June. The weevils begin to get quite active when the water reaches 20°C (68°F). By September the weevils stop laying eggs and are fattening up to head to the shoreline thus monitoring in September will be more difficult. For presence/absence monitoring of these weevils, you can monitor once during late July to early August. If you are monitoring to learn more about the densities of the weevils, you would want to monitor twice a month in July and August.

EQUIPMENT NEEDED

- Boat (canoe, kayak, fishing boat, paddle boat, etc.)
- Personal Floatation Device (PFD)
- Long handled rake with attached rope (see description and pictures on page 275)
- Lake map for marking EWM beds and sample sites within the bed.
- Pencil for marking on map
- Clip board or other hard surface for writing
- Ziploc® bags
- Waterproof sharpie pen (to write on Ziploc® bags)
- Cooler to keep plants and weevils in
- GPS unit (optional)
- Polarized sunglasses (optional)
- Aqua-View Scope (optional). To build your own Aqua-View Scope, see construction directions at the end of this section.
- A copy of appropriate report form (found at the end of this section)

**NOTE****MONITORING METHODS:**

If your lake group is augmenting weevil populations, return adults and larvae back to the lake.

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 water-milfoil weevils. 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 maintains the data and enters the monitoring results on the CLMN website <http://dnr.wi.gov/lakes/CLMN> (once the form is on-line) and the person to whom other volunteers can bring suspect weevil 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 for vouchering.

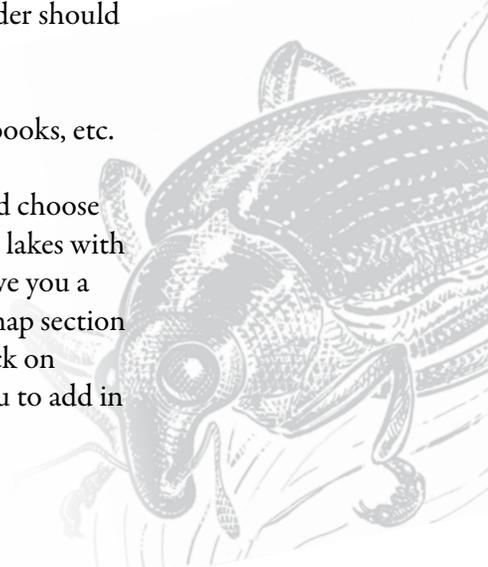
Consider having a mini-Eurasian water-milfoil weevil training session for your team. The Citizen Lake Monitoring Network Coordinator or the Aquatic Plant Management Coordinator for your area (refer front of manual and <http://dnr.wi.gov/lakes/contacts>) may be able to assist you with a training session. If not, 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 Eurasian water-milfoil beds, weevil monitoring sites and shoreline weevil overwintering areas. At the end of the season, you can map all of the sites visited.

If you have a team of weevil 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 Eurasian water-milfoil beds each volunteer is monitoring. Your team leader should keep the master copy of the map.

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 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.

Water body ID numbers can be found at <http://dnr.wi.gov/lakes/lakepages/results.aspx>. Choose your county, click on the lake name, then click on the “Facts and Figures” tab.

Water body types may be defined as man-made ponds, harbors, reservoirs, rivers, or lakes. Categorize to the best of your knowledge.

EWM Weevil

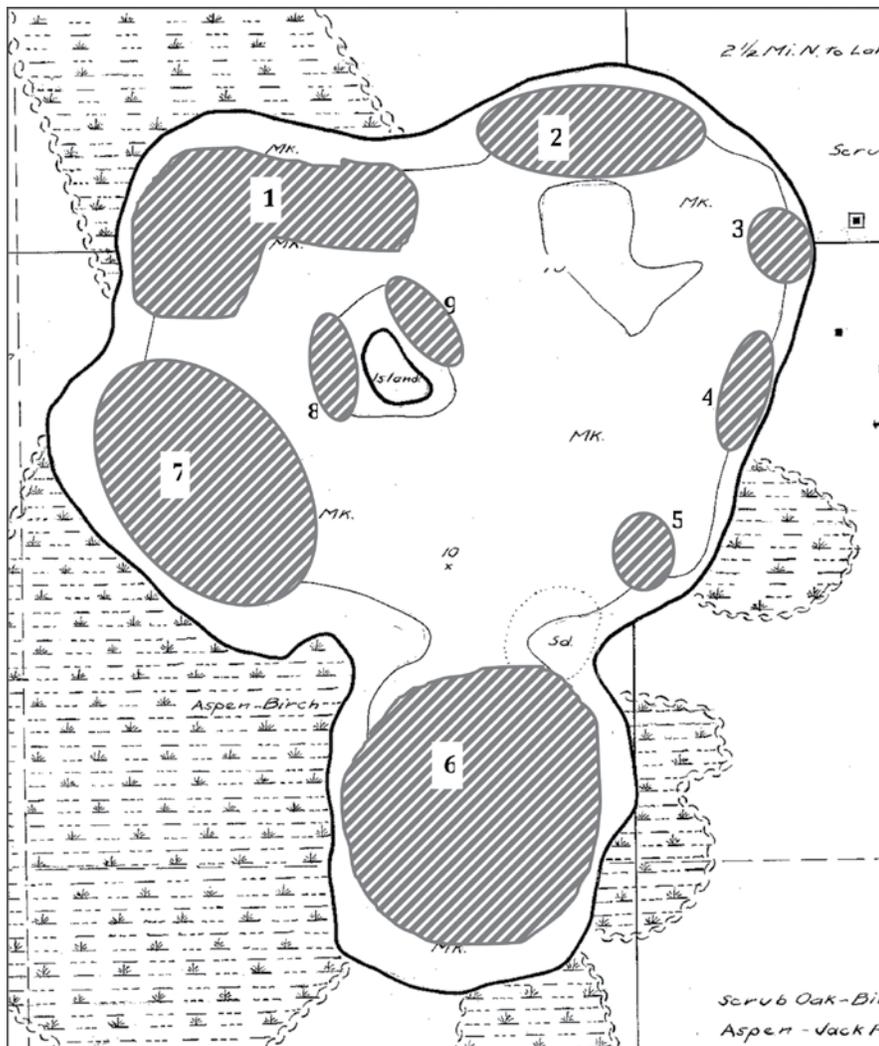


Photo by Paul Skawinski

MONITORING PROTOCOLS

If you are only interested in presence/absence of the weevil, you can look for weevil damage on the plants and not do the actual counts. If you are only after presence/absence data, it is best to look for damage in water depths of 3-8 feet near shorelines (this is where the weevils will most often be found). Look on the non-flowering tips to see the most damage. Please use a map to mark where you found the weevil damage. The University of Minnesota Department of Fisheries and Wildlife website (<http://fwcb.cfans.umn.edu/research/milfoil/milfoilbc/Doyouhaveweevils.html>) states that searching for weevils is easiest by snorkeling, followed by wading and lastly by boat. We use the boat method as we are following methods that can be done by any volunteer – whether they can snorkel or not and we are looking at densities of weevils on a lake. If you are interested in weevil densities continue with the following steps.

Before sampling weevil populations, the entire lake must be mapped for Eurasian water-milfoil beds. Label the beds with numbers: 1, 2, 3 ... etc. (see example below).



Mapped EWM beds

On another copy of the map (see example below), label the beds you will sample. These beds should be the largest EWM beds where EWM populations are stable and not expanding much. These are the locations where weevils are likely to establish. Choose a minimum of 4 beds and a maximum of 10 beds in each water body to sample. The beds within 20 feet of the shoreline are the most important beds to monitor as they are more likely to have weevils (researchers have found weevils in beds hundreds of yards from shore, but that is not common and if the EWM has not top out the bed may not be viable for the weevils). Next, plot and label three points (sites) on a transect running through bed #1. Go from shallow to deep when marking these sites. Bed 1, site A is the shallowest site in the bed; Bed 1, site B is in the middle of the water-milfoil bed; and Bed 1, site C is on the deepest edge of the bed. Repeat this process for the 4-10 beds you want to study. The maps you make are extremely important to compare data collected in other years and by other volunteers.



EWM beds with transects and sample points



Some folks may want to combine samples A, B & C when analyzing the data. This will work, but will not give you as much detail as when the samples are kept separate. It appears that the weevils will be found in the shallower portions of the EWM bed earlier in the season. As the season progresses, the weevils will be found further out in the EWM bed. This may be due to the water depths the EWM tops out at as it grows.

Canoe or boat to the first sample site. If using a motorboat, head towards the sampling site and turn off the motor before reaching the site so as to drift into the EWM bed. Paddle the rest of the way to the sample sites. This will prevent any stems from being broken by the motor and throwing off the “broken stems” counts. You can anchor at the site if you wish. Monitor that site, then let out the anchor line and float or paddle till you reach the next sample point in the bed. Tie off the rope and monitor at the second site, release rope and paddle or drift to the third site and monitor there. Pontoon use is limited as it is hard to anchor in one spot and/or paddling to the correct site within a bed without breakage of the plants – this may throw off your sampling if you are not careful. If you have a GPS unit, take readings at each site. Exactly 10 stems will be pulled from each of the three sites (A, B & C) in the EWM bed. That means 30 stems total from the bed.

- When collecting stems, carefully reach over one side of the boat and pull 5 stems out of the water; then go to the other side of the boat and collect 5 more stems. This allows for better coverage of the area. This way you are less likely to be bumping stems and knocking off adult beetles. If the bed is small you will have to pick all 10 plants from one side of the boat.
- Pull gently to get as much of the stem as possible (try to get the top two feet of the plant). Once you have the sample back in the boat, cut off the top 20-24 inches of the plant, and save that top portion in a Ziploc® bag. Toss the bottom portion of the plant into a bucket to be composted when you return to shore. If the entire stem is saved until you look for weevils, the stems can get twisted and break when you try to separate them, thus you will not know if the fragments are from the top portion of the plant or the bottom portion of the plant. By only saving the top 20-24 inches of the plant, you know that all fragments in the Ziploc® bag must be looked at.
- You may want to put each site’s (site A, B, & C) weevils into a separate bag to give you a better idea of where the weevils are at in the bed – this is often helpful in the early summer as the weevils move deeper in the bed as the milfoil tops out in deeper water. So shallow vs. middle vs. deep site counts may vary. If the data is kept separate, trends can be run on the data). Or you can combine the sites into one bag if you are only looking at weevil presence/absence.
- Repeat process for each of the three sites (A, B & C) in the EWM bed.
- Be conscientious about visual bias. It is easy to follow our natural tendency to reject a raggedy looking stem, but this can throw off your results and give you a much lower weevil count. Those raggedy stems are the stems mostly likely to contain weevils. It is important to collect the FIRST stem your hand touches, regardless of appearance, so long as it is rooted (floaters are rejected), AND make sure you collect the top two feet of that stem. If a piece breaks off, you need to make an effort to grab that piece as well. Collect ONLY the number of stems you need. Do not grab extras as this will cause confusion later at the lab. Weevils seem to prefer laying their eggs on a nice bushy leaf bud, not flowering tips. If you are just looking for presence/absence data, you can just look at non-flowering stems. If you are after densities, you should collect 10 stems no matter if they have flowers or not. Weevils live in the top three feet (more typically



Photo by Laura Herrman



the top 12 inches) of healthy EWM. Counting of the weevils can be done right on the lake or in a lab. If your lake group is augmenting weevil populations, count the weevils on the lake and return adults and larvae back to the lake.

- If you are counting in the lab, add water and label your Ziploc® bag with the bed and site number (For example, the bag with EWM from Bed 1, Site A would be labeled 1-A. If you are lumping all three sites into one bag, the bag would just be labeled Bed 1). If the EWM is not to the surface of the lake, you can use a rake to reach and pull up the plants. Again, try to collect the top two feet of the plant. The rake method is often needed in the early growing season.

Water temperatures and dissolved oxygen (DO) vary from day to day, but may be important when tracking where weevils reproduce. Warmer summer site temperatures have been correlated with higher percentages of weevil eggs in lab studies. Dissolved oxygen is being recorded in this study because it is somewhat lacking in other studies. Laura Jester found no correlation between dissolved oxygen and weevil populations in her 1998 study, but her dissolved oxygen readings were taken from the middle of the lake, not from the surface of every site. Because we know dense EWM makes dissolved oxygen fluctuate greatly between night and day, developing eggs and adults should be affected by the lack of oxygen near the surface at night. Your dissolved oxygen readings in the EWM bed will help us better understand the correlation with dissolved oxygen levels and weevil success. Water temperature may be taken with any kind of thermometer available. If you have the equipment, please record temperatures and dissolved oxygen surface levels.

Water depth can be measured with a Secchi disk (normally used to measure transparency in lakes) or a calibrated rake/rope. Lower the measuring tool into the water at sampling site and record depth in feet. Remember to collect the depth at each of the three sites in the EWM bed. Before pulling the rake (or other depth-measuring device), “feel” the bottom by bouncing the depth-measuring device on the lake bed. Substrates may be recorded as muck (soft, squishy, false bottom); sand (feels firm); gravel (pebbles and small stones – you will feel these bounce the device and often hear the clinking); or rock (either solid or boulders – you will feel the bounce of the device and hear the clinking). Estimate the substrate type. If the EWM bed is too dense, a record of the substrate surrounding the bed will suffice. Next, the EWM stand density should be observed. Plant density may indicate intensity of weevil feeding. Theoretically, as weevil feeding increases, plant density should decrease and vice versa.

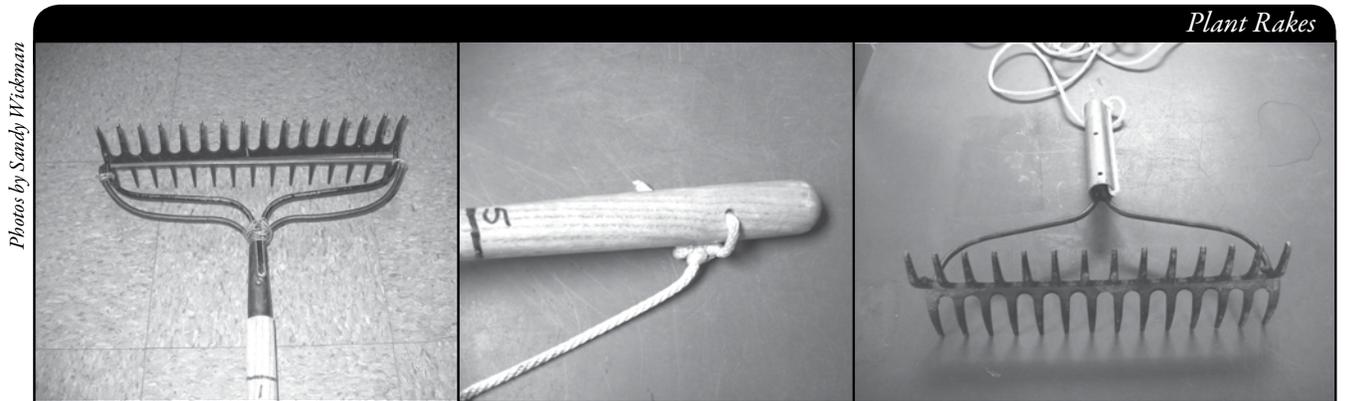


NOTE

The substrate type and EWM density data are collected after the weevil monitoring takes place. This way you will not be knocking the weevils off of your study plants.

PLANT RAKES

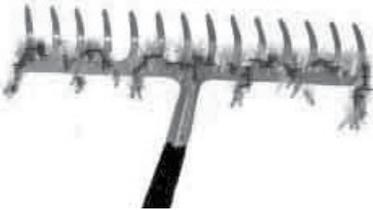
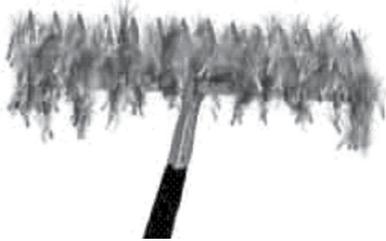
Since it is difficult to collect plants that have not reached the lake's surface, volunteers use rakes to sample plants. When the rake is thrown into the water, it settles to the bottom of the lake. When the rake is hauled back into the boat, aquatic plants come with it making for easier identification. A thatching rake can be used, or you can make a "2-headed" garden rake by purchasing two garden rakes (try looking at garage sales). Disconnect the head from one rake and wire or weld the rake heads together (teeth facing out). To monitor in deeper water, drill a hole in the end of the handle and tie a rope to it. With the two heads, no matter which way the rake falls to the lake bed, the teeth will catch the roots of the plants making plant collection a lot easier. If you need to make the rake heavier, you can use cable ties to attach duck decoy weights, a small brick or other weights. Some volunteers do not like to deal with a rake handle in deeper water or in a canoe, so they cut off the rake handle and attach the rope directly to the rake heads. If you use this type of rake, it is essential that you weigh the rake by using the decoy weights, a small brick, hand weights, etc. No matter which rake is used, please be sure to tie the loose end of the rope to the boat. This way you will not lose your sampling rake.



A rope is tied to the handle of this "2-headed" garden rake, so it can be used in deep water.



To determine EWM stand density, tie a rope to a garden rake and extend the rake so that the rake head is roughly 3.0 feet from the gunwale of the boat, then lower the rake to the lake bottom. Pull the rake toward the boat until the head of the rake is still resting on the bottom and the handle is roughly perpendicular to the water's surface. The rake head should be pulled approximately 2.5 feet along the substrate (bottom), then be pulled to the surface and into the boat. Once in the boat, rank the EWM stand density 1-3. One for only a few plants on the rake head; two for half full, the top of the rake head can be easily seen; and three for overflowing where the rake head cannot be seen.

RATING	COVERAGE	DESCRIPTION
1		A few plants on rake head
2		Rake head is about ½ full Can easily see top of rake head
3		Overflowing Cannot see top of rake head

Available wintering habitat plays a major role in the location of weevil populations. When recording the shoreline vegetation type near the EWM bed, observe the nearest shoreline. Only natural shorelines are included as buffer zones; mown lawns, rip-rap (any amount), and sand beaches do not count and will be recorded as zero-foot buffer zone. If there is vegetation, record whether the vegetation is mostly grasses, bushes, or trees and how wide this shoreline buffer zone stretches from the water's edge (0ft, 1-10ft, 10-20ft, or 20+ ft). This information will be useful if you are looking at possible weevil augmentation. Some lake groups will ask landowners with lawns to not mow right up to the water's edge. If possible, please include photos of the shoreline buffer zone to verify the width of the zone. Add in additional observations in the comment section. Survey the entire shoreline for overwintering habitat as your EWM may spread over the years.

Repeat the above processes for each EWM bed you are monitoring.

THE REMAINING STEPS CAN BE DONE ON THE LAKE OR IN YOUR GARAGE.

It is hard to find the eggs and small larvae in the EWM plants. Volunteers can choose to only look for adults and weevil damage and record this information. Please note on your Monitoring Data Sheet if you only looked for the adults and damage. For those looking for all stages of the weevil's life cycle, it is helpful to count the number of weevils in each stage. There are up to three generations of weevils born in a single summer. We can then follow the survival rate of weevils in each water body. If you are after rough counts, you may want to record the number of eggs, larvae, pupae, and adult weevils you find while you are still on the lake and then return the weevils back to the lake. Eggs are small and cream colored, larvae look like little grubs, pupae are dark shapes in the stems, and adults possess a distinctive snout. Refer to lifecycle information for tips on weevil identification.

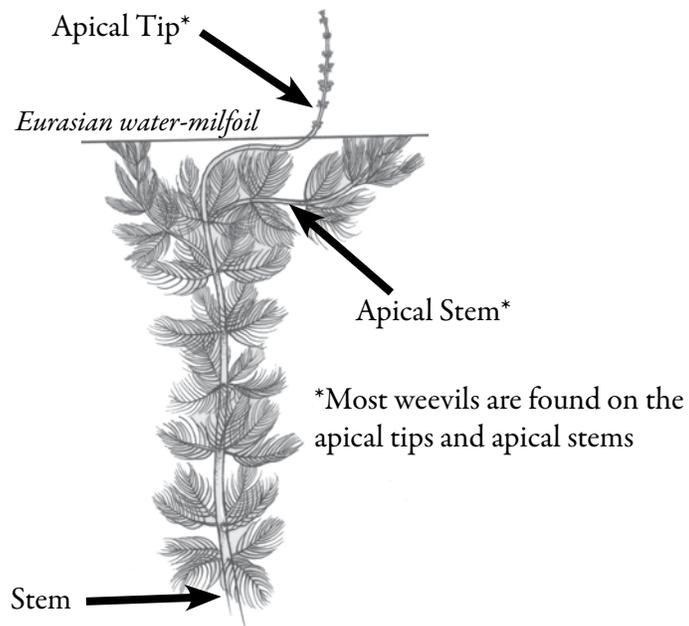
- If you are going to look for all stages of weevils you will want to check for eggs first as eggs are easy to knock off with just a little handling. Eggs can be found in leafy tips of the water-milfoil. Tips may be floated in a pan of water to see between the leaves better. **Tip for looking for eggs: If you use a clear pan, place the pan over a dark background (black paper or plastic bag). This makes the eggs and young larvae (the hardest and tiniest life stages to see) pop out – they nearly glow. Pick the bud up so that you are looking straight down at the top of it usually made the eggs stand out more readily.** Sometimes tiny algae blobs looked a lot like eggs but the algae have a fuzzy appearance around the edges and don't look as solid as an egg. Recognizing that the algae had a fuzzy appearance makes it easier to eliminate them without needing closer examination. Also if algae blobs are down lower on the stem and not on the apical bud, you can assume they are not eggs as the eggs are laid in the tip of the plant. Once you have looked for the eggs in the plant tips, continue examining down the stem for the larvae/pupae/adults.
- Larvae may be feeding inside or outside the stems of the water-milfoil.
- Pupae are difficult to see under any circumstance; hold the stem up to the sunlight and look for a dark crescent shape. For this reason, identification is best done on a sunny day. If you're unsure, poke the suspect with a pin or thumb nail.
- Adult weevils will likely be clinging to the stem just about anywhere on the plant – make sure to flip the plants over as the adults will “hide” on the back side of the plants.
- Record the total number of weevils (all stages) in the data sheet. You can place the weevils back into the lake. If you are augmenting weevil populations on your lake you do not want to hinder your efforts by killing the weevils.
- Please note on the Data Sheet if the counts were done on the lake or back at your lab.



Photo by Laura Hermann

Sometimes fragmentation and autofragmentation scars can be found on the water-milfoil stems. These scars tend to have a black “scab” look as compared to weevil damage which tends to have a longer blackened stem. Fragmentation (from boats, etc) and autofragmentation scars “heal / scab” over. Weevil damage is brown to black and often has a tattered appearance. Refer to the pictures provided on your laminates to see the difference in the two appearances. Adventitious root bud look a lot like eggs except they are on the lower part of the plant. Healthy stems (no weevil damage) from the lower part of the plant are a white color with a red streak down the center of the stem. Weevil larvae hollow out the red streak portion of the plant.

Weevils spend different stages of their lives on different parts of water-milfoil. This information can tell researchers where the weevils are feeding on the plant. Imagine the water-milfoil stem as a tree trunk, the apical stems would be the branches, and the apical tips would be the tips of twigs. The information about weevil location on the plant can be recorded on the Monitoring Data Sheet.



The feeding behavior of weevils has a tendency to break off the tips off of water-milfoil stems and the plant stem often breaks where the larvae burrow into and out of the stem. The stem will also break when the adults emerge from the pupa chambers. Heavy feeding by the weevils inhibits the growth of water-milfoil. Weevil-damaged stems have blackened tips as compared to other breaks. Record the number of broken EWM stems/tips and the total number of EWM stems/tips.

Algae may become thick in some EWM beds. The warm, still surface water provides perfect growing conditions for algae but may reduce the amount of oxygen available for weevils. Record if algae are absent, present, or abundant under “stems algae-covered” section.

When sampling is finished, you can pour/place the counted weevils and EWM stems (with the eggs and larvae) back into the water-milfoil bed. Do this so you do not spread EWM further in the water body but yet you are returning the weevils back to the water body. If you find what you suspect to be weevils in your lake and wish to be certain, you should preserve several adults in alcohol (rubbing alcohol will work). Include a label with your lake's name and county in the bottle (use a pencil as ink will dissolve in alcohol). Fill out your data form and deliver that to your weevil contact so that they can verify your information and make sure the weevil data is added to the proper files and data bases. If you do not find any weevil damage/sign, please dispose of the EWM on land (in your compost pile) so that you are not spreading EWM on your lake.

REPORTING

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

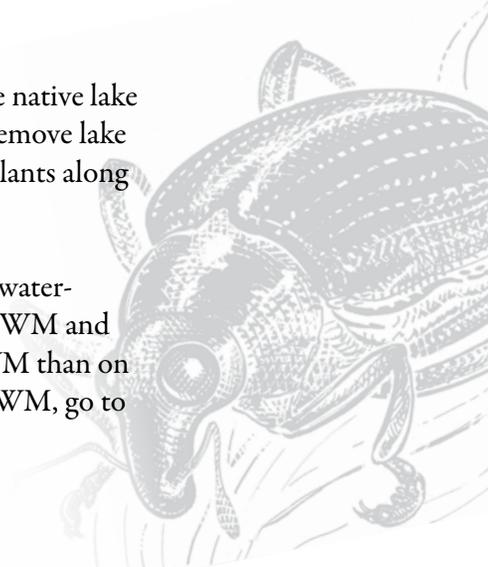
DNR staff, lake managers, researchers, and others use the information that is reported through the Citizen Lake Monitoring Network to study lakes and better understand aquatic invasive species. The information reported by volunteers is also provided to the state legislature, federal, tribal and local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

We do not have a website on-line weevil reporting form for 2009. For 2009, please send your completed Water-milfoil Weevil (*Eubrychiopsis lecontei*) Monitoring Data Sheet to your local Citizen Lake Monitoring Coordinator (page vii) and they will share the information with the local Lake Coordinator and the Aquatic Plant Coordinator. They will also save the data for when it can be reported on-line.

HOW TO IMPROVE YOUR LAKE'S CHANCES OF SUCCESS WITH THE WATER-MILFOIL WEEVILS

Even if your lake does not have Eurasian water-milfoil, you will want to keep the native lake plants healthy so that EWM does not get a foot-hold if it is introduced. Only remove lake plants where absolutely necessary to gain access to your lake. The more native plants along your shoreline, the less chance EWM will get a foot-hold.

The water-milfoil weevil is native to Wisconsin and normally lives on northern water-milfoil, but once EWM comes into the lake, the weevil will switch over to the EWM and eat and reproduce on the EWM. Egg and larvae survival is often greater on EWM than on northern water-milfoil. For more information on the weevil success rates on EWM, go to <http://fwcb.cfans.umn.edu/research/milfoil/milfoilbc.html>.



The weevil will overwinter on the shoreline of your lake. It overwinters in leaf litter. Some studies indicate that the success of the weevil is greater where the native plants remain along the shoreline. By keeping a natural shoreline (as compared to a lawn shoreline) you may be increasing the chances of success of the weevil. If you would like to switch from a lawn setting to a natural shoreline area, work with your local Land and Water Conservation Department on shoreline restoration projects. They have lists of plants that will grow in your area and will know if there is financial assistance available for you. The following links will assist you in the process. <http://dnr.wi.gov/org/water/wm/dsfm/shore/restoration.htm> contains information on the shoreline restoration processes. <http://dnr.wi.gov/org/water/wm/dsfm/shore/buffers.htm> gives your information on shoreline buffers. Langlade County created a good interactive site that helps to choose plants that fit certain criteria <http://lrrd.co.langlade.wi.us/shoreland/customize.asp>. Again, your local Land and Water Conservation Department should be one of your first contacts if you decide to modify your shoreline.

The weevil does not overwinter in rip-rap areas. If you have erosion along your shoreline, work with your local DNR or Land and Water Conservation Department to add in natural shoreline.

Refer to http://dnr.wi.gov/waterways/shoreline_habitat/erosioncontrol-biological.html for more information on erosion control methods.



Photo by Laura Herrman



ADDITIONAL MATERIALS AND SUPPORTING DOCUMENTATION

INFORMATION SOURCES

REFERENCES

PLANT LABELS

AQUA-VIEW SCOPE CONSTRUCTION DIRECTIONS

REPORTING FORMS

WATER-MILFOIL WEEVIL MONITORING DATA REPORTING FORM





EURASIAN WATER-MILFOIL AND EUHRYCHIOPSIS LECONTEI

INFORMATION SOURCES

Biological Control of Eurasian Watermilfoil

<http://fwcb.cfans.umn.edu/research/milfoil/milfoilbc.html>

Do You Have Milfoil Weevils in Your Lake?

<http://fwcb.cfans.umn.edu/research/milfoil/milfoilbc/Doyouhaveweevils.html>

REFERENCES

Bode, J. et al. 1992. Eurasian Water Milfoil in Wisconsin: A Report to the Legislature.

Cofrancesco, Alfred F. and H. Crosson. August 1999. Euchiopsis lecontei as a potential biocontrol agent of Eurasian watermilfoil (*Myriophyllum spicatum*). Aquatic Plant Control Research Program. US Army Corps of Engineers. Volume A-99-3.

Jester, Laura L. October 1998. The geographic distribution of the aquatic milfoil weevil (*Euchryiopsis lecontei*) and factors influencing its density on Wisconsin lakes. Masters Thesis. University of Wisconsin. Stevens Point, WI.

Jester, L.L., M.A. Bozek and D.R. Helsel. 1999. Wisconsin Milfoil Weevil Project. WI Cooperative Fishery Research Unit.

Smith, C.S. and J.W. Barko. 1990. Ecology of Eurasian watermilfoil. *J. Aquat. Plant Manage.* 28:55-64.

PLANT LABELS



Project Name: Citizen Lake Monitoring Network

(Scientific Name & authority)

Common Name:
Lake Name:
Water Body ID code#:
County:
Collected by:
Date:
Depth:
Location and Habitat:



EWM Weevil



Project Name: Citizen Lake Monitoring Network

(Scientific Name & authority)

Common Name:
Lake Name:
Water Body ID code#:
County:
Collected by:
Date:
Depth:
Location and Habitat:



Project Name: Citizen Lake Monitoring Network

(Scientific Name & authority)

Common Name:
Lake Name:
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Collected by:
Date:
Depth:
Location and Habitat:





EWM Weevil

AQUA-VIEW SCOPE CONSTRUCTION DIRECTIONS

- 1 - 3 foot section of 4" diameter plastic pipe. We use ABS pipe because it is black and because it is lighter than PVC pipe. If you are unable to find ABS pipe, PVC pipe will work just fine. Your hardware store may have a short piece of pipe they will sell you. We bought a 10-foot piece of pipe and cut it.
- 1 or 2 - 5 ½" pull handles (we used one, it was easier to hold and guide)
- Screws if not supplied with handle
- 1 - 4" ABS coupler
- 1 - 4 3/8" diameter lexan disk – Lexan is non-breakable plexiglass that we had cut at our local glass repair shop. You can use plexiglass for the disk but it is difficult to cut the plexiglass in a circle.
- Clear silicone rubber sealant
- Drill and screw driver
- Weatherstripping for around the top of the aqua-view scope. Marine and automotive weatherstrip tape works well.

HOW TO MAKE AN AQUA-VIEW SCOPE (picture on next page)

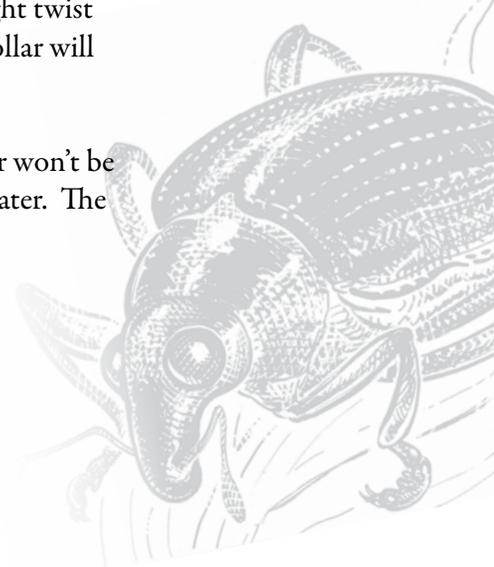
Cut a 3 foot section of 4" diameter ABS or PVC pipe. The cut must be straight and square to the pipe. If you can't find pipe with a black interior, you can paint the inside a flat black. If the pipe is shiny on the inside, rough it up using sandpaper or steel wool so that there won't be any glare inside the tube. **If you are going to rough it up on the inside, make sure to do that before you attach the screws so you don't scratch your hand!**

Attach one or two handles on either side of the pipe about four inches from one end. ABS pipe is fairly soft, you can use a screw driver to put the screws in or you can drill pilot holes and put the screws in. If you are using a drill, make sure to make the hole smaller than the screw so the screw will hold. If using PVC pipe, you will need to drill the holes.

Run a bead of clear silicone rubber sealant on the bottom of the squared off end of pipe. Place the lexan disk on the bead of sealant.

Smear a small amount of silicon sealant on the outside of the pipe one half inch from the end of the pipe with the lexan. Slide the coupling over the end and give it a slight twist to distribute the sealant evenly. Slide the coupling on as far as it will go. The collar will extend out beyond the lexan disk protecting it from scratching.

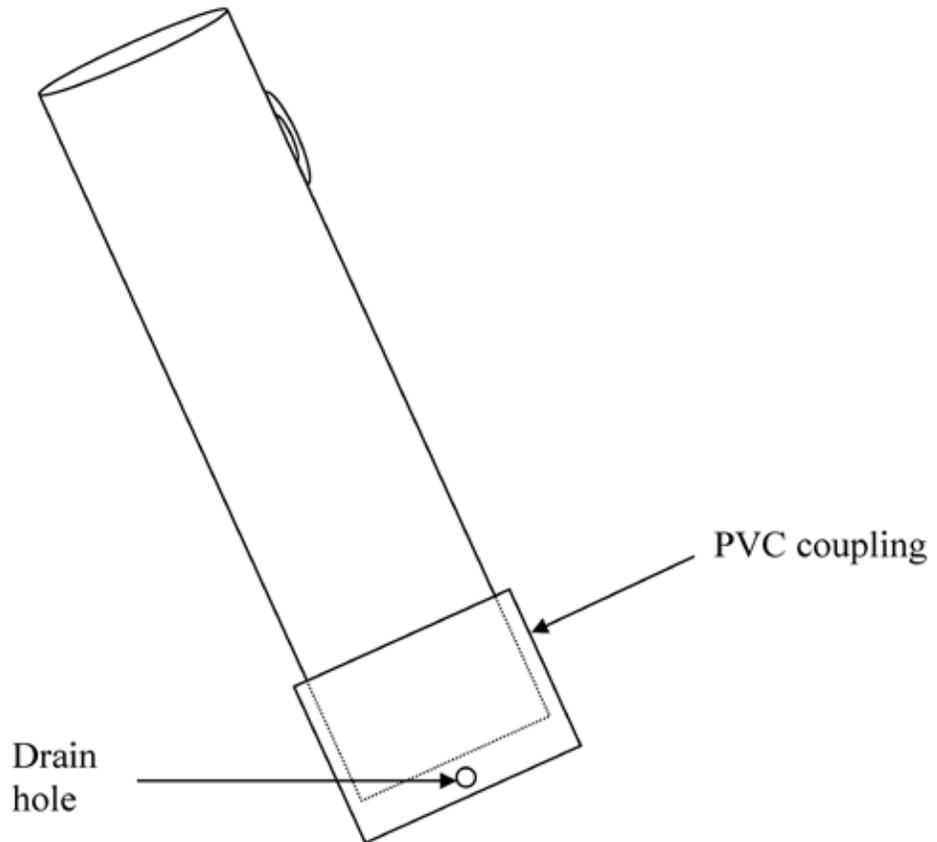
Drill two small (1/4") holes in the side of the collar close to the lexan so that air won't be trapped in the open end of the coupler when you put the view scope into the water. The holes should be drilled on opposite sides of the pipe.



Weatherstripping is placed around the top of the open end of the scope (the side you look into). Weatherstripping has a sticky side that sticks to the plastic and the foam makes it a little more comfortable for your face to rest against.

Aqua-view scope instructions adapted from those designed by Jeff Schloss, coordinator of New Hampshire Lakes Lay Monitoring Program (603) 862-3848.

AQUA-VIEW SCOPE DRAWING



The purpose of this form is to track the abundance of the Water-milfoil weevil (*Euhrychiopsis lecontei*) and the amount of weevil damage in individual beds of EWM in Wisconsin lakes.

Use one datasheet for each EWM bed surveyed. When collecting stems for weevil counts, collect the TOP 50 centimeters (20 inches). Collect 10 stems/site for a total of 30 stems/bed.

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	Township Name	County	
Latitude of center of EWM bed (optional)	Longitude of center of EWM bed (optional)		
Date and Time of Monitoring			
Monitoring Date	Start Time	End Time	
EWM Bed Habitat Information			
Shoreline Vegetation Type: <input type="checkbox"/> Natural Herbaceous (non-woody plants) <input type="checkbox"/> Natural Woody Shrubs <input type="checkbox"/> Trees <input type="checkbox"/> Manicured Lawn			
Distance of Natural Shoreline Buffer from Lakeshore to Manicured Lawn (If there is any rip-rap along the shoreline, record this as 0 ft of buffer) <input type="checkbox"/> 0 feet <input type="checkbox"/> 1-10 feet <input type="checkbox"/> 10-20 feet <input type="checkbox"/> 20+ feet			
Site Habitat Characteristics			
	Site A	Site B	Site C
Surface Water Temperature inside bed (optional)	° F	° F	° F
Surface Dissolved Oxygen inside bed (optional)	mg/L	mg/L	mg/L
Substrate (muck, sand, gravel, boulders)			
Water Depth at Site	feet	feet	feet
Substrate (muck, sand, gravel, boulders)			
Site EWM Characteristics			
EWM Rake Density (see "rake density" on pg 2)			
Stems Algae-Covered (none, present, abundant)			
Weevil Damage Count (number of pin-holes, pupa chambers and broken stems)			
Number of Weevil Eggs for 10 Stems			
Number of Weevil Larvae for 10 Stems			
Number of Weevil Pupae for 10 Stems			
Number of Weevil Adults for 10 Stems			
Total Number of Weevils			
Comments			
For DNR or UW-Ext Lakes Staff to fill out			
Have you entered the results of the voucher in SWIMS? <input type="checkbox"/> Yes <input type="checkbox"/> No			
Name of person or museum who identified the voucher specimen			
Was the specimen confirmed as....?			
<i>Euhrychiopsis lecontei</i> ?	<input type="checkbox"/> Yes <input type="checkbox"/> No	<i>Phytobius</i> species?	<input type="checkbox"/> Yes <input type="checkbox"/> No
DNR or UW-Ext Lakes Staff: Please enter this report in SWIMS under the Weevil project for the appropriate county. Then, keep the paper copy for your records.			

The purpose of this form is to track the abundance of the Water-milfoil weevil (*Euhrychiopsis lecontei*) and the amount of weevil damage in individual beds of EWM in Wisconsin lakes.

Use one datasheet for each EWM bed surveyed. When collecting stems for weevil counts, collect the TOP 50 centimeters (20 inches). Collect 10 stems/site for a total of 30 stems/bed.

Notice: Information on this voluntary form is collected under ss. 33.02 and 28.11, 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		Phone Number	Email
Monitoring Location			
Waterbody Name		Township Name	County
Latitude of center of EWM bed (optional)			
Longitude of center of EWM bed (optional)			
Date and Time of Monitoring		Start Time	End Time
EWM Bed Habitat Information			
Shoreline Vegetation Type: <input type="checkbox"/> Natural Herbaceous (non-woody plants) <input type="checkbox"/> Natural Woody Shrubs <input type="checkbox"/> Trees <input type="checkbox"/> Manicured Lawn			
Distance of Natural Shoreline Buffer from Lakeshore to Manicured Lawn (if there is any rip-rap along the shoreline, record this as 0 ft of buffer)			
<input type="checkbox"/> 0 feet		<input type="checkbox"/> 1-10 feet	<input type="checkbox"/> 10-20 feet <input type="checkbox"/> 20+ feet
Site Habitat Characteristics			
	Site A	Site B	Site C
Surface Water Temperature inside bed (optional)	° F	° F	° F
Surface Dissolved Oxygen inside bed (optional)	mg/L	mg/L	mg/L
Substrate (muck, sand, gravel, boulders)	feet	feet	feet
Water Depth at Site			
Substrate (muck, sand, gravel, boulders)			
Site EWM Characteristics			
EWM Rake Density (see "rake density" on pg 2)			
Stems Algae-Covered (none, present, abundant)			
Weevil Damage Count (number of pin-holes, pupa chambers and broken stems)			
Number of Weevil Eggs for 10 Stems			
Number of Weevil Larvae for 10 Stems			
Number of Weevil Pupae for 10 Stems			
Number of Weevil Adults for 10 Stems			
Total Number of Weevils			
Comments			
For DNR or UW-Ext Lakes Staff to fill out			
Have you entered the results of the voucher in SWIMS? <input type="checkbox"/> Yes <input type="checkbox"/> No			
Name of person or museum who identified the voucher specimen			
Was the specimen confirmed as....?			
<i>Euhrychiopsis lecontei</i> ? <input type="checkbox"/> Yes <input type="checkbox"/> No <i>Phytobius</i> species? <input type="checkbox"/> Yes <input type="checkbox"/> No			
DNR or UW-Ext Lakes Staff: Please enter this report in SWIMS under the Weevil project for the appropriate county. Then, keep the paper copy for your records.			