

## Aquatic Invasive Species Early Detection



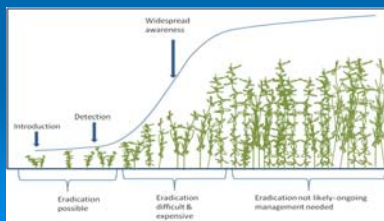
## Why are AIS a problem?



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

## Early Detection/Rapid Response

- Find AIS early
- Better chance of eradication



## 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-petaled flowers



## Carolina fanwort (*Cabomba caroliniana*)

Regulated



- 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

## 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)

## Brazilian waterweed/Hydrilla


### Similar species

Whorls of 4 – 6  
Fine-toothed leaves




Brazilian waterweed

Whorls of 3 leaves



Canada waterweed


Whorls of 3 – 10 toothed leaves





Hydrilla

## Brittle naiad


### (*Najas minor*)








- Slender stems, many branches
- Leaves opposite, linear, toothed, stiff and curled
- Leaves 1-2" long
- Flowers small, single

## Curly-leaf pondweed



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

All native pondweeds have parallel leaf veins

## Eurasian water-milfoil

### (*Myriophyllum spicatum*)









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

## Eurasian watermilfoil

- Similar species









Northern watermilfoil


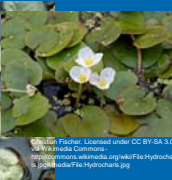
Coontail

Eurasian watermilfoil

## European frogbit

### (*Hydrocharis morsus-ranae*)





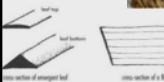
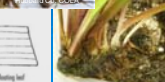
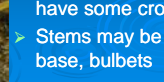






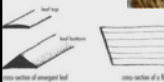
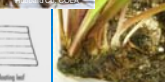
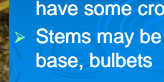






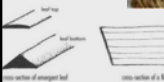
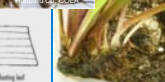
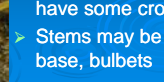






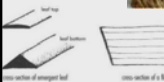
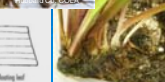
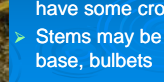






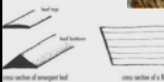
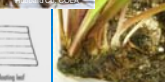
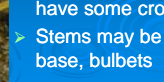






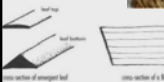
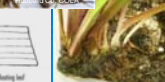
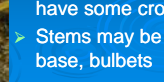






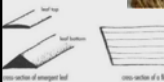
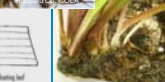
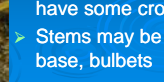






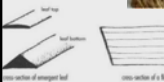
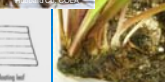
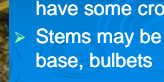






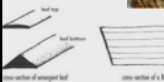
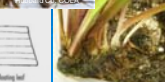
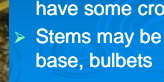






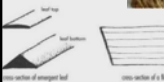
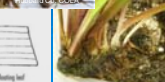
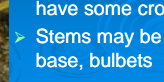






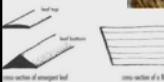
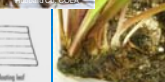
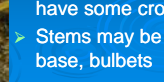






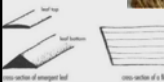
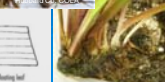
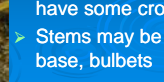






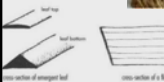
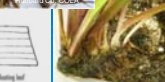
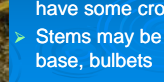






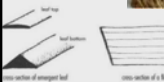
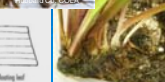
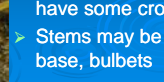






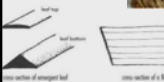
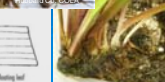
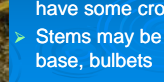






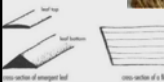
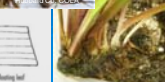
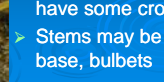






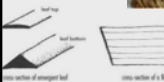
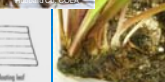
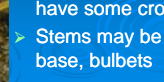






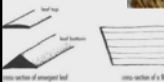
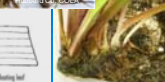
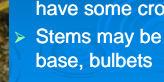






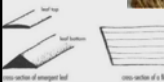
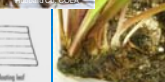
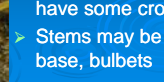






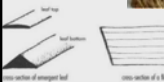
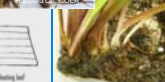
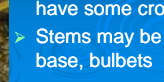






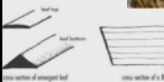
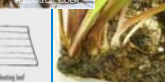
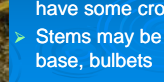






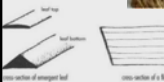
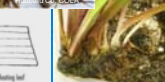
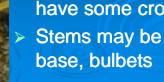






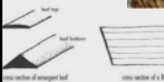
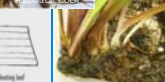
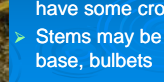






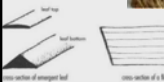
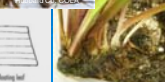
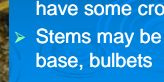






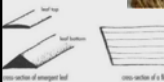
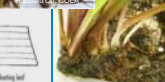
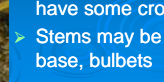






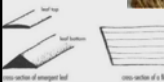
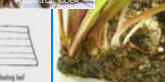
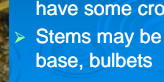






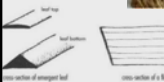
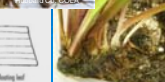
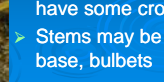






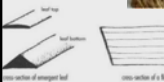
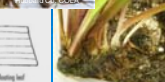
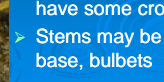






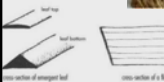
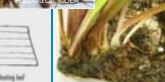
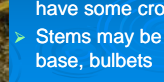






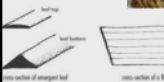
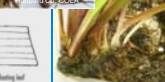
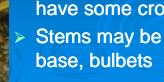






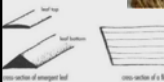
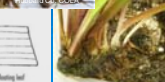
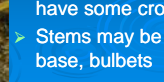






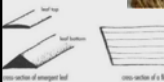
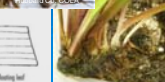
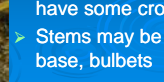






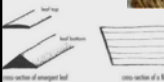
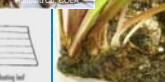
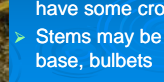






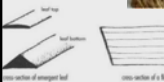
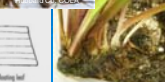
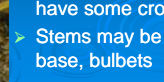






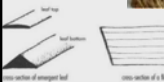
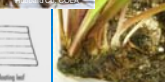
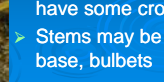






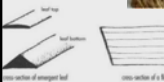
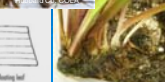
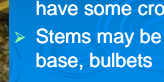






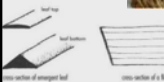
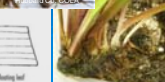
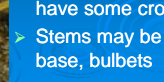






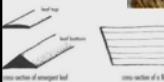
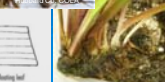
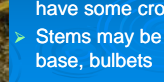






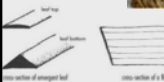
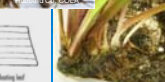
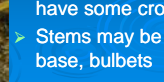






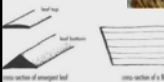
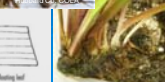
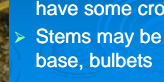






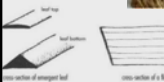
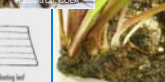
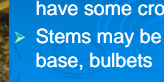






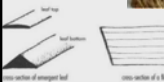
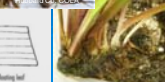
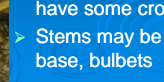






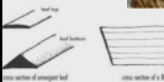
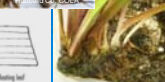
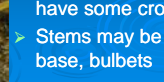
- Leathery, round to heart-shaped leaves
- Like miniature water lily (1-2" wide)
- Smooth-edged
- Spongy, purplish undersides
- Flowers ½" wide, 3 white petals, yellow center



## Flowering Rush

(*Butomus umbellatus*)

Prohibited




































































































































































































































































































































































































## Purple Loosestrife

(*Lythrum salicaria*)

Prohibited

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

## Purple Loosestrife

Prohibited

- Similar species





Purple loosestrife      Fireweed

## Water chesnut

(*Trapa natans*)

Prohibited

- 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


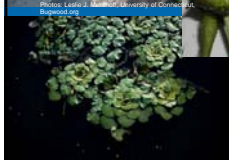





Photo: Leslie J. Munn, University of Connecticut, Bugwood.org

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## 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: Fotis Consulting

## Water lettuce

(*Pistia stratiotes*)

Unlisted Invasive

- Resembles lettuce
- Thick, dull, light green leaves
- Leaves up to 6" long
- Leaves with soft hairs and parallel veins
- Inconspicuous flowers





Fotis Consulting

Mississippi River backwater - WI data      Photo: USFWS 2012

## Starry Stonewort

(*Nitellopsis obtusa*)

Unlisted Invasive

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





Chara      Starry stonewort

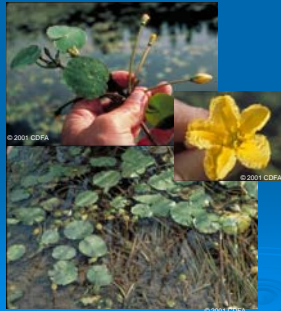
~¼" diam.

MI DEQ      USGS



## Yellow floating heart (*Nymphoides peltata*)

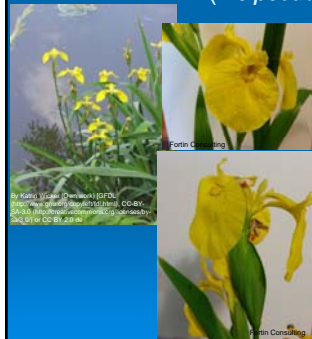
Unlisted  
Invasive



- 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

## 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.

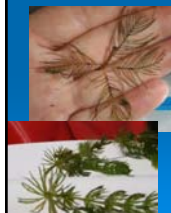
## What If I find Something?

- 1. Map it**
  - Note where found (where on the lake, which access, near which 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**
  - DNR AIS specialist or Eddmaps <http://www.eddmaps.org/>
- 5. Disposal**
  - If sample not needed, dispose by sealing in plastic bag and disposing in trash.

## Photo tips

### Close ups to show details

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



Size comparison



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](mailto:Keegan.Lund@state.mn.us)**  
➤ 651-259-5828
- **Kylie Bloodsworth**  
**[Kylie.Bloodsworth@state.mn.us](mailto:Kylie.Bloodsworth@state.mn.us)**  
➤ 651-259-5729

## Clean your equipment and boots

**Make sure you are not spreading AIS**

- Clean
- Drain
- Dry

## References/credits

### Information

- USDA Natural Resources Conservation Service Plants Profile [www.plants.usda.gov](http://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](http://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/>