

Aquatic Invasive Species Early Detection

Carolyn Dindorf
carolyn@fortinconsulting.com



Why are AIS a problem?



- Displace beneficial native species
- Decrease biodiversity
- Harm fish populations
- Damage natural habitat
- Interfere with recreation
- Alter water quality
- Cause economic harm

MN Invasive Species Regulations

Prohibited Invasive Species

Unlawful to possess, import, purchase, transport, or introduce these species

Regulated Invasive species

Legal to possess, sell, buy, and transport, but they may not be introduced into a free-living state

Early Detection

Non-native, invasive plants with limited distribution in Minnesota that are assessed as high risk

Unlisted nonnative Unregulated

Focus on species

- Those not found in MN, or
- found in limited locations in MN, or
- found in nearby states or similar latitude, or
- most likely to survive in MN



Organized by growth habit

Submergent



Floating-leaved



Emergent



Shoreline



Submergent

Rooted or floating underwater



Brazilian waterweed

(*Egeria densa*)

Regulated



- Whorls of 4 - 6 bright green leaves
- Leaves 0.8 – 1.2" long, 0.2" wide
- Leaf edges slightly serrated
- Whorls spaced close together (bushy), especially at top
- White 3-petalled flowers

Aquatic plant line drawings are the copyright of the University of Florida Center for Aquatic Plants (Gainesville). Used with permission.

© 2001 CDFA

Hydrilla

(*Hydrilla verticillata*)

Prohibited



- Leaves in whorls of 3 - 10
- Whorls are 0.1 – 2" apart
- Slender, branching stem, up to 20' long
- Leaves with saw-toothed edges, rough to touch
- Leaves with pointed tips
- Produces turions (winter buds)

© 2001 CDFA

© 2001 CDFA

© 2001 CDFA

Brazilian waterweed/Hydrilla

Similar species

Whorls of 4 – 6
Fine-toothed leaves



Brazilian waterweed



Whorls of 3 short leaves



Canada waterweed



Whorls of 3 – 10 toothed leaves



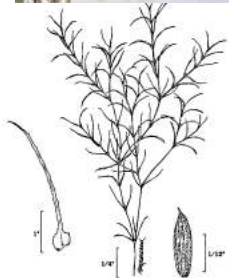
Hydrilla



Brittle naiad (*Najas minor*)



MN DNR



USDA-NRCS PLANTS
Database / USDA NRCS



Donald Cameron

- Slender stems, many branches
- Leaves opposite, linear, toothed, stiff and curled
- Leaves 1-2" long
- Flowers small, single
- Older plants brittle and leaves recurved
- Young plant leaves may not be toothed or curved

Brittle naiad

Similar species



Brittle naiad



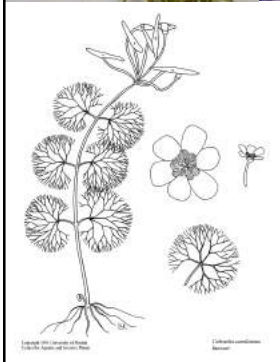
Bushy pondweed
(slender naiad)



Carolina fanwort

(*Cabomba caroliniana*)

Regulated



Aquatic plant line drawings are the copyright of the University of Florida Center for Aquatic Plants (Gainesville). Used with permission



By Show nry [CC BY-SA 3.0 (<http://creativecommons.org/licenses/by-sa/3.0/>)], via Wikimedia Commons

- Fan shaped submersed leaves 2" wide
- Two leaves attach on opposite sides of stem
- Short stem attaching leaves (petiole)
- Finely divided leaves
- Less common- floating narrowly diamond shaped leaves
- Flowers white to purplish 1/2" diameter

Carolina fanwort

similar species



Carolina fanwort
Cabomba caroliniana



Water marigold
Bidens beckii



Water crowfoot
Ranunculus aquatilis

Curly-leaf pondweed

Prohibited

- Stiff wavy leaves ½" wide, 2-3" long
- Leaf edges serrated
- Alternate translucent leaves
- Winter buds (pinecone like) turions



Curly-leaf pondweed
showing branching leaf veins
and toothed leaf edge



All native pondweeds have
parallel leaf veins

Graphic: U of M Extension

Curly-leaf pondweed

➤ Similar species



Clasping-
leaf/Richardson's
pondweed



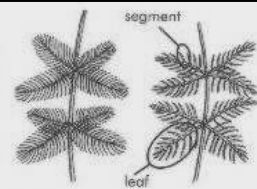
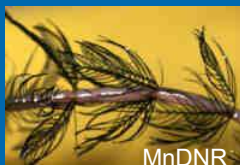
Curly-leaf
pondweed



Flat-stem
pondweed



Eurasian water-milfoil (*Myriophyllum spicatum*)



Leaf of Eurasian water-milfoil (left) and
native Northern water-milfoil (right)
showing leaf and segment

12-21
leaflet
pairs

<12
leaflet
pairs



Out of water, leaves of Eurasian water-
milfoil hang limp against the stem (left);
those of native Northern water-milfoil
are rigid (right)

Graphic: U of M Extension

Eurasian watermilfoil

➤ Similar species



Northern watermilfoil



Coontail



Eurasian watermilfoil



Starry Stonewort (*Nitellopsis obtusa*)



- Macroalga
- **Tiny star-shaped bulbils**
- Irregular branching, whorls of 4 – 6 branchlets
- Looks similar to Chara, but
 - Taller (up to 2 ½ + feet)
 - Longer branchlets
 - Lighter, brighter green
 - No garlicky smell
 - Smooth stems



Starry Stonewort

similar species



Chara 😊



Starry stonewort 😞



Nitella 😊

UWEX has a good Youtube video on Starry stonewort identification

Emergent

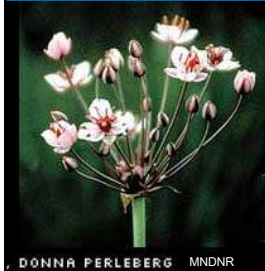
Rooted below water and growing out of the water



Peter Whitcomb [CC BY-SA 2.0 (<http://creativecommons.org/licenses/by-sa/2.0/>)], via Wikimedia Commons

Flowering Rush

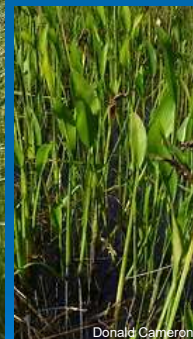
(*Butomus umbellatus*)



- Triangular sword-like leaves, parallel veins
- Whitish-pink flower cluster (June – Aug)
- Submergent- limp, ribbon-like leaves
- Grows in shallow water, mud flats to 10' deep
- ~3 – 6' tall
- Other similar species have some cross veins
- Stems may be curved at base, bulbets

Flowering Rush

Similar species



Flowering rush



Bulrush



Arrowhead



Burreed



Parrot feather

(*Myriophyllum aquaticum*)

Regulated



Fortin Consulting



© 2001 CDFA

- Leaves in whorl of 4 - 6 around stem, ½ - 2" long
- Feather-like, but stiff
- Stems up to 5' long
- Can emerge up to 1'
- Inconspicuous white flowers

Parrot Feather

Similar species



Parrot feather



Northern watermilfoil



Floating-leaved

Rooted or free floating, with floating leaves



Photo: Louise-M. Landry, CalPhotos

European frogbit (*Hydrocharis morsus-ranae*)

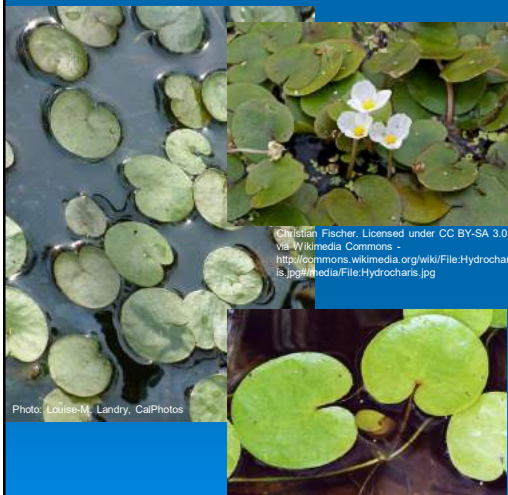


Photo: Louise-M. Landry, CalPhotos

Christian Fischer. Licensed under CC BY-SA 3.0 via Wikimedia Commons - <http://commons.wikimedia.org/wiki/File:Hydrocharis.jpg#/media/File:Hydrocharis.jpg>

Christian Fischer. Licensed under CC BY-SA 3.0 via Wikimedia Commons - <http://commons.wikimedia.org/wiki/File:HydrocharisMorsus-ranae.jpg#/media/File:HydrocharisMorsus-ranae.jpg>

- Leathery, round to heart-shaped leaves
- Like miniature water lily (1-2" wide)
- Smooth-edged
- Spongy, purplish undersides
- Flowers ½" wide, 3 white petals, yellow center

Water chesnut (*Trapa natans*)



Photos: Leslie J. McMahon, University of Connecticut, Bugwood.org



- Rooted floating plant
- Triangular shaped, toothed leaves
- Feather-like submersed leaves (resemble milfoil)
- Inflated petiole (between leaf and stem)
- Small four-petaled white flower, July - frost
- Nut-like fruit, sharp spines

Karelj - Own work. Licensed under CC BY-SA 3.0 via Wikimedia Commons - http://commons.wikimedia.org/wiki/File:Trapa_natans_Prague_2012_1.jpg#/media/File:Trapa_natans_Prague_2012_1.jpg

Water Aloe or Water Soldiers (*Stratiotes aloides*)



- Similar to aloe plant
- Sword shape-serrated leaves, 16" long (sharp)
- Leaves arranged in circle
- Bright green leaves
- White 3-petaled flowers



Velela http://commons.wikimedia.org/wiki/File%3AWater_soldier_plants.JPG

Jörg Hempel [CC BY-SA 3.0 de (<http://creativecommons.org/licenses/by-sa/3.0/de/deed.en>)] via Wikimedia Commons

Yellow floating heart (*Nymphoides peltata*)

Early
Detection
Target



- Up to 3' long
- Floating leaves on stalks from rhizomes
- Heart-shaped leaves
- Wavy edges, purplish underside
- Flowers bright yellow, 5 fringed petals
- Flowers on stalks of 2 - 5

Not likely to survive in MN

Water hyacinth
(*Eichhornia crassipes*)



Water lettuce
(*Pistia stratiotes*)





Water hyacinth (*Eichhornia crassipes*)

Regulated



- Round waxy leaves, up to 6" wide
- Floating, air-filled petioles
- Grow in rosettes
- Showy spike of 8 – 15 light purple 6-petaled flowers
- Dark purple/black feathery roots



Petiole →
Daughter
plant →



All photos: Fortin Consulting

Shoreline

Growing along the edge of a lake, stream or wetland. May be in water during wet periods.



Chinese Amur/Silver Grass

Miscanthus species

- ❑ Popular ornamental; many varieties
- ❑ Looks like pampas grass
- ❑ *M. sacchariflorus* often found along waterways
- ❑ White mid-vein on leaves (sharp)
- ❑ Grows into tall, thick monocultures



Slide courtesy of Carole Gernes, RWMWD

Non-Native *Phragmites australis*

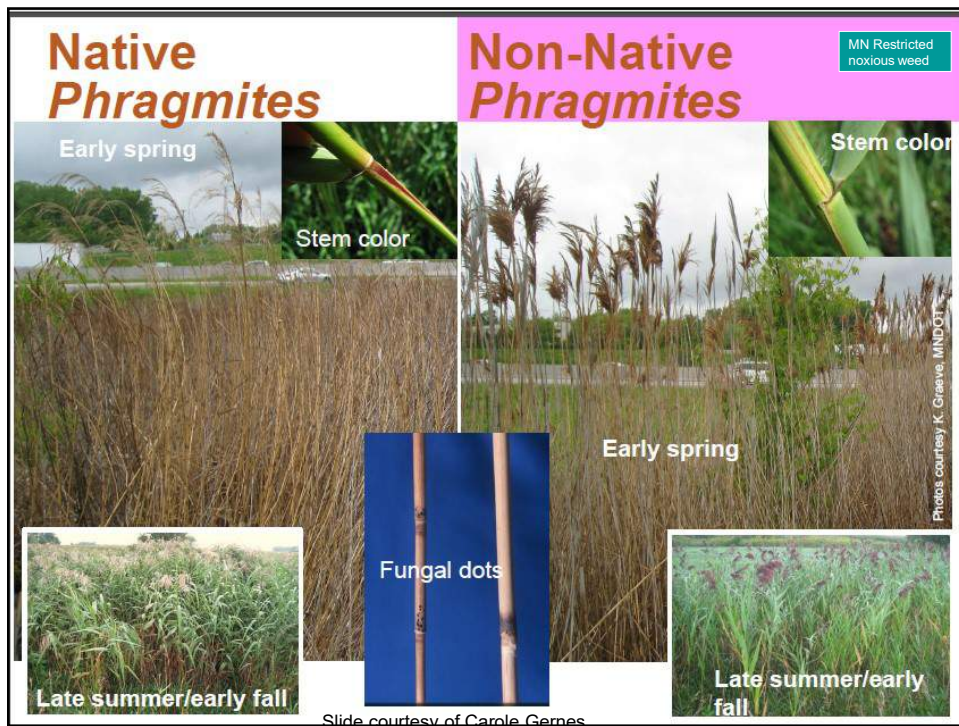
Phragmites australis, ssp. *Australis*, Haplotype M

MN Restricted
noxious weed

- ❑ Widespread in eastern U.S.
- ❑ Blue-green leaves
- ❑ Large, thick seed heads
- ❑ Leaves / seed heads persist through winter
- ❑ No red color on upper stems
- ❑ No circular fungal spots



Slide courtesy of Carole Gernes




Purple Loosestrife

(Lythrum salicaria)



Prohibited

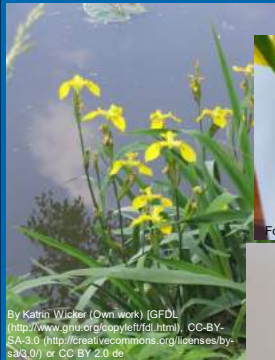
- 3 – 7' tall
- Purple spike Aug – Sept
- Angled stem (square)
- Downy smooth-edged leaves, usually paired and opposite


Yellow iris

(*Iris pseudacorus*)

Regulated



- 3-4 feet tall
- Broad, sword-shaped leaves are stiff and erect with green to greyish-blue coloration.
- Blooms in May and June. Each stem has several white, cream, or yellow flowers.
- Fruit capsules are six-angled and egg-shaped.
- Rhizomes are pink-fleshed.

AIS- Animals

Invertebrates- animals without a backbone



Mystery Snails

Regulated

Chinese Mystery Snail (*Cipangopaludina chinensis*)



Large golf ball sized,
up to 3"
Dark brown

Operculum

Banded Mystery Snail (*Viviparus georgianus*)



Large up to 1.5"
Lighter colored
shell with
Brown bands



Rusty crayfish (*Orconectes rusticus*)

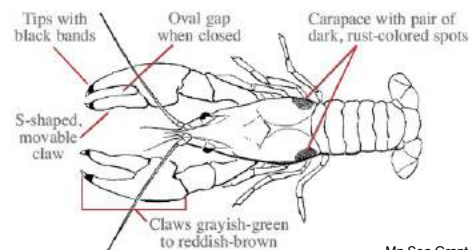
Regulated



- Up to 5" long
- Rusty colored spots on tan/light brown body
- Claws grayish-green, larger and smoother than natives, may have black bands at tips



Jeff Gunderson



Mn Sea Grant

What If I find Something?

- **1. Map it**
 - Note where found (where on the wetland, near what road, GPS coordinates, smart phone tag).
- **2. Take photos or make a collection**
- **3. Collection**
 - Store in sealed plastic bag/container with water or wet paper towel
 - Label with specific location, date, your name
 - Refrigerate the sample
- **4. Report ASAP**
 - **DNR AIS specialist or Eddmaps** <http://www.eddmaps.org/midwest>
 - Dakota County/Hennepin County
 - FCI for identification assistance
- **5. Disposal**
 - If sample not needed, dispose by freezing and then sealing in plastic bag and disposing in trash.

Complete the Aquatic Invasive Species Data Sheet

MN WHEP SURVEY FIELD SHEET: Aquatic Invasive Species Early Detection

During both vegetation and invertebrate surveys, please note any of the following species, if observed in the wetland. Note its location in the wetland. In addition, if observed within the vegetation plot, note its presence and cover class. Take photos of whole plants, close-ups of leaves, stem attachment, and other details. Place object of known size in photo for comparison. If unsure of identification, collect a sample. If you observe an AIS not listed, please record it. Report any AIS found in EDDMaps.

Site Name: _____ Date/Time: _____
 Team Leader/Observer: _____ Team Name: _____
 Local Sponsor: _____ County: Dakota

Present outside plot	Present inside plot	Cover	Common Name (Vegetation)	Scientific Name	Photos	Sample
			Brazilian Waterweed	<i>Egeria densa</i>		
			Brittle Reed	<i>Najas minor</i>		
			Caroline Fenswort	<i>Cabomba caroliniana</i>		
			Common Slad Grass (non-native)	<i>Proserpinaca acaulis</i>		
			Curlyleaf Pondweed	<i>Potamogeton zosterifolius</i>		
			Eurasian Watermilfoil	<i>Myriophyllum spicatum</i>		
			European Frog-bit	<i>Hydrocharis morsus-ranae</i>		
			Flowering Rush	<i>Butorhus umbellatus</i>		
			Hydrilla	<i>Hydrilla verticillata</i>		
			Parrot Feather	<i>Myriophyllum aquaticum</i>		
			Purple Loosestrife	<i>Lythrum salicaria</i>		
			Starry Stonewort	<i>Najas flexilis</i>		
			Water Chestnut	<i>Tropaeolum</i>		
			Water Hyacinth	<i>Eichhornia crassipes</i>		
			Water Lettuce	<i>Pistia stratiotes</i>		
			Yellow Floating Heart	<i>Nymphoides peltata</i>		
			Yellow Iris	<i>Iris pseudacorus</i>		

Present outside plot	Present inside plot	# found	Common Name (Invertebrates)	Scientific Name	Photos	Sample
			Asian Clam	<i>Corbicula fluminea</i>		
			Banded Mystery Snail	<i>Villosa gouldianus</i>		
			Chinese Mystery Snail	<i>Campelodoma chinensis</i>		
			Faucet Snail	<i>Bithynia tentaculata</i>		
			New Zealand Mudsnail	<i>Hydrobia ulvae</i>		
			Orange Mussel	<i>Dreissena bugensis</i>		
			Red Swamp Crayfish	<i>Procambarus clarkii</i>		
			Rusty Crayfish	<i>Orconectes rusticus</i>		
			Spiny Waterflea	<i>Bythotrephes cederstroemi</i>		
			Zebra Mussel	<i>Dreissena polymorpha</i>		

Notes (continue notes on back of form, if necessary):

Photo tips

Close ups to show details

Leaf form
Leaf attachment
No. of leaves
Pairs of leaflets
Different views
Color variations



Fortin Consulting



Size comparison



All photos by Fortin Consulting

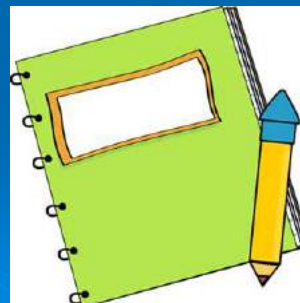


Full plant, growth form



Take Notes

- How tall
- Plant type
- Stem shape
- Branched or not
- Depth where growing or found
- Flowering
- Colors
- Date found
- Where found



It is illegal to transport prohibited AIS

- Exception:
transport the invasive species to the Minnesota DNR, or another destination as the Commissioner may direct, in a sealed container for purposes of identifying the species or reporting the presence of the species



Local DNR AIS Specialist

St. Paul

- Keegan Lund
Keegan.Lund@state.mn.us
651-259-5828
- Kylie Catoor
Kylie.Catoor@state.mn.us
651-259-5729
- April Londo
April.Londo@state.mn.us
651-259-5861

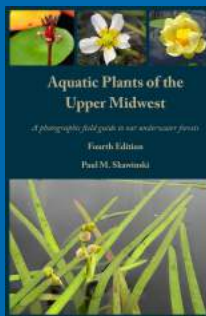
Clean your equipment and boots

Make sure you are not spreading AIS

- Clean
- Drain
- Dry

Resources

Aquatic Plants of the Upper Midwest- 4th edition



<https://www.uwsp.edu/cnr-ap/UWEXLakes/Pages/resources/bookstore/APUM.aspx>

Aquatic Invasive Species Early Detectors, A How-To Guide, Minnehaha Creek Watershed District



https://www.minnehahacreek.org/sites/minnehahacreek.org/files/pdfs/AIS/MCWD%20AIS%20Early%20Detector%20Manual%20%20mcwd%20_web.pdf

Phragmites Identification Guide- MN Aquatic Invasive Species Research Center

https://www.maisrc.umn.edu/sites/maisrc.umn.edu/files/mn_phrag_identification_guide_v6-18.pdf

Phragmites

References/credits

Information

- USDA Natural Resources Conservation Service Plants Profile www.plants.usda.gov
- MNDNR
- Univ. MN Sea Grant
- Early Detection and Distribution Mapping System
- Center for Invasive Species and Ecosystem Health www.invasive.org
- Midwest Invasive Species Information Network
- University of Florida Center for Aquatic and Invasive Species

Images

- Fortin Consulting
- California Department of Food and Agriculture
- Bugwood.org
- University of Florida Center for Aquatic and Invasive Species
- Creative Commons and public domain images

Maps

- EDDMapS. 2015. Early Detection & Distribution Mapping System. The University of Georgia - Center for Invasive Species and Ecosystem Health. <http://www.eddmaps.org/>