1 Getting Started

Aquatic Invasive Species Monitoring

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:

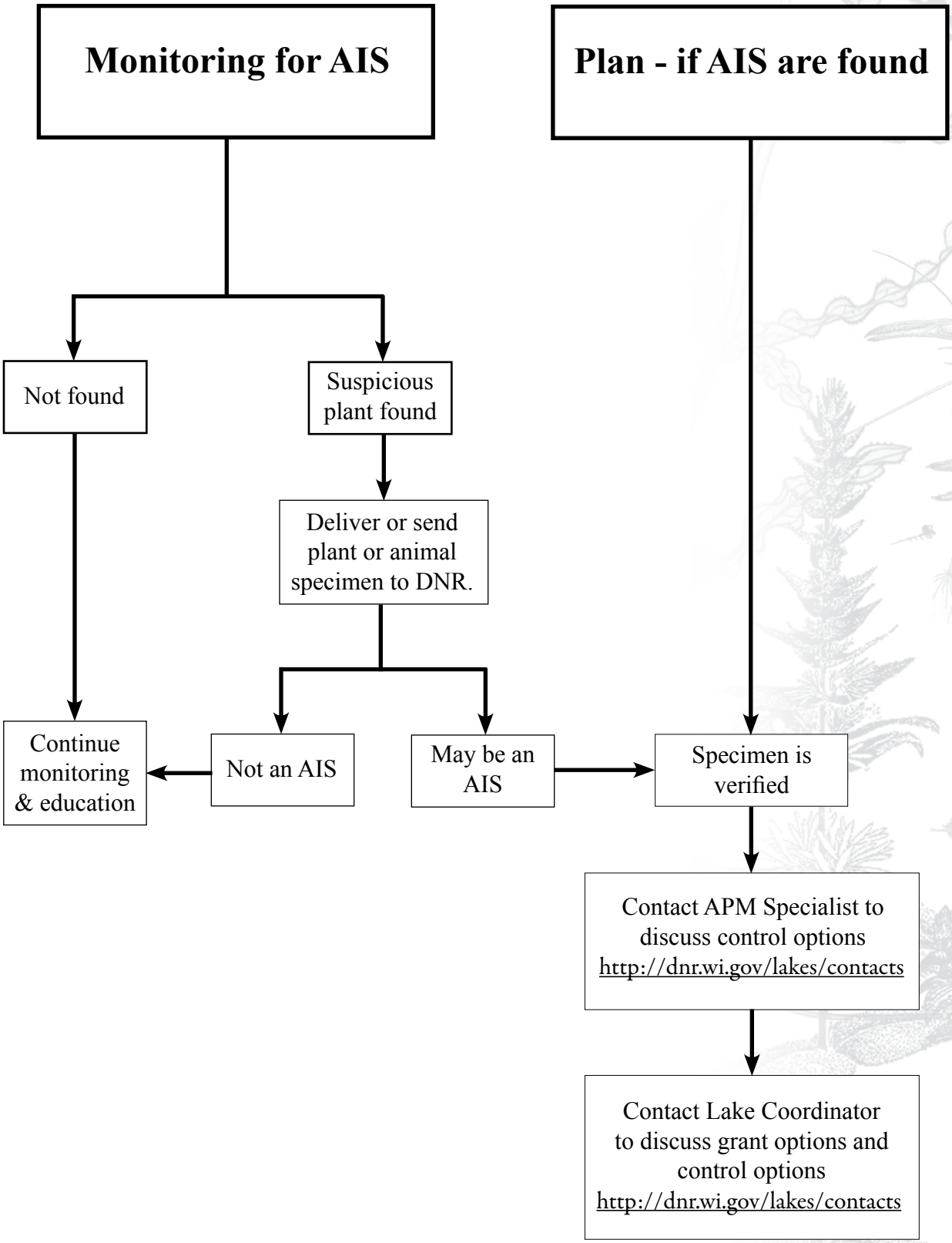
- Collect "suspect" aquatic invasive plants and animals from their lake. They will be looking for presence or absence of the AIS.
- Collect "suspect" aquatic invasive plants and animals from their lake. If an invasive is found, map and/or track the spread of the invasive. This will help determine the 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 prolems they cause

Eurasian water-milfoil

Eurasian Water-milfoil

Photo by Sara Schmidt

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.

Curly-leaf pondweed

Curly-leaf Pondweed

Photo by Susan Knight

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.

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 WDNR

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.

Zebra Mussel & Quagga Mussel

Photo by Robert Korth

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.

Banded, Brown, Chinese Mystery Snailes

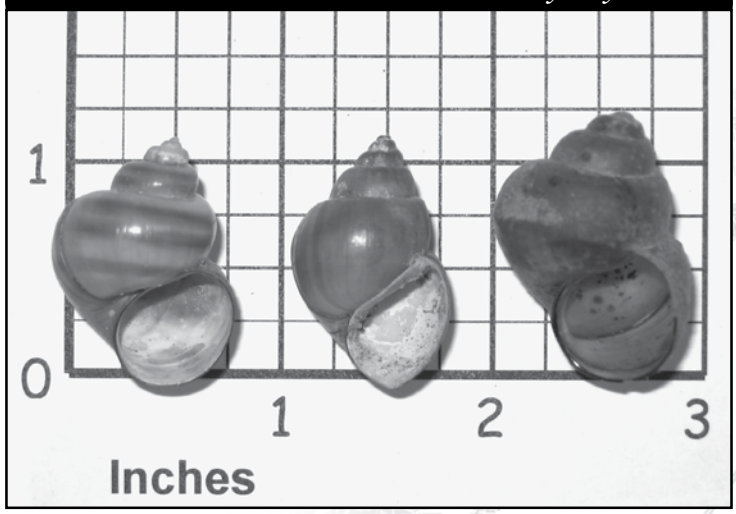


Photo by Laura Herman

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.

Waterflea

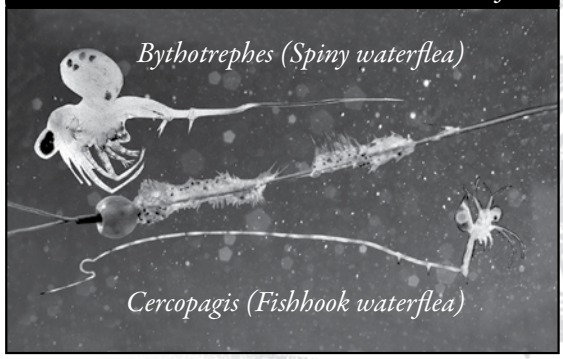


Photo provided by U. of MN Sea Grant

Freshwater jellyfish

Freshwater Jellyfish

Photo by Sharon Milstead

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.

Hydrilla

Hydrilla

Photo by Vic Ramey, University of Florida

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.

New Zealand Mudsnails

Photo by Dan Gustafson

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 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. The New Zealand mudsnail is small (less than ¼ inches tall).

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/uwexlakes/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.