



WISCONSIN
AQUATIC INVASIVE SPECIES
EARLY DETECTOR
HANDBOOK





This publication is a handbook for volunteers participating in the Wisconsin Citizen Lake Monitoring Network or Water Action Volunteers stream monitoring program.

NOTES

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AIS EARLY DETECTORS

Early detection of aquatic invasive species (AIS) can be the difference between long-term management and potential eradication--the difference between \$\$\$ and \$. Once they become well-established, invasive species can be very difficult to control, and may be impossible to eradicate. Early detection and rapid response to new AIS populations in Wisconsin has resulted in some populations being eradicated from entire waterbodies, including notable invaders like Eurasian watermilfoil, flowering rush, and yellow floating heart (cover photo). The best possible option for a waterbody is to have trained eyes on the water often, so that a suspicious plant or animal can be detected early and quickly responded to.

Your local lake and river monitoring staff and Aquatic Invasive Species Coordinators are ready to help you! They can provide hands-on training, assist with identification, suggest locations to monitor on your lake or river, and more. This is a team effort to stop invasive species from spreading to our favorite fishing spots, our cherished swimming holes, and the peaceful places where we love to observe native plants and animals. We can all do our part. Thank you for being a partner to protect the amazing waters of Wisconsin.

This booklet is adapted from *Aquatic Invasive Species Early Detectors: A How-to Guide*, produced by the Minnehaha Creek Watershed District, Minnetonka, Minnesota, used with permission.

Produced by the Wisconsin Citizen Lake Monitoring Network, UW-Stevens Point - Extension Lakes Program.

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Jeffrey Thompson, Minnesota Public Radio; (p. 3)

Minnehaha Creek Watershed District; (pp. 8, 12)

Tina Fitzgerald, Minnesota Department of Natural Resources (top photo, p. 38)

Jeff Jackson (top photo, p. 25)

Katy Chayka, minnesotawildflowers.info (lower photos, p. 25)

Updated April 2023



HOW TO PREPARE FOR LAKE MONITORING

1

Know which invasive species are already present in the lake you are monitoring. Lists of invasive species in each waterbody can be found on the Wisconsin Department of Natural Resources website: dnr.wi.gov/lakes/invasives/AISbywaterbody.aspx. Also, you may want to watch our Aquatic Invasive Species Monitoring video that reviews the methods explained in this handbook. Go to Youtube.com and search for Extension Lakes to find our channel, or type in this direct link to the video: <https://youtu.be/Yz2AWgsgoAk> (case-sensitive)

2

Determine several locations to sample. Be sure to target boat landings, inlets/outlets, public parks, developed shorelines, and a variety of sediment types (mucky, sandy, etc.). Your own shoreline is also a great place to keep an eye on. Mark these sampling locations on a map so that you can show others where you sampled or found a suspicious species.

3

Refer to the *Assembling a Monitoring Kit* section on page 6 to prepare for monitoring. If any of your gear has been used in another waterbody, be sure that it doesn't contain any plants, animals, or debris that could be holding invasive species.



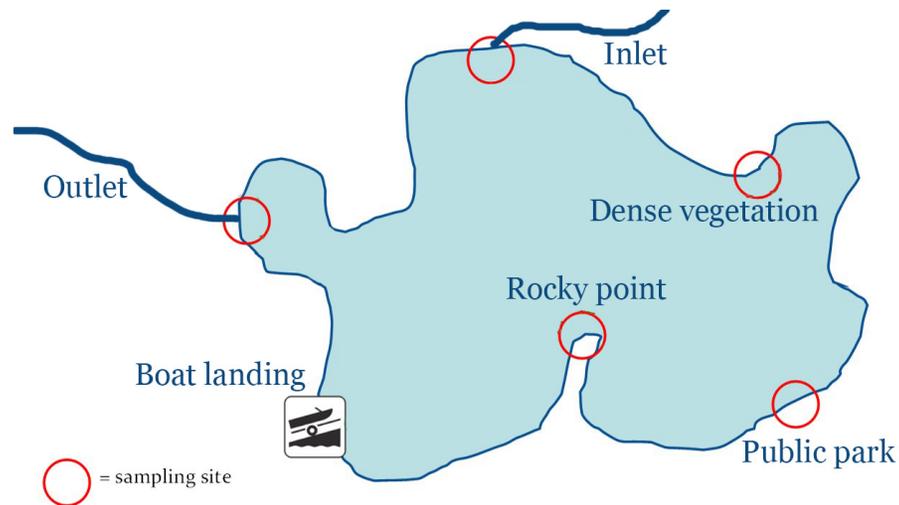
Inspect
your equipment before and after monitoring for any attached plants, animals, or mud



Remove
all attached debris



Drain
water from your boat, motor, live wells, bait buckets, and any other location that holds water



Lake maps can be found for public lakes across the state by searching for "lake maps" at dnr.wi.gov.

HOW TO PREPARE FOR RIVER OR STREAM MONITORING

1

Know which invasive species are already present in the river or stream you are monitoring. Lists of invasive species in each waterbody can be found on the Wisconsin Department of Natural Resources website: dnr.wi.gov/lakes/invasives/AISbywaterbody.aspx

2

As you float or walk down the river or stream, determine several locations to sample. Be sure to target boat landings, public parks, urban areas, bridges, and a variety of sediment types (mucky, sandy, etc.). Mark these sampling locations on a map so that you can show others where you sampled and found a suspicious species.

3

Refer to the *Assembling a Monitoring Kit* section on page 6 to prepare for monitoring. If any of your gear has been used in another waterbody, be sure that it doesn't contain any plants, animals, or debris that could be holding invasive species.



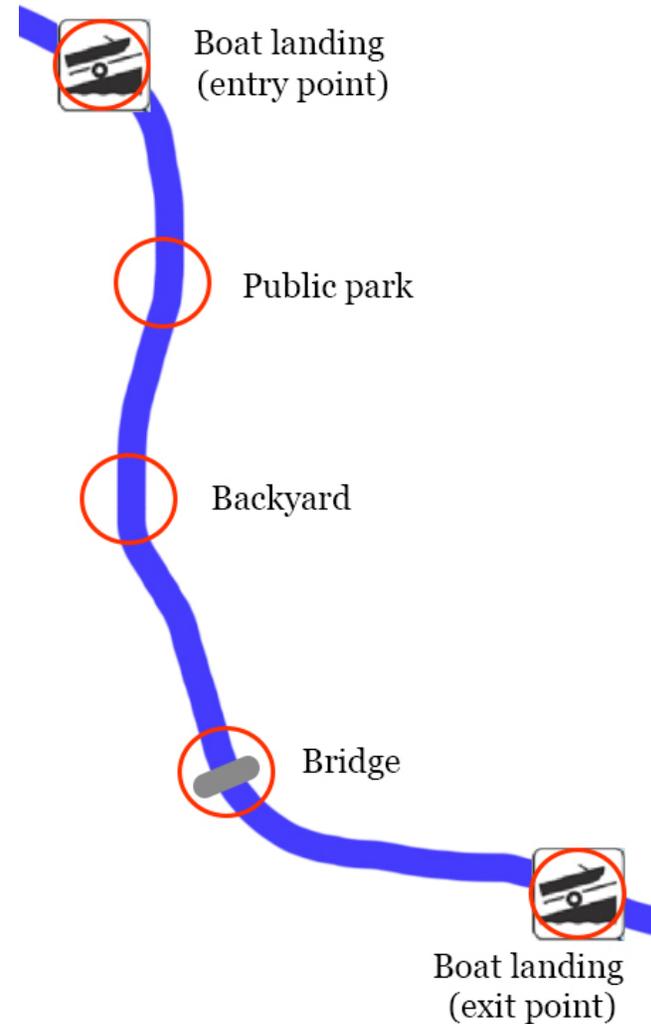
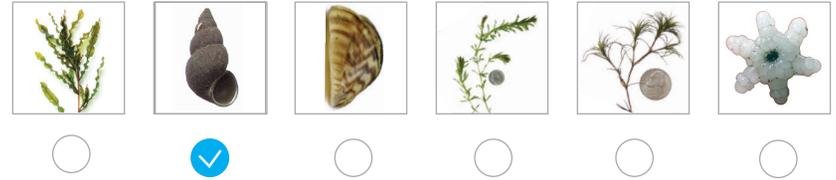
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your equipment before and after monitoring for any attached plants, animals, or mud



Remove
all attached debris



Drain
water from your boat, motor, live wells, bait buckets, and any other location that holds water



ASSEMBLING A MONITORING KIT

Use the checklist below to assemble an AIS monitoring kit. Items marked with an asterisk (*) can be provided by your Regional Citizen Lake Monitoring Network Coordinator, Project Riverine Early Detectors (RED) Coordinator, or local Aquatic Invasive Species Coordinator.

- 1) Aquatic plant sampling rake*
- 2) Waterproof labels*
- 3) Ziploc bags*
- 4) Hand lens*
- 5) Pencil*
- 6) AIS monitoring forms*
- 7) Polarized sunglasses
- 8) Towel to dry your hands and equipment
- 9) Underwater viewing tube or bucket

A steel rake head (usually with at least 30 feet of rope attached to it) is a very effective aquatic plant sampling tool. You can buy a rake head by itself, or simply cut the handle off of a rake and tie the rope to the head. If desired, a double-sided rake can be made by attaching two rake heads together with cable ties, stainless steel hose clamps, or welding. Double-sided is better, since there will always be rake tines pointed down into the sediment to snag plants.



1



7

Polarized sunglasses reduce glare and allow a person to see much more clearly into the water.



Waders (10), and snorkeling gear (11) can also be very useful tools for AIS monitoring, but are not required. Volunteers wishing to do a very thorough check of an area may choose to use these items.



10



11



8

A towel is useful to wipe your hands and your gear!

HOW TO SURVEY FOR AQUATIC INVASIVE SPECIES FROM SHORE

Identify the public boundaries of the site. Beginning at one of the boundaries, conduct the sampling steps outlined below, and repeat these steps at five points spaced about equally between the site boundaries. If your site is less than 20 feet wide, use three sampling points - one on each side, and one in the middle.



1. Scan the area for at least 30 seconds, examining plants and animals in the water and any plant fragments/shells that are washed up on shore.



2. Toss your sampling rake from shore into the water, aiming for concentrations of plants or anything suspicious that you noticed during your scan. Be sure to hang on to the end of your rope!

If there is a dock or pier, use it as one of your sampling locations. You can sample off of any side of the dock. If you are able to see or touch the legs of the dock, this is a good way to look for zebra mussels.



3. Retrieve the rake and examine the attached vegetation and animals. Snails, mussels, and other creatures will often be attached to the vegetation or stuck on the rake itself. Toss the rake 2 times per site, unless you need to toss it again to sample a suspected AIS. Use this handbook to help you identify suspicious plants and animals.

If you find a suspected invasive species on a lake, please record that on your *Aquatic Invasives Surveillance Monitoring* form. If you find a suspected invasive species in a river or stream, please record that on your *Project RED Field Data Collection Sheet*. Then take digital photographs of the invasive species (please include the waterproof label in the photos) and email the photos to your local AIS Coordinator (DNR or county). Please save all suspicious plants and animals in the refrigerator or in a cooler until you hear back. Your AIS Coordinator may ask to see the actual specimen to confirm its identification.

Place a sample of any invasive species in a plastic bag with a waterproof label. Bags, labels, and pencils are included in your monitoring kit. Seal the bag tightly and place it somewhere secure until you can get it into a refrigerator or deliver it to an expert.



4. Report what you found. If you did not find any suspected invasive species, that's great! We want to know the good news! Please enter this information into the Surface Water Integrated Monitoring System (SWIMS) database, or email the *Aquatic Invasives Surveillance Monitoring* form or *Project RED Field Data Collection Sheet* to your local Aquatic Invasive Species Coordinator. Please enter or mail your results by November 1st so we can compile information from across the state.

Who is my local AIS Coordinator? Visit the Wisconsin DNR website at dnr.wi.gov and type "AIS Coordinator" into the search box. Then click on your county to find contact information for AIS staff that cover your area.

If you need help finding this information, please contact:

Paul Skawinski
(Citizen Lake Monitoring)
Pskawins@uwsp.edu

Emily Heald
(Citizen Stream Monitoring)
Emily.Heald@wisc.edu

HOW TO SURVEY FOR AQUATIC INVASIVE SPECIES FROM A BOAT

Identify five sites around the lake or stream/river with a high risk of invasive species introductions, such as boat landings, public parks, bridges, and inlets. Conduct the sampling steps outlined below at each site you have identified around the waterbody. While motoring/paddling between sites, stay shallow enough that you can see aquatic plants, and watch for AIS as you move in a zig-zag fashion.

1. Scan the area for suspicious plants and animals, both in the water and along the shoreline. Scan for at least 30 seconds at each site.

2. Toss your sampling rake into the water, once from each side of the boat. Aim for concentrations of plants or anything suspicious that you noticed during your scan. Be sure to hang on to the end of the rope!

3. Retrieve the rake and examine the attached vegetation and animals. Snails, mussels, and other creatures will often be attached to the vegetation or stuck on the rake itself. Toss the rake 2 times per site, unless you need to toss it again to sample a suspected AIS. Use this handbook to help you identify suspicious plants and animals.

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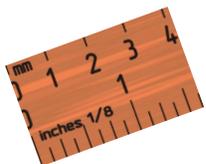
Emily Heald
(Citizen Stream Monitoring)
Emily.Heald@wisc.edu

PHOTOGRAPHING AQUATIC INVASIVE SPECIES

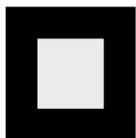
Most aquatic invasive species can be readily identified from a good photograph. Here are some tips to make your specimen easy for your local AIS Coordinator to identify.



Light it up! Have the sun or other light source behind you, not behind the object. Shadows make it difficult to see colors and patterns.



Show scale. Some species can be differentiated based on size. Use the provided waterproof labels to demonstrate size, or include the ruler at the front of this handbook.



Have a contrasting background. Important features of plants and animals can be tough to see against backgrounds that are busy or contain similar colors/textures.

Wisconsin Citizen Lake Monitoring Network
Use these labels when submitting a sample of an aquatic plant or animal for identification

Which species do you think it is?
Asian clam

Lake & county where it was collected:
Lulu Lake, Walworth co.

Date:
8/10/16

Your name and contact information:
Paul Skawinski
715-346-4853 Pskawins@uwsp.edu



PLANT ID

BRAZILIAN WATERWEED AND HYDRILLA

Plant type: Submergent
 Status: Prohibited
 Native look-alike:
 Common waterweed



INVASIVE

Brazilian waterweed
(Egeria densa)

- Rings (whorls) of 4-8 leaves around the stem
- Fine teeth on leaf edges. This usually requires a hand lens to see
- No teeth underneath the leaves

NATIVE

Common waterweed
(Elodea canadensis)

- Rings (whorls) of 3 leaves around the stem
- Smooth leaf edges
- No teeth underneath the leaves

INVASIVE

Hydrilla
(Hydrilla verticillata)

- Rings (whorls) of 4-8 leaves around the stem
- Fine teeth on leaf edges
- Teeth are also produced underneath the leaf, along the centerline





BRITTLE NAIAD
 Plant type: Submergent
 Status: Prohibited
 Native look-alike: Slender naiad



CAROLINA FANWORT
 Plant type: Submergent
 Status: Prohibited
 Native look-alike: Water marigold

INVASIVE

Brittle naiad
 (*Najas minor*)

- Teeth obvious with light magnification
- Readily breaks into small fragments
- Leaves curve strongly downward

NATIVE

Slender naiad
 (*Najas flexilis*)

- Teeth on edge of leaf require strong magnification to view
- Flexible
- Leaves straight or slightly curving

INVASIVE

Carolina fanwort
 (*Cabomba caroliniana*)

- Leaves on short stalks, attaching on opposite sides of the stem
- Flower white with a yellow center
- May have tiny, floating leaves

NATIVE

Water marigold
 (*Bidens beckii*)

- Ring/whorl of leaves around the stem
- Leaves do not have stalks
- Yellow, daisy-like flower





CURLY-LEAF PONDWEED

Plant type: Submergent
 Status: Restricted
 Native look-alike: Claspingleaf pondweed

INVASIVE

NATIVE

Curly-leaf pondweed
 (*Potamogeton crispus*)

- Leaves are usually very wavy
- Finely toothed leaf edges
- Leaf tips are blunt
- Leaf base not wrapped around stem

Claspingleaf pondweed
 (*Potamogeton richardsonii*)

- Leaves are gently wavy
- Leaf edges smooth, no teeth
- Leaf tips are pointed
- Leaf base wraps around stem



EURASIAN WATERMILFOIL

Plant type: Submergent
 Status: Restricted
 Native look-alikes: Other watermilfoils, common bladderwort

INVASIVE

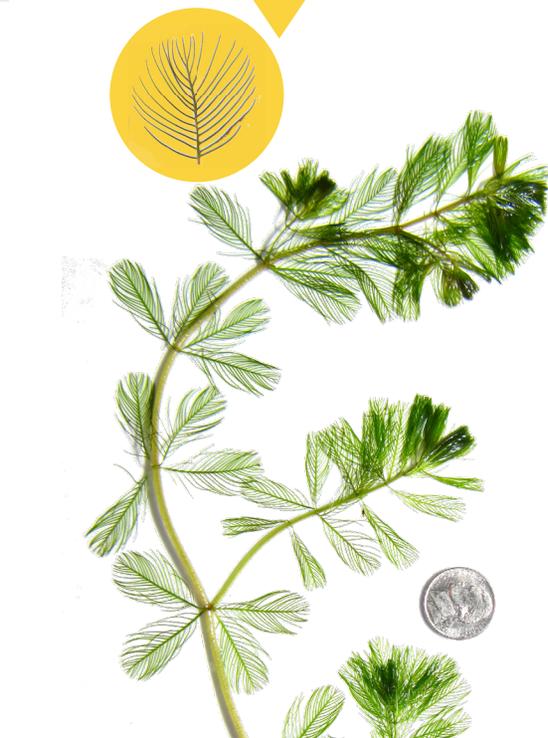
NATIVE

Eurasian watermilfoil
 (*Myriophyllum spicatum*)

- 12+ pairs of leaflets per leaf
- Stems usually weak and limp, reddish-brown to pink
- Leaves at tip of branches often red

Northern watermilfoil
 (*Myriophyllum sibiricum*)

- 5-10 pairs of leaflets per leaf
- Stems tan to green, usually stiff, holding shape out of water
- Leaves at tips of branches usually green



NATIVE

NATIVE

Whorled watermilfoil
(*Myriophyllum verticillatum*)

Common bladderwort
(*Utricularia macrorhiza*)

- 8-17 pairs of leaflets per leaf
- Stems brown or dark green
- Rings (whorls) of leaves packed closely together along the stem

- Leaves contain many small sacs (bladders) that trap invertebrates
- Stems are unrooted, usually tangled on other vegetation



EUROPEAN FROG-BIT

Plant type: Floating
 Status: Prohibited
 Native look-alike: White water lily

INVASIVE

NATIVE

European frog-bit
(*Hydrocharis morsus-ranae*)

White water lily
(*Nymphaea odorata*)

- Free-floating, roots hang below
- Small, heart-shaped leaves (2-3")
- Small, white flower, 3 petals

- Rooted to the bottom
- Round leaves with a slit/notch
- Large leaves up to 12" diameter
- Large, white flower, many petals





FLOWERING RUSH

Plant type: Emergent/submergent
 Status: Restricted
 Native look-alike: Bur-reeds

INVASIVE



JAPANESE HOPS

Plant type: Shoreline/terrestrial
 Status: Prohibited/Restricted
 Native look-alike: American hops

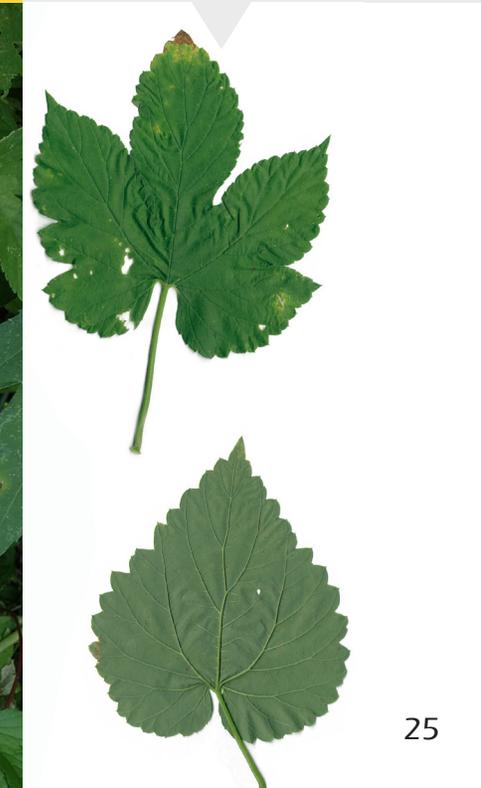
INVASIVE

NATIVE

- Flowering rush
 (*Butomus umbellatus*)
- Produces small, onion-like growths on the roots called bulbils
 - Usually 3-6 feet tall
 - Cluster of pink/red flowers held above the plant
 - Can be emergent or submergent
 - Tall, dark green leaves are triangular in cross-section and often twisted near the top

- Japanese hops
 (*Humulus japonicus*)
- Annual, climbing vine
 - Opposite leaves, most w/ 5-7 lobes
 - Downward-pointing, prickly hairs on stems
 - Petiole longer than the leaf

- American hops
 (*Humulus lupulus*)
- Perennial, climbing vine
 - Opposite leaves, mostly with 3 lobes
 - Nearly hairless stems
 - Petiole shorter than leaf



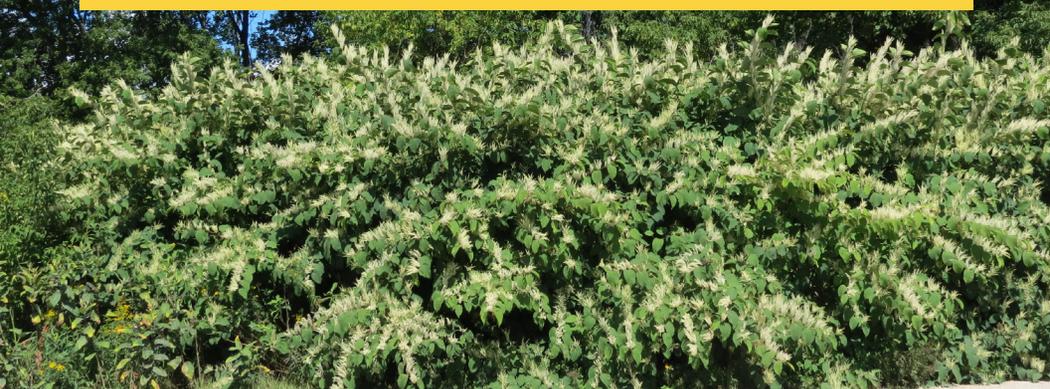


JAPANESE KNOTWEED
Plant type: Shoreline/terrestrial
Status: Restricted

INVASIVE

Japanese knotweed
(*Fallopia japonica*)

- Alternate, spade-shaped to heart-shaped leaves
- Thick, hollow, jointed stems
- Creamy white to greenish flowers clustered above the leaves
- Usually 4-10 feet tall, forming large patches or hedges
- One of several large, invasive knotweed species



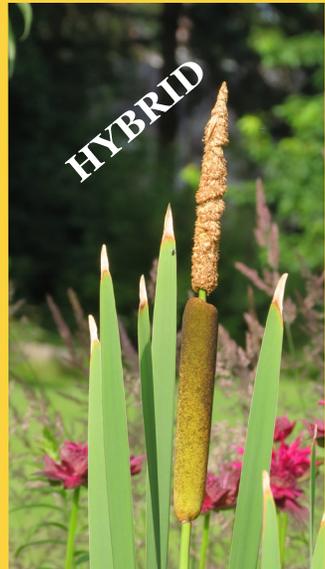
NARROW-LEAF CATTAIL
Plant type: Emergent
Status: Restricted

INVASIVE

Narrow-leaf cattail
(*Typha angustifolia*)

- Leaves 4-10mm wide
- Male and female flowerheads separated by 1" or more
- Pollen is shed as single grains

Note: Narrow-leaf and broad-leaf cattails can hybridize. Hybrid cattail (*Typha x glauca*) typically has a gap of 1/4" to 1" between the male and female flowerheads, sheds pollen mostly in single grains but also as clusters of two, three, and four, and grows in very dense stands.



NATIVE

Broad-leaf cattail
(*Typha latifolia*)

- Leaves >12mm (1/2") wide
- Male and female flowerheads touching, or nearly touching
- Pollen is shed in clusters of four grains



PURPLE LOOSESTRIFE

Plant type: Emergent/shoreline
 Status: Restricted
 Native look-alike: Blue vervain

INVASIVE

Purple loosestrife
 (*Lythrum salicaria*)

- Flowers pink-purple, with 6 petals, blooming in a tall spike
- Leaves have smooth edges and are opposite or in rings/whorls of 3
- Square or 6-sided stem



NATIVE

Blue vervain
 (*Verbena hastata*)

- Flowers blue, with 5 petals, blooming one ring/whorl at a time
- Leaves opposite with toothed edges
- Square stem



STARRY STONEWORT

Plant type: Submergent
 Status: Prohibited
 Native look-alike: Native stoneworts

INVASIVE

Starry stonewort
 (*Nitellopsis obtusa*)

- Rings/whorls of 4-6 branchlets
- Smooth stem
- Uneven forking near end of branchlets
- Produces 4-8mm, star-shaped bulbils in sediments
- Stiff; holds shape out of water



NATIVE

Slender stonewort
 (*Nitella flexilis*)

- Rings/whorls of 4-6 branchlets
- Smooth stem
- Symmetrical forking near end of branchlets
- Does not produce bulbils in sediments
- Delicate; collapses out of water





WATER CHESTNUT

Plant type: Floating
Status: Prohibited
Native look-alike: None

INVASIVE

Water chestnut
(*Trapa natans*)

- Triangular, toothed leaves
- Leaf bases are inflated
- Mostly free-floating but with long, feathery leaves dangling below
- Fruits with sharp spines formed underneath the leaves
- Entire plant may be over 1 foot in diameter



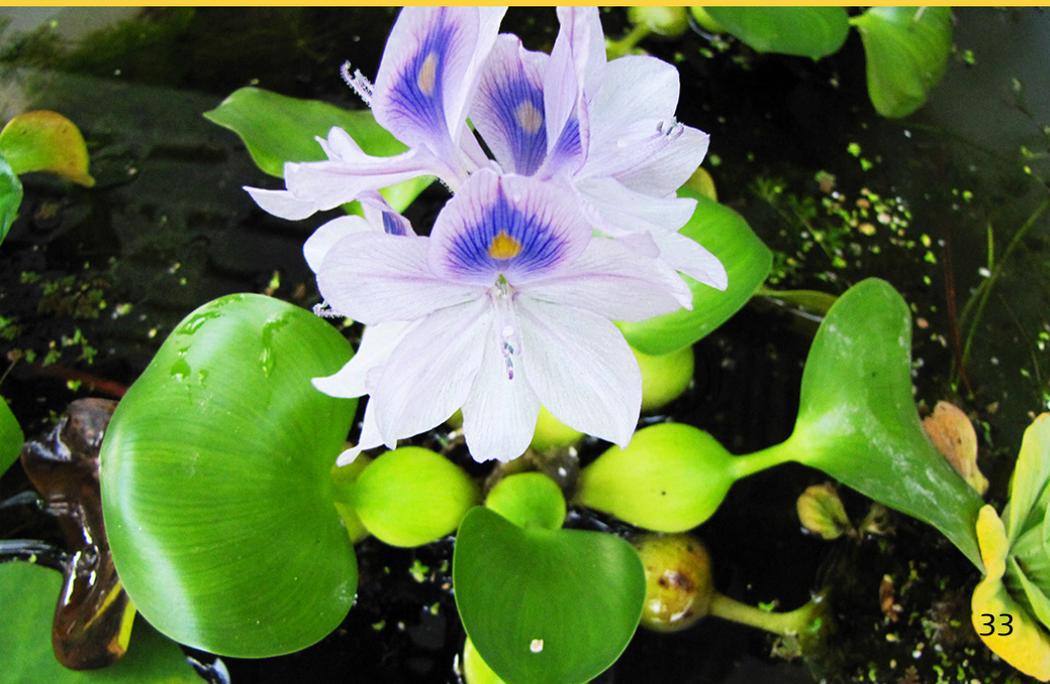
WATER HYACINTH

Plant type: Floating
Status: Prohibited
Native look-alike: None

INVASIVE

Water hyacinth
(*Eichhornia crassipes*)

- Leaves are waxy and very shiny
- Leaf base is inflated
- Lavender flower with a purple/yellow spot
- Roots hang below the plant
- Forms interconnected colonies





WATER LETTUCE

Plant type: Floating
 Status: Prohibited
 Native look-alike: None

INVASIVE

Water lettuce
 (*Pistia stratiotes*)

- Free-floating
- Roots hang below the plant
- Leaves are thick, ridged, fuzzy, and light green
- Forms dense, interconnected colonies
- Resembles a floating head of lettuce



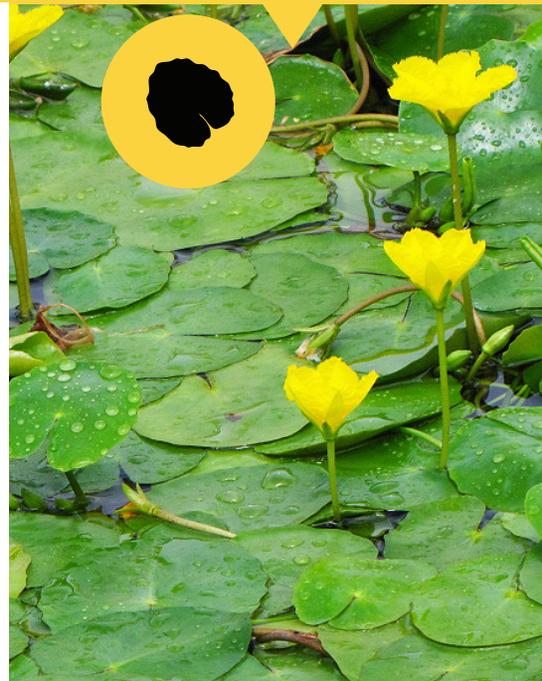
YELLOW FLOATING HEART

Plant type: Floating
 Status: Prohibited
 Native look-alike: Bullhead pond lily

INVASIVE

Yellow floating heart
 (*Nymphoides peltata*)

- Heart-shaped leaves up to 4 inches long
- Leaves have wavy edges
- Yellow flowers have five fringed petals
- Plant is rooted to the bottom



NATIVE

Bullhead pond lily
 (*Nuphar variegata*)

- Heart-shaped leaves up to 15 inches long
- Leaves do not have wavy edges
- Yellow flower is cup-shaped
- Plant is rooted to the bottom





YELLOW IRIS

Plant type: Emergent
Status: Restricted
Native look-alike: Blue-flag Iris

INVASIVE

Yellow Iris
(*Iris pseudacorus*)

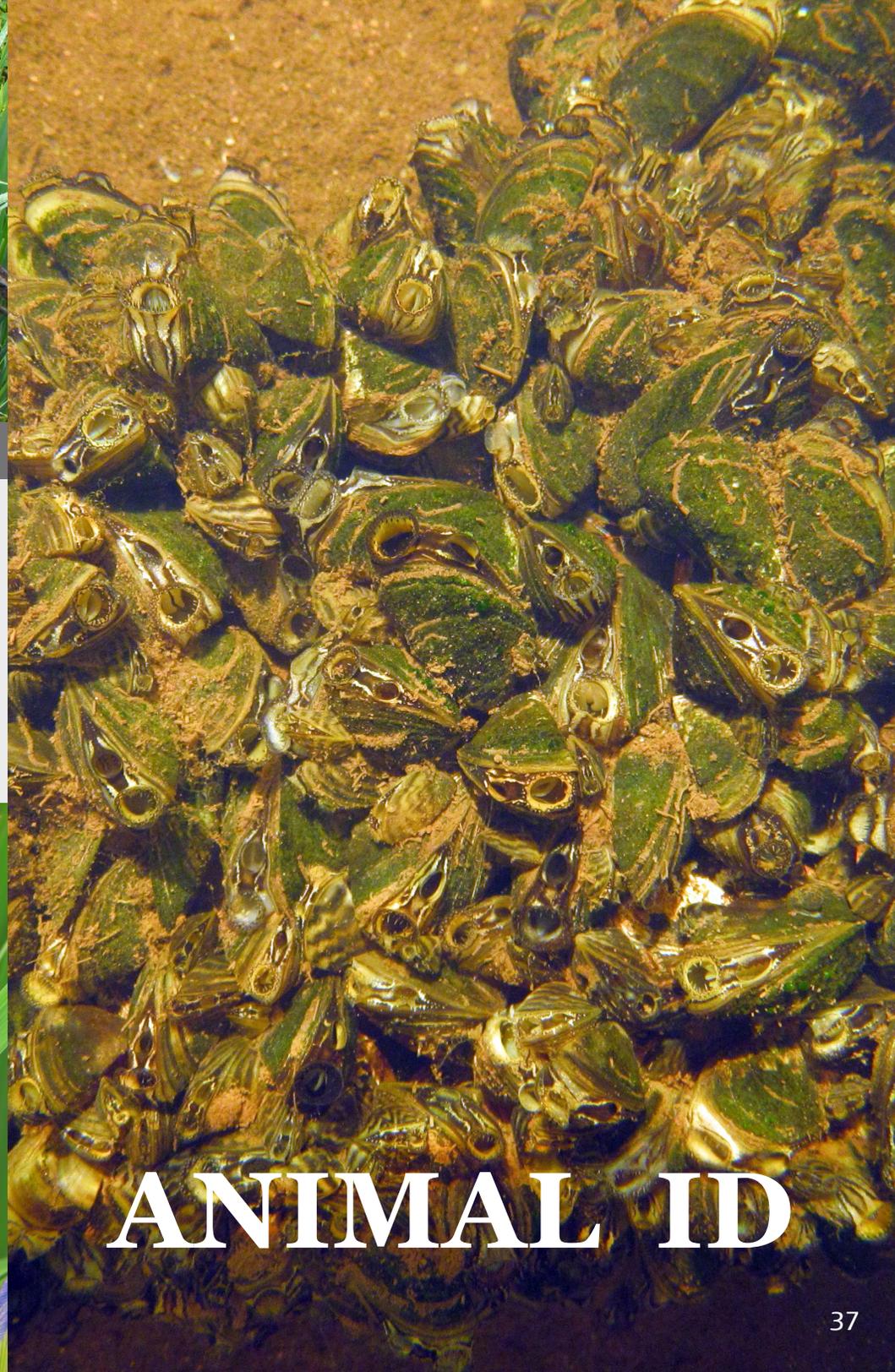
- 3-5 feet tall
- Leaves are dark green or blue-green
- Flower is yellow
- Center of leaf is sharply thickened



NATIVE

Blue-flag Iris
(*Iris versicolor* & *Iris virginica*)

- 2-4 feet tall
- Leaves light green
- Flower is blue
- Center of leaf gradually thickened



ANIMAL ID



ASIAN CLAM / FRESHWATER GOLDEN CLAM

Status: Prohibited
Native look-alike: Fingernail clams

INVASIVE

Asian clam / freshwater golden clam
(*Corbicula fluminea*)

- Distinctly raised rings on shell
- Up to 2 inches across
- Shell yellow-brown, often blue inside, solid and thick
- Three large hinge teeth on each shell



NATIVE

Fingernail clams
(multiple species)

- Rings of shell not distinctly raised
- Under 1 inch across
- Shell light to dark brown and white inside
- Shell translucent and thin
- 1 or 2 teeth at the hinge



BANDED & CHINESE MYSTERY SNAILS

Status: Restricted
Native look-alike: Brown mystery snail

INVASIVE

Banded mystery snail
(*Viviparus georgianus*)

- 1-1.5 inches tall
- Horizontal brown bands on shell
- Bands may be hidden by algae or sediment



Chinese mystery snail
(*Cipangopaludina chinensis*)

- Up to 3 inches tall
- Dark brown shell, often with short ridges near the shell opening





FAUCET SNAIL

Status: Prohibited
 Native look-alike: Several other small snails. Consult an expert for verification.

NEW ZEALAND MUDSNAIL

Status: Prohibited
 Native look-alike: Several other small snails. Consult an expert for verification.

INVASIVE

INVASIVE

Faucet snail
(Bithynia tentaculata)

- Small, 12-15mm long (1/2 inch)
- Light brown to black
- 5-6 spirals
- Shell opening is on right side and teardrop-shaped



New Zealand mudsnail
(Potamopyrgus antipodarum)

- Very small, 4-6mm long (1/8-1/4 inch)
- 7-8 spirals separated by deep grooves
- Gray to brown
- Shell opening is on right side
- Typically found in cold streams





RED SWAMP CRAYFISH
 Status: Prohibited
 Native look-alike: White River crayfish



ROUND GOBY
 Status: Restricted
 Native look-alike: Sculpins

INVASIVE

NATIVE

INVASIVE

Red swamp crayfish
 (*Procambarus clarkii*)

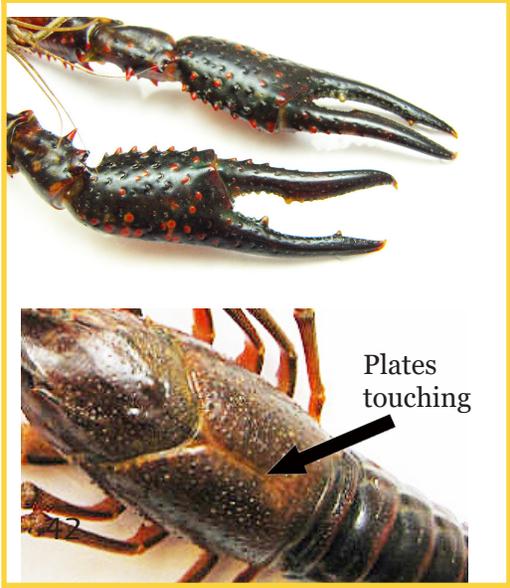
- Very large, to 5 inches+
- Red color with raised spots
- Plates of carapace touch along the center of the back (lower photo)

White river crayfish
 (*Procambarus acutus*)

- Very large, to 5 inches+
- Red color with raised spots
- Plates of carapace DO NOT touch along the center of the back (lower photo)

Round goby
 (*Neogobius melanostomus*)

- Commonly 3-6 inches long
- Round head with bulging eyes
- Pelvic fins on underside are fused into one circular fin
- Dark spot on back of dorsal fin





RUSTY CRAYFISH

Status: Restricted
Native look-alike: Several native crayfishes

INVASIVE

Rusty crayfish
(*Orconectes rusticus* a.k.a.
Faxonius rusticus)

- Rusty brown spot on each side
- Body is mostly light brown
- Up to 5 inches long
- Claws have black and orange bands



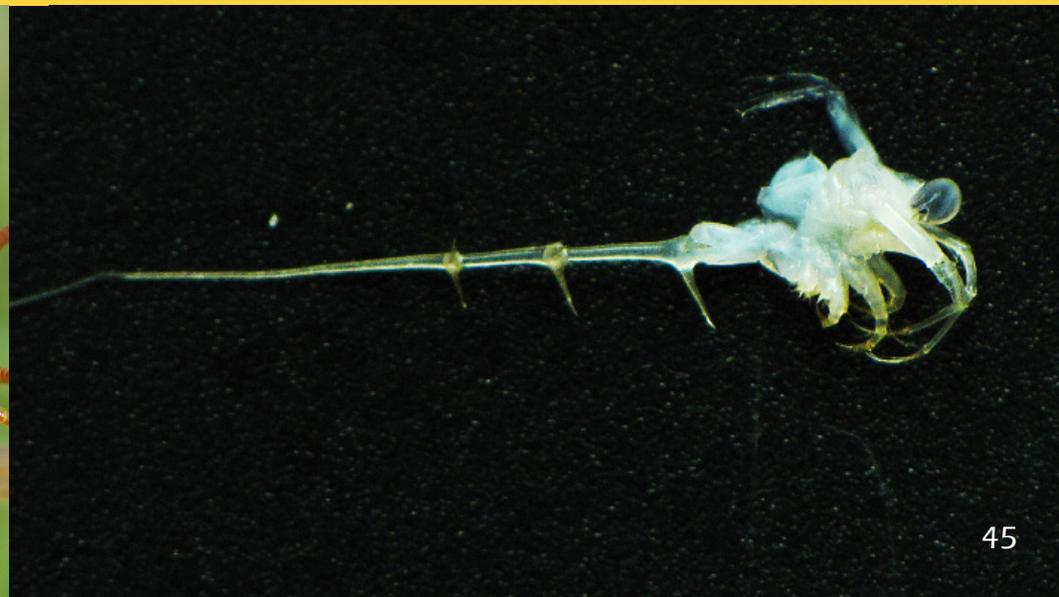
SPINY WATER FLEA

Status: Prohibited
Native look-alike: none

INVASIVE

Spiny waterflea
(*Bythotrephes longimanus*)

- About 1cm (3/8") in length
- Very long tail spine
- Often seen as clumps on fishing line, anchor lines, downriggers





ZEBRA AND QUAGGA MUSSELS

Status: Restricted (Zebra), Prohibited (Quagga)

INVASIVE

Zebra mussel
(*Dreissena polymorpha*)

- D-shaped shell
- Sits flat on its side
- Color varies but is usually light brown to white with brown-black stripes
- Up to 1.25" in length
- Usually attached to hard surfaces

Quagga mussel
(*Dreissena bugensis*)

- Teardrop-shaped shell
- Does not sit flat on its side
- Color usually light brown to white with brown stripes
- Can grow up to 1.5" in length
- Usually attached to hard surfaces



Wisconsin's Citizen Lake Monitoring Network and the Water Action Volunteers stream monitoring program support more than a thousand volunteers like you as they monitor the health of Wisconsin's lakes and streams. This information is used to assess the health of our waters, develop management plans and invasive species management strategies, identify long-term trends, evaluate effects of land use practices, and more.

Visit these websites to learn more!

uwsp.edu/uwexplakes

www.wateractionvolunteers.org



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