

# Aquatic Invasive Species Early Detection Monitoring in Lakes

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*State of Wisconsin Department of Natural Resources*

*STANDARD OPERATION PROCEDURES*

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## MONITORING OBJECTIVES

The monitoring objectives are to detect new populations of NR 40 prohibited species and to understand the distribution of NR 40 restricted invasive species within lakes. The Wisconsin Department of Natural Resources (DNR) currently relies on a network of DNR lake biologists and volunteers (i.e. Citizen Lake Monitoring Network) to collect data on the presence and absence of invasive species. The biologist's efforts help evaluate the relationship between water quality and invasive species, and the variable volunteer efforts provide additional reconnaissance, but early detections from these efforts have been incidental. This monitoring will target vulnerable waterbodies for early detection monitoring.

This monitoring strategy may trigger statewide, regional, or local implementation of a rapid response strategy, lead to an assessment of abundance and frequency within a waterbody and/or an evaluation of management activities.

Monitoring will be conducted by WDNR staff, partners, and volunteers.

## DESIGN

Sample Period:	May 15 <sup>th</sup> – September 15 <sup>th</sup>
Frequency:	Rotating cycle or as needed
Locations:	Boat landings, 5 littoral targeted sites, shoreline, deep hole
Parameters:	list of invasive species
Methods:	<ol style="list-style-type: none"><li>1. 30 min. search with Dnet &amp; rake (snorkeling optional) at boat landing</li><li>2. 10 min. search with Dnet &amp; rake (snorkeling optional) at 5 targeted sites that vary in habitat and include up- and downstream locations and recreation areas (beaches, resorts, parks, etc.)</li><li>2. Shoreline meander</li><li>3. Mussel veliger tows (3 at targeted locations)</li><li>4. Waterflea Ekman dredges (1 at deep hole)</li></ol>

## LAKE SELECTION

The most important factor influencing the introduction and establishment of invasive species are pathways for invasive species to favorable habitats for establishment (Vander Zanden and Olden 2008). The primary vectors for invasive species are anthropogenic, such as public access and recreational opportunity (Leung 2002; Vander Zanden and Olden 2008; Rothlisberger et al. 2011; Latzka personal communication). Disturbed or degraded ecosystems are generally unfavorable for native species and provide niches for invasive species establishment and expansion once a species is introduced (Didham et al. 2005, MacDougall and Turkington 2005, Havel et al. 2005; Johnson et al. 2008).

Our earlier studies suggest that urban land use increase risk of invasive species establishment along streams. Other research suggests that invasive species dispersal is about 15 miles, though more research is needed. Therefore, identifying pioneer populations of invasive species in these locations (i.e., urban

land use and within 15-mile buffers of know populations) is important to detect new populations and enable response efforts.

Central Office will generate a list of lakes within 15-mile proximity to prohibited species for regional staff to choose from. Biologists will review a list of lakes each winter to monitor the following year. The priority list will be based on the following criteria (in descending order):

- Whether a public boat landing is present;
- $\leq 15$  mi proximity to known occurrences of prohibited or uncommon restricted species; and
- $\geq 13\%$  development.

## FIELD PREPARATION

Review the AIS Monitoring Field Preparation document which outlines procedures for communication, crews, general safety guidelines, snorkeling guidelines, and ethanol guidelines.

<https://dnrx.wisconsin.gov/swims/downloadDocument.do?id=239109781>

## TARGET SPECIES

Table 1. Species targeted for aquatic invasive species surveys. Species **with (\*)** are prohibited early detection species.

Common Name	Latin Name	Species Code
<b>Aquatic Plants</b>		
European Frog-bit*	<i>Hydrocharis morus-ranae</i>	EFB
Yellow Floating Heart*	<i>Nymphoides peltata</i>	YFH
Water Chestnut*	<i>Trapa natans</i>	WC
Brazilian Waterweed*	<i>Egeria densa</i>	BWW
Brittle Naiad*	<i>Najas minor</i>	BRN
Hydrilla	<i>Hydrilla verticillata</i>	HYD
Curly-Leaf Pondweed	<i>Potamogeton crispus</i>	CLP
Fanwort*	<i>Camboba caroliniana</i>	FW
Parrot Feather*	<i>Myriophyllum aquaticum</i>	PF
Eurasian Water Milfoil	<i>Myriophyllum spicatum</i>	EWM
Water Hyacinth*	<i>Eichhornia crassipes</i> and <i>E. azurea</i>	WH
Water Lettuce*	<i>Pistia stratiotes</i>	WL
Didymo*	<i>Didymosphenia geminata</i>	DIDY
<b>Wetland Plants</b>		
Flowering Rush	<i>Butomus umbellatus</i>	FR
Tall Manna Grass*	<i>Glyceria maxima</i>	
Phragmites	<i>Phragmites australis</i>	PHRG
Japanese Knotweed	<i>Polygonum cuspidatum</i>	JK
Giant Knotweed*	<i>Polygonum sachalinense</i>	GK
Purple Loosestrife	<i>Lythrum salicaria</i>	PL
Japanese Hop	<i>Humulus japonicus</i>	JH
Yellow Iris	<i>Iris pseudoacorus</i>	YI

Japanese Stilt Grass*	<i>Microstegium vimineum</i>	JSG
Narrow-Leaf Cattail	<i>Typha angustifolia</i>	NLC
Hybrid Cattail	<i>Typha x glauca</i>	HC
Java Waterdropwort	<i>Oenanthe javanica</i>	
Lesser Celandine	<i>Ficaria verna</i>	
Hairy Willowherb	<i>Epilobium hirsutum</i>	
Graceful Cattail	<i>Typha laxmanni</i>	
Southern Cattail	<i>Typha domingensis</i>	
Bohemian Knotweed	<i>Polygonum x bohemicum</i>	
Golden Creeper	<i>Ernodea littoralis</i>	
European Swamp Thistle	<i>Cirsium palustre</i>	
Poison Hemlock	<i>Conium maculatum</i>	
<b>Invertebrates</b>		
Zebra Mussels	<i>Dreissena polymorpha</i>	ZM
Quagga Mussels*	<i>Dreissena bugensis</i>	QM
Asian Clam*	<i>Corbicula fluminea</i>	AC
Faucet Snails*	<i>Bithynia tentaculata</i>	FS
Spiny Waterfleas*	<i>Bythotrephes longimanus</i>	SWF
Chinese Mystery Snails	<i>Cipangopalundina chinensis</i>	CMS
Banded mystery Snails	<i>Viviparus georgianus</i>	BMS
New Zealand Mudsnail	<i>Potamopyrgus antipodarum</i>	NZMS
Red Swamp Crayfish*	<i>Procambarus clarkii</i>	RSC
Rusty Crayfish	<i>Orconectes rusticus</i>	RC

## FIELD GUIDES

For guidance on target species identification and habitat preference, please review the attached and the following guides:

- [AIS Identification Guide](#) (multi-page) and [AIS Identification Guide](#) (one-page)
- [Crayfish of Wisconsin Guide \(2017\)](#) (multi-page)
- [Citizen Lake Monitoring Network Aquatic Invasive Species Monitoring Protocol](#)
- [Field guide to Wisconsin Streams](#)
- [Key to Wisconsin Freshwater Snails](#)

## EQUIPMENT

### All lakes

- Gazetteer
- Bathymetric map of lake
- Boat
- Boat ladder (for easily exiting and entering the boat in deep water)
- GPS
- Waterproof camera
- Polarized sunglasses
- Waterproof paper (to print monitoring forms and specimen labels on)
- D-net

- Aquatic plant rake on a rope and pole ~ (detailed instructions in [Recommended Baseline Monitoring of Aquatic Plants in Wisconsin](#))
- 54 µm plankton net (veliger samples)
- Ekman grab w/ line and messenger (waterflea samples)
- Wash bucket w/ 500 micron filter bottom
- Spray bottle
- Gallon or quart sized zip-locs (1 per Ekman grab)
- Sonde or Hydrolab (to measure conductivity)
- Secchi disk
- Depth finder (in boat or handheld)
- Mesh bag (nylons or fruit mesh bags can be used) – to place specimens in underwater
- Sorting trays for plants and inverts
- Ziploc bags for plant preservation (can be reused)
- Plastic bottles for benthic invertebrate specimens (~3 per lake)
- Bottle labels printed on waterproof paper

#### **Turbid lakes**

- Latex or other gloves to protect hands from blue-green algae.

#### **Clear lakes**

- Wetsuits

- Dive flag, float and anchor
- Snorkel, mask, fins and weight belt
- Snorkel mask clearing solution
- Stopwatch

#### **Disinfection Equipment**

- Long-handled stiff bristled brush
- Portable Jiffy steam cleaner
- Jugs for clean water
- Tubs for equipment disinfection
- Backpack or handheld sprayer
- Bleach solution
- Black plastic bags
- Nitrile gloves
- Emergency eyewash station or eye wash solution
- Eye protection meeting ANSI Z87 (safety sunglasses are acceptable)
- Splash goggles and/or a face shield
- Dust mask respirator (optional – requires training)
- Chlorine solution and/or Virkon® Aquatic

#### **Preservation and Vouchering**

- Waterproof camera
- Ethanol (non-denatured preferred) for veliger sample preservation and prohibited species
- Plant press, newspaper, and herbarium paper for prohibited plant species

## FIELD METHODS

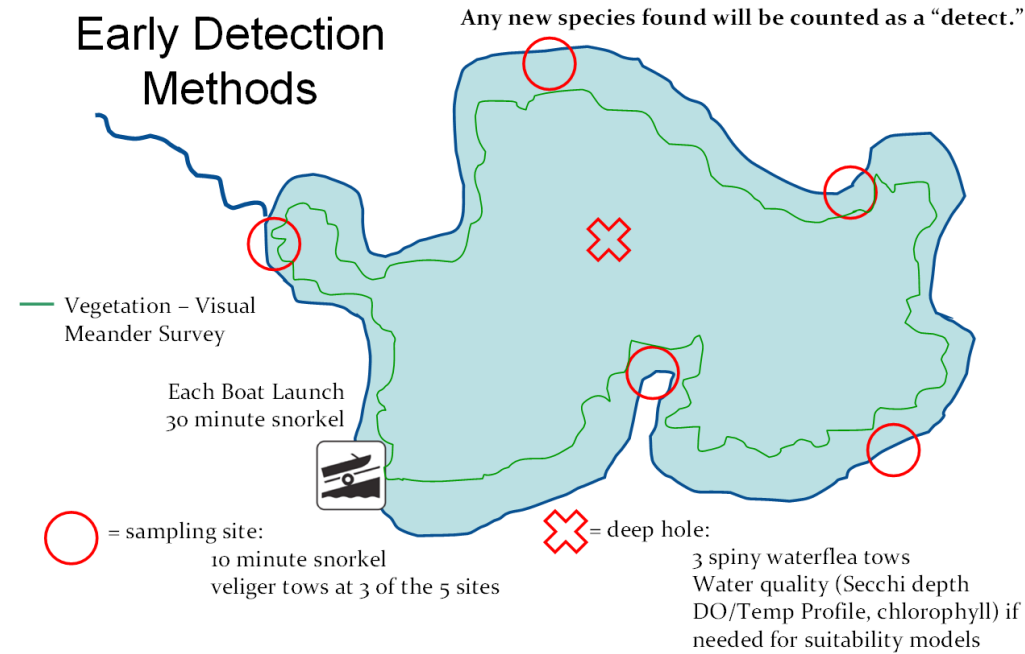


Figure 1 Schematic of AIS Early Detection Lake Survey Design (Latzka and Van Egeren 2010). This map does not accurately illustrate tows and has additional water quality information that is not collected during these surveys

### Data Collection

Collect data using appropriate forms on waterproof paper.

- [Aquatic Invasive Species Early Detection Monitoring Form](#)
- Mussel Veliger Tow Labslip (generated in SWIMS)
- Water Flea Tow Labslip (generated in SWIMS)

### Photo/Specimen Collection Protocol

- Collect **photographs** of all new AIS occurrences for verification purposes. Follow the DNR Photographing Aquatic and Wetland Invasive Species Guidance: <https://dnrx.wisconsin.gov/swims/downloadDocument.do?id=145712698>.
- Collect specimens of **prohibited** or unusual invasive species for vouchering. Collect about 5 intact specimens that contain all the identifying characteristics. While in the boat, store specimens in separate sample bottles or in Ziploc bags with water or a wet paper towel.
- Upon completion of the survey, specimens should be properly preserved and submitted to the Regional DNR AIS Coordinator as soon as possible.
- Record data on the Early Detection Form.

### ***Boat Landing Search(es)***

- Survey all public boat landings (public and commercial). Do not include small, backyard boat ramps. Record the location of each boat landing from the shoreline in decimal degrees using a GPS (datum WGS84) whether or not any AIS are found.
- Each landing is searched for 30 minutes using snorkeling, D-nets, rakes, and surveying shoreline. Snorkel for 15 minutes covering an area of shoreline 200' long out to the maximum depth of plant growth or 100' from shore. For distance reference, baseball bases are 90' apart and a football field is 300' long. Spend 15 minutes using the D-net and rake in the shallow water and also examining the shoreline for 200'.
- For QAQC purposes, collect specimens of all AIS recorded.
- Do not swim in water that looks like "pea soup", green or blue paint, or that has a scum layer or puffy blobs floating on the surface. If there is poor visibility or safety is a concern (e.g., blue-green algae bloom), do not snorkel. Instead, analyze rake tows and D-net samples for about 30 minutes within the defined area (200' shoreline and 100' from shore).
- Record data on Early Detection form.

### ***Targeted Search Sites***

- Stop at each targeted search site and conduct 10-minute snorkel searches. If there are two people, one person should snorkel for 5 minutes while the other person examines the shallows and shoreline for 5 minutes (while also keeping watch on the snorkeler). If you find additional appropriate search sites during the shoreline meander, you can add additional 10-minute searches or replace the sites that you pre-selected.
- For QAQC purposes, collect specimens of all AIS recorded.
- If there is poor visibility or safety is a concern (e.g., blue-green algae bloom), do not snorkel. Instead, at each site analyze rake tows and D-net samples for about 10 minutes.
- Record the site number and location (center of site at shoreline in decimal degrees) of each site on the datasheet whether or not any AIS are found. Record the name of any species found and density rating (as defined on the datasheet). Record data on Early Detection Form.

### ***Meander Survey***

- During the meander survey, drive boat slowly between target sites and look for aquatic invasive plants, mussels, and snails in the water and along the shoreline. Meander between shallow water and maximum rooting depth or 100' from shore whichever comes first.



- If not snorkeling the target sites due to poor visibility or safety concerns, visibility will likely be difficult during the meander survey also. To sample during the meander survey in low visibility, collect 50 rake tows/D-net samples during the meander survey.
- Record the site number, location in decimal degrees and the name and density (as defined on the back of the datasheet) of each AIS occurrence observed. However, only collect separate GPS points from discretely different beds or populations of invasive species.
- If three discrete locations of a certain species are found either at targeted search sites and/or during the meander survey stop recording new locations during the meander survey. Three discrete locations of one species will indicate that the species is established in the lake.
- Collect specimens of all AIS reported for QAQC purposes.
- Record data on Early Detection Form.

#### ***Waterflea Tows***

- See the waterflea collection protocol:  
<https://dnrx.wisconsin.gov/swims/downloadDocument.do?id=234380921>

#### ***Veliger Tows***

- See the mussel veliger collection protocol:  
<https://dnrx.wisconsin.gov/swims/downloadDocument.do?id=234380927>.

## **FOLLOWING FIELD PROTOCOL**

### ***Equipment Disinfection***

- Review the manual code and best management practices on the [Boat, Gear and Equipment Decontamination and Disinfection Website](#)

### ***Verification***

- Follow the AIS Early Detection Monitoring Verification and Voucher Guidance for all suspected new AIS occurrences: <https://dnrx.wisconsin.gov/swims/downloadDocument.do?id=145713313>

### ***Data Entry***

- Enter Early Detection form data into SWIMS once each week in the “Aquatic Invasive Species Early Detection Surveys” project.
- Contact your Regional AIS Coordinator if you have questions about SWIMS data entry. The regional DNR AIS Coordinator will contact the Statewide AIS Monitoring Lead if they have questions.

### ***Notification***

- If AIS not previously observed in a waterbody are found, follow the Department's communication protocol:  
<http://dnr.wi.gov/water/wsSWIMSDocument.ashx?documentSeqNo=118813642>.

***Voucher***

- Follow the AIS Early Detection Monitoring Voucher Guidance for all new NR40 prohibited or unusual species occurrences:  
<https://dnrx.wisconsin.gov/swims/downloadDocument.do?id=145713415>

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