



MINNEHAHA CREEK
WATERSHED DISTRICT

AQUATIC INVASIVE SPECIES
EARLY DETECTORS
A HOW-TO GUIDE

TABLE OF CONTENTS

AIS EARLY DETECTOR BASICS

- 3 How to prepare
- 5 Assembling a monitoring kit
- 7 How to survey - invasive snails & mussels
- 9 How to survey - aquatic invasive plants
- 10 Collecting and identifying samples
- 11 How to report

PLANT ID

- 13 Curlyleaf Pondweed
- 14 Eurasian Watermilfoil
- 15 Brazilian Waterweed, Hydrilla, & Canadian Waterweed
- 17 Parrot Feather
- 18 Brittle Naiad
- 19 Flowering Rush
- 20 Water Lettuce
- 21 Didymo "Rock Snot"
- 22 Starry Stonewort
- 23 Yellow Floating Heart
- 24 Water Hyacinth
- 25 Water Chestnut
- 26 European Frog-Bit
- 27 Carolina Fanwort

ANIMAL ID

- 29 Zebra & Quagga Mussels
- 30 Chinese & Banded Mystery Snails
- 31 New Zealand Mudsnail
- 32 Faucet Snail
- 33 Asian Clam
- 34 Rusty Crayfish
- 35 Spiny Waterflea

APPENDICES

- 36 How to disinfect
- 37 How to construct a zebra/quagga mussel sampler

Produced by the Minnehaha Creek Watershed District.

Unless otherwise noted, photos provided by Paul Skawinski, University of Wisconsin-Extension.

www.minnehahacreek.org | (952) 471-0590

AIS EARLY DETECTORS

Thank you for your interest in becoming an AIS Early Detector! You play a vital role. Quickly noticing and responding to a new aquatic invasive species can prevent a full-blown infestation, and with more than 180 lakes in the Minnehaha Creek Watershed District (MCWD) alone, we can't keep a close eye on all of them ourselves.

This book will walk you through how to monitor, what equipment to use, and how to identify a variety of species -- and know the difference between the desirable and not! It includes the full suite of monitoring tools, though you may choose to only do a few activities depending on time and equipment. Being an early detector shouldn't feel like a chore; it is an easy activity and a good excuse to get out on the lake!

This guide was developed and produced by the MCWD but can apply to anyone looking to fight the spread of aquatic invasive species. Contact ais@minnehahacreek.org to learn more.

Photo by Jeffrey Thompson,
Minnesota Public Radio News.
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HOW TO PREPARE

1

Know which invasive species are already present in the lake or stream you are monitoring. The Minnesota DNR keeps an up-to-date list of AIS present in each water body at:

<http://www.dnr.state.mn.us/invasives/ais/infested.html>

2

Determine a location to monitor. Hotspots for new invasive species are inlets and outlets, developed shorelines, rocky areas, and areas with frequent public use such as boat launches and fishing piers. Your own shoreline is also a great place to check. You never know where something might turn up!

3

If you are sampling multiple lakes, it is critical to properly clean your equipment to avoid unintentionally spreading an invasive species. Follow the rules of “Clean, Drain, Dry” – they’re not just for boats!

There is more information on how to properly clean your equipment in the “How to Disinfect” section.



CLEAN

Clean plants, mud, animals and fish from all equipment. Rinse equipment with high pressure, hot water.



DRAIN

Drain water from your boat, motor, live well, bait bucket, and other equipment before transporting.



DRY

Dry everything that came in contact with water for at least five days to destroy any clinging AIS.



ASSEMBLING A MONITORING KIT

Most sampling tools can be either provided by the MCWD or made from common household items:

- 1) Hand scoop/strainer*
- 2) Zebra/Quagga mussel sampler*
- 3) Underwater scope.*
- 4) Hand lenses*
- 5) Containers for each sample (such as Ziploc bags)
- 6) Bucket
- 7) Sampling rake
- 8) AIS monitoring form

Can be accessed online with your smartphone (see Page 11). If you are using your device out on the water, a Ziploc bag works as a cheap waterproof case.

Also available as paper copy

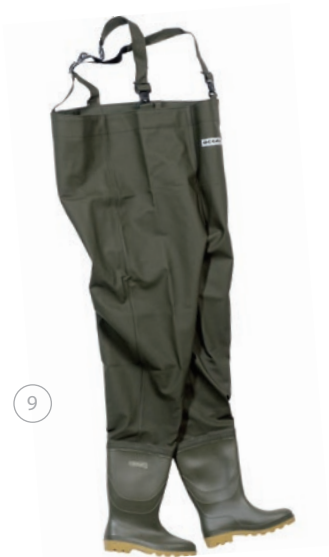
- 9) Waders
- 10) Pens, towels, hand sanitizer
- 11) Polarized sunglasses
- 12) Snorkel and mask (optional)

*Can be provided by MCWD



A **sampling rake** can be made by fastening two rake heads together and attaching a rope. A single headed rake or garden rake with a handle will work as well.





9



2



12

11



3



HOW TO SURVEY INVASIVE SNAILS & MUSSELS

- Walk the shoreline examining debris that is washed up on shore
- Pick up rocks and examine all sides.
- Zebra mussels prefer the shade so the undersides of docks, boat lifts, and swim platforms are good places to check. Many snails and mussels will also attach to vegetation and native mussels.



If you are able to enter the water, keep moving back and forth parallel to the shoreline using polarized sunglasses, an underwater scope or snorkel to search underwater rocks and logs.



Use a small strainer to look in areas of the lake with a sandy or muddy bottom. Scoop and strain the water and mud and place into a tub for closer examination.





ZEBRA/QUAGGA MUSSEL SAMPLER

Another way to check for zebra and quagga mussels is by hanging a sampler from the underside of your dock. The mussels will attach to most any hard surface but a sampler attached to a rope is an easy and consistent way to check. Samplers can be provided by MCWD or easily constructed using the diagram in Appendix B.

- » Sampler should be checked weekly or every other week.
- » It should hang about one foot above the lake bottom.



HOW TO CHECK

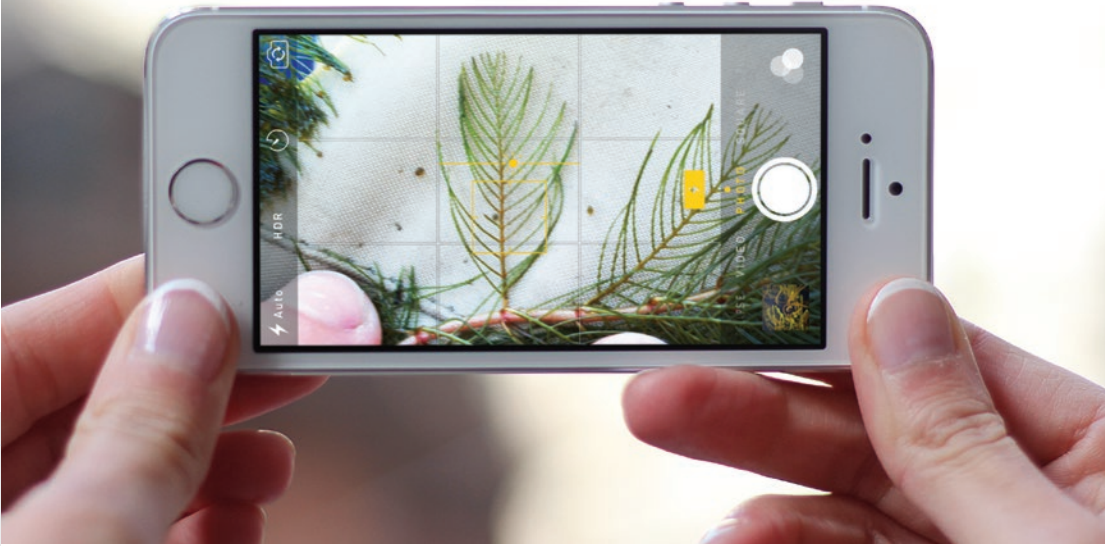
- Pull out of the water and place in a tub or tray
- Disassemble by removing nut from bottom of sampler
- Feel surface with fingertips for small bumps. When zebra mussels first attach they can be very small. Look for the D-shaped shell.
- If the sampler is covered in muck, clean it off and shorten the rope so it hangs closer to the surface
- Return the sampler to the lake and complete the monitoring report

HOW TO SURVEY AQUATIC INVASIVE PLANTS

Walk the shoreline examining plants that are washed up on shore. If you are able to enter the water, keep moving back and forth parallel to the shoreline using polarized sunglasses, an underwater scope, or snorkel to search for underwater plants.

In deeper water, throw a sampling rake to pull in aquatic plants. Also check plants for attached zebra mussels or other invasive species.

Many invasive plants will continue to grow once they reach the surface so keep an eye out for dense mats of vegetation.



COLLECTING & IDENTIFYING SAMPLES

Use this book to identify any questionable species you have collected.

If you think you have found a new invasive species, take multiple photos both close up and far away, including the location and habitat where it was found.

Use a coin or ruler in the close-up photos to show the size. For aquatic plants, try to spread out the leaf of the plant on your hand or another flat surface. Submit photos in our online form, or contact MCWD's AIS staff using the information on the next page.



*Actual Size

0 INCH

1

2

3

4

5

COLLECTING & IDENTIFYING SAMPLES (CONTINUED)

If you are surveying your own shoreline, you can store your samples at home until they are confirmed.

Note that it is illegal to transport invasive species, unless you are asked to deliver them for further identification. Animal species can be preserved in a container with rubbing alcohol or stored in water. Plant species can be wrapped in a damp paper towel, sealed in a Ziploc bag, and stored in the refrigerator.



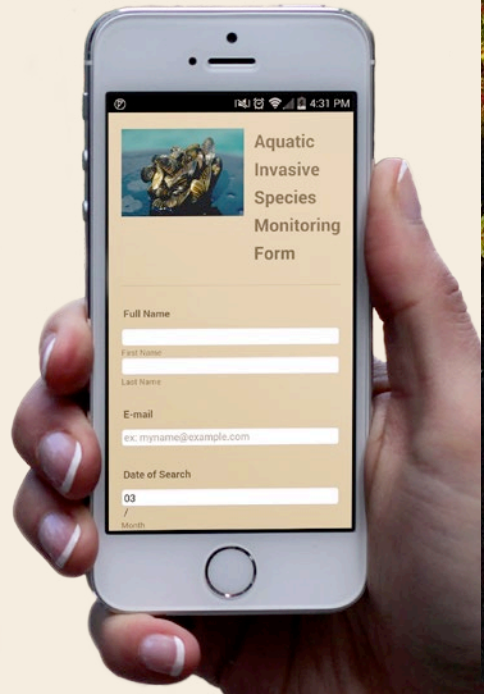
HOW TO REPORT

Consistent reporting is critical for the success of the monitoring program. Reports should be completed after each check, even if nothing new is found. We've worked to make the reporting process quick and easy!

MCWD's AIS Monitoring Form is available at www.minnehahacreek.org/ais-report. The page is formatted to be easily used on a mobile phone or computer.

Paper copies are available upon request. Contact ais@minnehahacreek.org for more information.

- If you would like hard copies, they can be picked up at MCWD's office or mailed to your address. They should be returned to MCWD upon completion.





PLANT ID



CURLYLEAF PONDWEED

Plant Type: Submerged

Status: Widespread throughout Minnesota

Native Look-alike: Clasping Leaf Pondweed



Curlyleaf Pondweed

INVASIVE

Curlyleaf Pondweed

(Potamogeton crispus)

- Leaves are crinkly
- Fine-toothed leaf edges
- Leaf tips are blunt
- Leaf base does not wrap around the stem
- Begins growing in early spring before other plants and dies back mid-summer
- Forms dense mats

NATIVE

Clasping Leaf Pondweed

(Potamogeton richardsonii)

- Slightly wavy leaves
- Smooth leaf edges
- Leaf tips come to a point
- Leaf base wraps around (clasps) the stem.
- Does not begin growing until summer
- Does not form dense mats



EURASIAN WATERMILFOIL

Plant Type: Submerged

Status: Widespread throughout Minnesota

Native Look-alike: Northern Watermilfoil (*Myriophyllum sibiricum*)

INVASIVE

Eurasian Watermilfoil

(*Myriophyllum spicatum*)

- 12-21 pairs of leaflets
- Stems are limp and spaghetti-like
- Stems are reddish brown to pink



NATIVE

Northern Watermilfoil

(*Myriophyllum sibiricum*)

- 5-10 pairs of leaflets
- Stems are stiff and hold their shape
- Stems are whitish green



BRAZILIAN WATERWEED, HYDRILLA, & CANADIAN WATERWEED

Plant Type: Submerged

Status: Not yet found in Minnesota

Native Look-alike: Canadian
Waterweed (*Elodea canadensis*)



INVASIVE

Brazilian waterweed

(*Egeria densa*)

- "Whorls" (the number of leaves attached to the same point) of 4-6
- Fine-toothed leaves (need to use a hand lens to see)





NATIVE

Canadian Waterweed

(Elodea canadensis)

- Whorls of 3
- Whorl of leaves is smaller than a quarter
- Smooth edges

INVASIVE

Hydrilla

(Hydrilla verticillata)

- Whorls of 4-8
- Whorl of leaves is smaller or the same size as a quarter
- Fine-toothed leaves



PARROT FEATHER

Plant Type: Submerged/Emergent

Status: Upper Mississippi River, no inland lakes in Minnesota

Similar to: Northern Watermilfoil and Eurasian Watermilfoil

INVASIVE

Parrot Feather

(Myriophyllum aquaticum)

- 6-30 pairs of leaflets
- Whorls of 4-6 around the stem
- Thick, rigid stem



Parrot Feather



Eurasian Watermilfoil



Northern Watermilfoil





BRITTLE NAIAD

Plant Type: Submerged

Status: Limited presence in Minnesota

Native Look-alike: Slender Naiad (*Najas flexilis*)

INVASIVE

Brittle Naiad

(*Najas minor*)

- Noticeably toothed
- Brittle
- Re-curved leaves
- Usually very short

NATIVE

Slender Naiad

(*Najas flexilis*)

- Not toothed
- Flexible
- Leaves are mostly straight
- Can reach 3 feet in length





FLOWERING RUSH

Plant Type: Submerged/Emergent

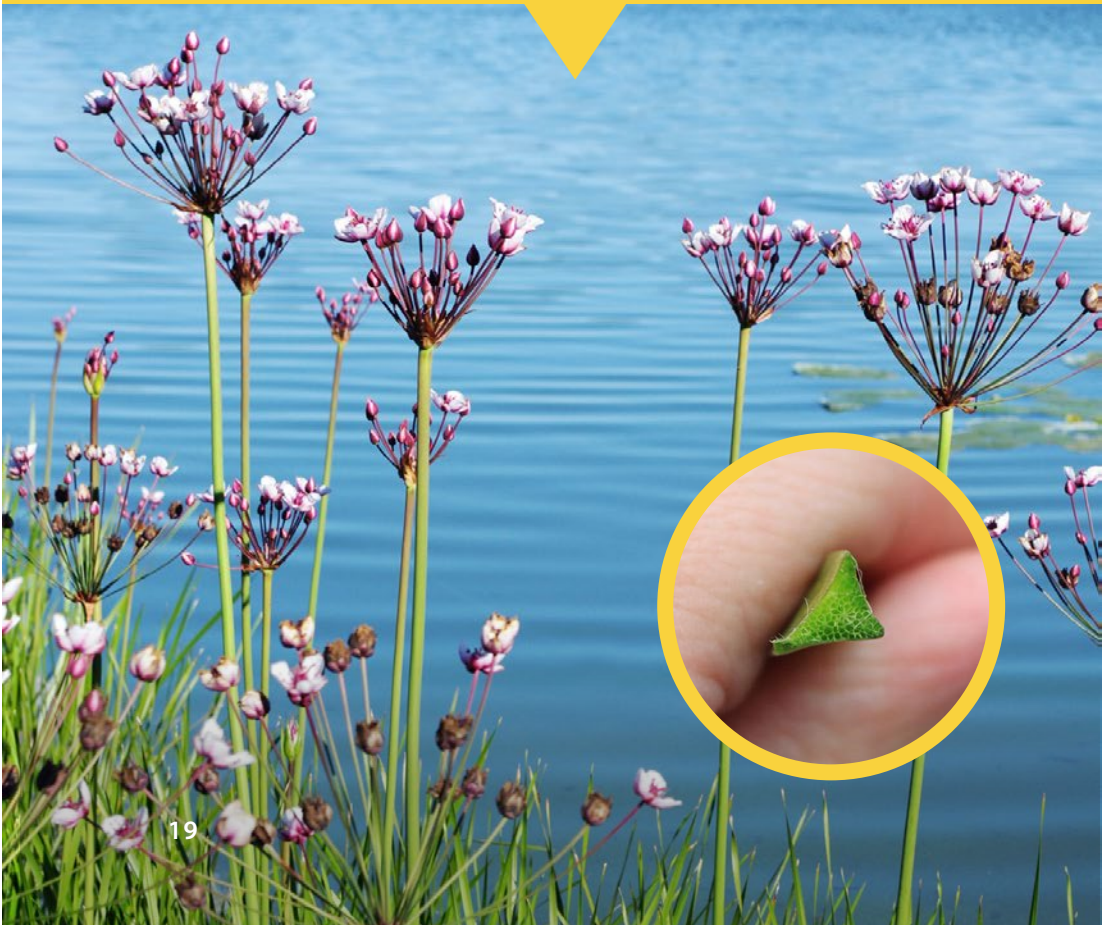
Status: Limited presence in Minnesota

Native Look-alike: Bulrushes, Arrowhead

INVASIVE

Flowering Rush (*Butomus umbellatus*)

- Very difficult to identify when not flowering
- Grows in shallow water, generally in depths of 10 feet or less
- Tall, dark green leaves
- Stem is triangular in cross-section
- Cluster of pink flowers is held on a round stalk



WATER LETTUCE

Plant Type: Floating

Status: Upper Mississippi River, no inland Minnesota lakes

Native Look-alike: None

INVASIVE

Water Lettuce (*Pistia stratiotes*)

- Resembles a head of lettuce
- Leaves are thick, ridged, fuzzy, and light green
- Free-floating
- Roots dangle
- Forms dense inter-connected mat





DIDYMO "ROCK SNOT"

Plant Type: Submerged

Status: Not yet in Minnesota

Native Look-alike: None

INVASIVE

Didymo "Rock Snot" (*Didymosphenia geminata*)

- Brownish algae
- Forms thick mats on river bottoms and shorelines
- Looks like snot, feels like wet wool



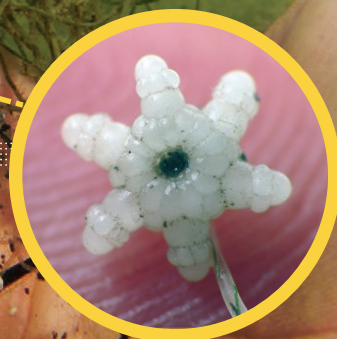


STARRY STONEWORT

Plant Type: Submerged

Status: Present in Minnesota

Native Look-alike: Muskgrass (*Chara* sp.)



INVASIVE

Starry Stonewort (*Nitellopsis obtusa*)

- Stem is smooth and green but may have a white/gray coating of minerals covering the stem.
- Whorls of 4-8 branches
- Star-shaped growths called bulbils are produced on clear threads at the base. (see photograph in upper right of opposite page)

NATIVE

Muskgrass (*Chara* sp.)

- Rough, crunchy stems. May also have white/gray mineral coating.
- Skunky smell.
- Whorls of 6 to 16 branches.





YELLOW FLOATING HEART

Plant Type: Floating

Status: Not yet found in Minnesota

Native Look-alike: Bullhead Pond Lily

INVASIVE

Yellow Floating Heart

(Nymphoides peltata)

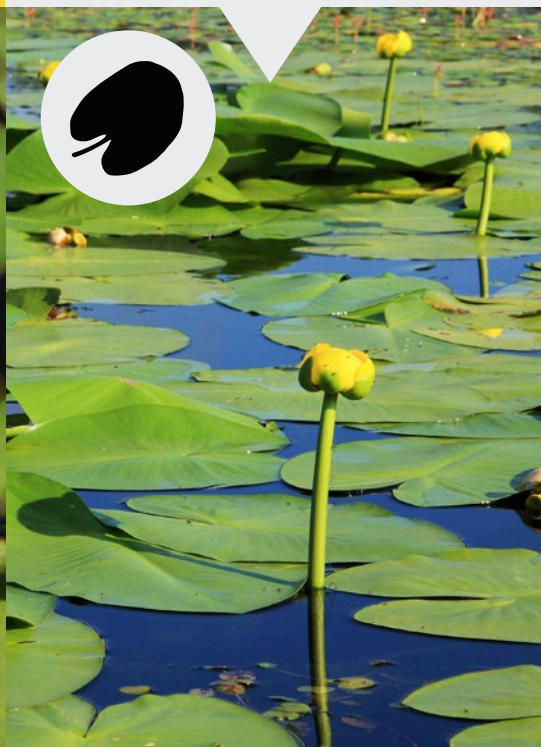
- Round, heart-shaped leaves
- Leaves have wavy edges
- Yellow flowers are 5-parted and are held above the water


NATIVE

Bullhead Pond Lily

(Nuphar variegata)

- Oblong leaves
- Leaves do not have wavy edges
- Yellow flower is ball-shaped and often sits on the water surface





WATER HYACINTH

Plant Type: Floating

Status: Not yet found in Minnesota

Native Look-alike: None

INVASIVE



Water Hyacinth

(Eichhornia crassipes)

- Leaves are shiny
- Inflated sac on the stem
- Lilac flower with a yellow spot
- Mass of roots hangs below the plant
- Forms free-floating mats

WATER CHESTNUT

Plant Type: Floating

Status: Not yet found in Minnesota

Native Look-alike: None

INVASIVE

Water Chestnut

(Trapa natans)

- Triangular, toothed leaves
- Inflated sac on stem
- Usually free-floating
- Forms dense mats





EUROPEAN FROG-BIT

Plant Type: Floating

Status: Not yet found in Minnesota

Native Look-alike: White Water Lily

INVASIVE

European Frog-Bit

(Hydrocharis morsus-ranae)

- Free-floating, roots dangle
- Heart-shaped leaves
- Small leaves (2 inch diameter)
- Small white flower, 3 petals

NATIVE

White Water Lily

(Nymphaea odorata)

- Floating lily pad is firmly rooted
- Round leaves with a slit
- Larger leaves (5-12 inch diameter)
- Large white flower, many petals





CAROLINA FANWORT

Plant Type: Submerged

Status: Not yet in Minnesota

Native Look-alike: Water Marigold

INVASIVE

Carolina Fanwort

(*Cabomba caroliniana*)

- Two leaves attaching on opposite sides of the stem
- Has a short stem attaching the leaves
- Small, white flower with a yellow center

NATIVE

Water Marigold

(*Bidens beckii*)

- Leaves are whorled
- No stems attaching the leaf
- Yellow, daisy-like flower



ANIMAL ID





QUAGGA MUSSELS & ZEBRA MUSSELS

Status: Not yet in Minnesota

Native Look-alike: None

Status: Present in Minnesota

Native Look-alike: None

INVASIVE

Quagga Mussel

(Dreissena bugensis)

- Rounder in shape than the zebra mussel
- Does not sit flat on its side
- Color varies but is typically lighter than the zebra mussel
- Can grow to larger sizes than zebra mussels (1.5 inches in length)



INVASIVE

Zebra Mussel

(Dreissena polymorpha)

- D-shaped
- Sits flat on its side
- Color varies but is usually light brown to white with brown/black stripes.
- Size: 0-1.25 inches in length





CHINESE & BANDED MYSTERY SNAILS

Status: Present in Minnesota

Native Look-alike: Native snails in the Viviparus genus

Status: Present in Minnesota

Native Look-alike: None

INVASIVE

Chinese Mystery Snail

(Cipangopaludina chinensis)

- Larger size, up to 3 inches tall
- Dark brown shell

INVASIVE

Banded Mystery Snail

(Viviparus georgianus)

- 1-1.5 inches tall
- Horizontal brown bands on shell





NEW ZEALAND MUDSNAIL

Status: Present in the Great Lakes

INVASIVE

New Zealand Mudsnail

(Potamopyrgus antipodarum)

- Very small (4-6 mm long) (1/8-1/4 inch)
- 7-8 spirals separated by deep grooves
- Gray to light brown





FAUCET SNAIL

Status: Present in Great Lakes and northern Minnesota



INVASIVE

Faucet Snail

(Bithynia tentaculata)

- Small (12-15 mm long)
- Light brown to black
- 5-6 spirals
- Teardrop-shaped opening





ASIAN CLAM

Status: Present in the Great Lakes

Native Look-alike: Fingernail clams

INVASIVE

Asian Clam (*Corbicula fluminea*)

- Very distinct ridges
- May burrow several inches into the soil
- 1-2 inches across
- Yellowish brown shell





RUSTY CRAYFISH

Status: Present in Minnesota

Native Look-alike: Several native crayfish species are present in Minnesota

INVASIVE

Rusty Crayfish (*Orconectes rusticus*)

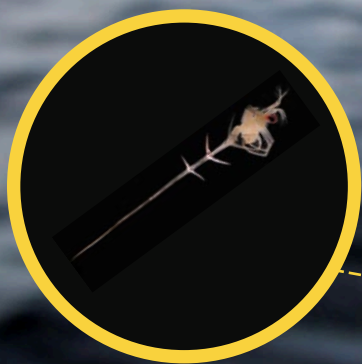
- Rusty brown spot. No native crayfish have a spot
- Rest of body is tan to light brown
- 1-4 inches



SPINY WATERFLEA

Status: Present in the Great Lakes and northern Minnesota

Native Look-alike: None



INVASIVE

Spiny Waterflea (*Bythotrephes longimanus*)

- Hard to detect without a net but may get tangled on fishing line or anchor rope
- ¼ to 5/8 inches long
- Long, straight tail spine that is twice as long as its body



APPENDIX A

HOW TO DISINFECT

If you are moving to another body of water, please thoroughly disinfect any equipment using standard protocols from the National Oceanic and Atmospheric Administration (NOAA).

- Remove all vegetation and mud.
- Rinse any equipment that has come in contact with the water.
- Allow everything to completely dry for at least 5 days OR soak in undiluted white vinegar for 20 minutes. If using snorkel equipment, soak for 30 minutes in a salt water bath (1/2 cup salt to 1 gallon of water). Thoroughly rinse in tap water afterwards.
- Don't forget to check your footwear and clothing.

WARNING: Please use separate sets of equipment if you are sampling in both **zebra mussel infested waters** and **non-zebra mussel infested waters**.



APPENDIX B

HOW TO CONSTRUCT A ZEBRA/QUAGGA MUSSEL SAMPLER

Visit your local hardware store for help with materials and construction. It can be constructed for approximately \$10.

¹Drill 13/32" hole in both top and bottom caps

²Drill 5/8" hole in center of plates





3 ft. of Nylon Rope for attaching to dock

Eyebolt: 3/8" diameter x 8" length

Spacers: 3/4" diameter CPVC x 1"



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