

# 12<sup>TH</sup> ANNUAL MICORPS CONFERENCE 2016

## Plants of Michigan's Lakes and Streams



# Your Instructors



- Jo Latimore - MSU
- Erick Elgin – MSUE

**MICHIGAN STATE**  
**UNIVERSITY** | **Extension**

# Outline for Today

- Aquatic Plant Identification – the Basics
- Practice!
- Focus on invasive species and monitoring
- More practice!





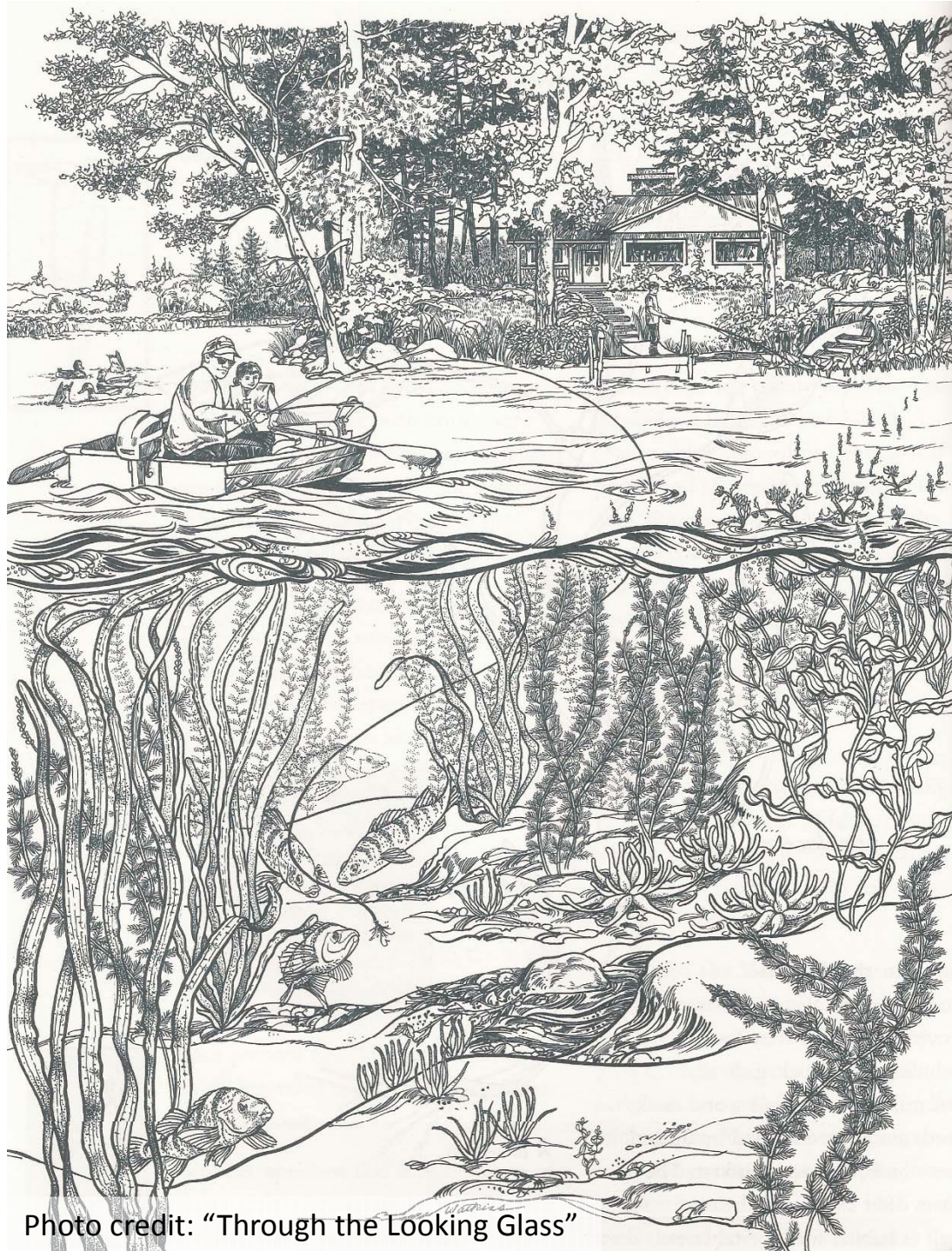


Photo credit: "Through the Looking Glass"

# The Underwater Forest

"In the end, we will only conserve what we love... we will love only what we understand... we will understand only what we are taught"

Chinese Philosopher, Lao-Tsu

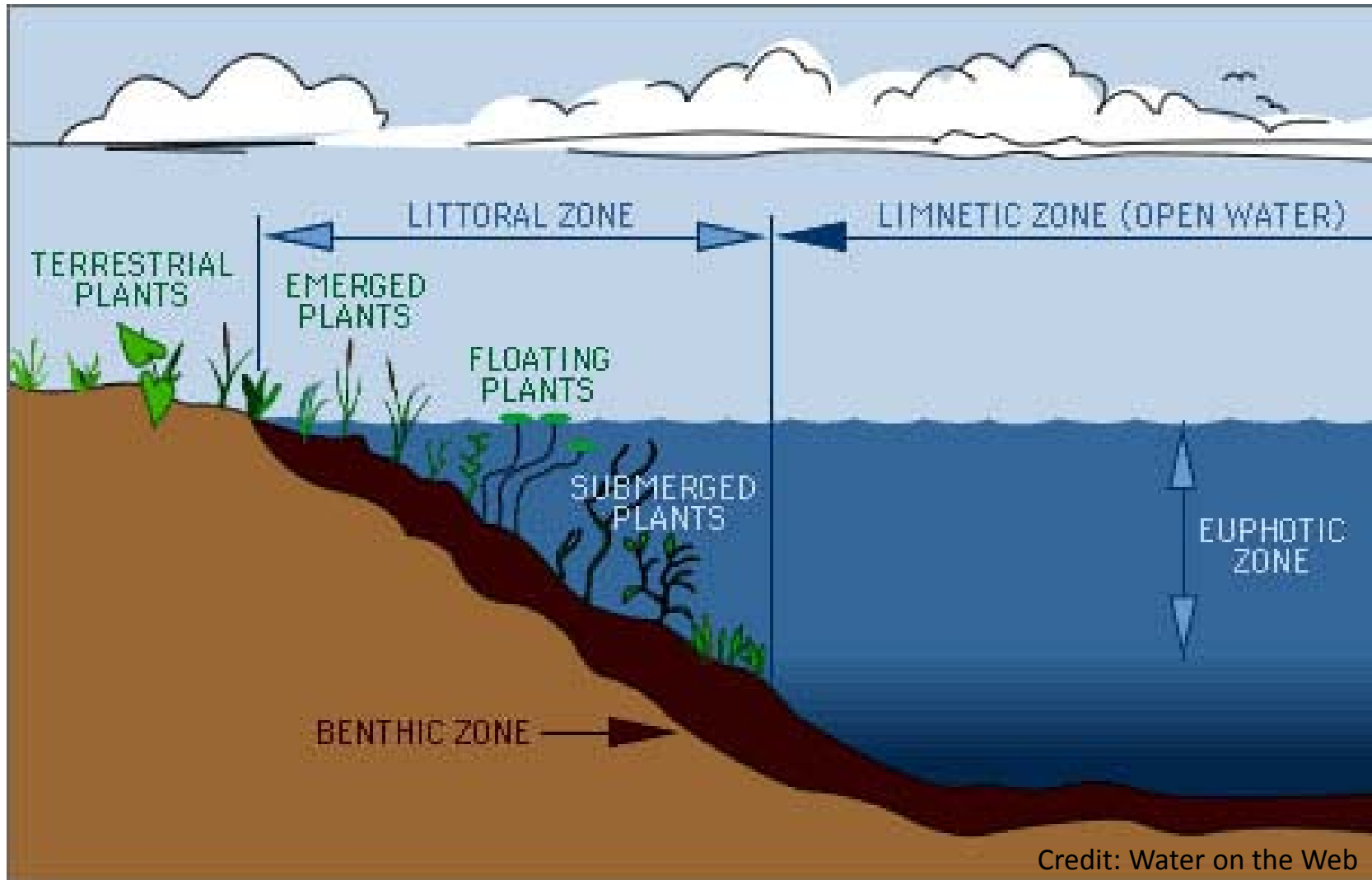


# Aquatic Plant Value

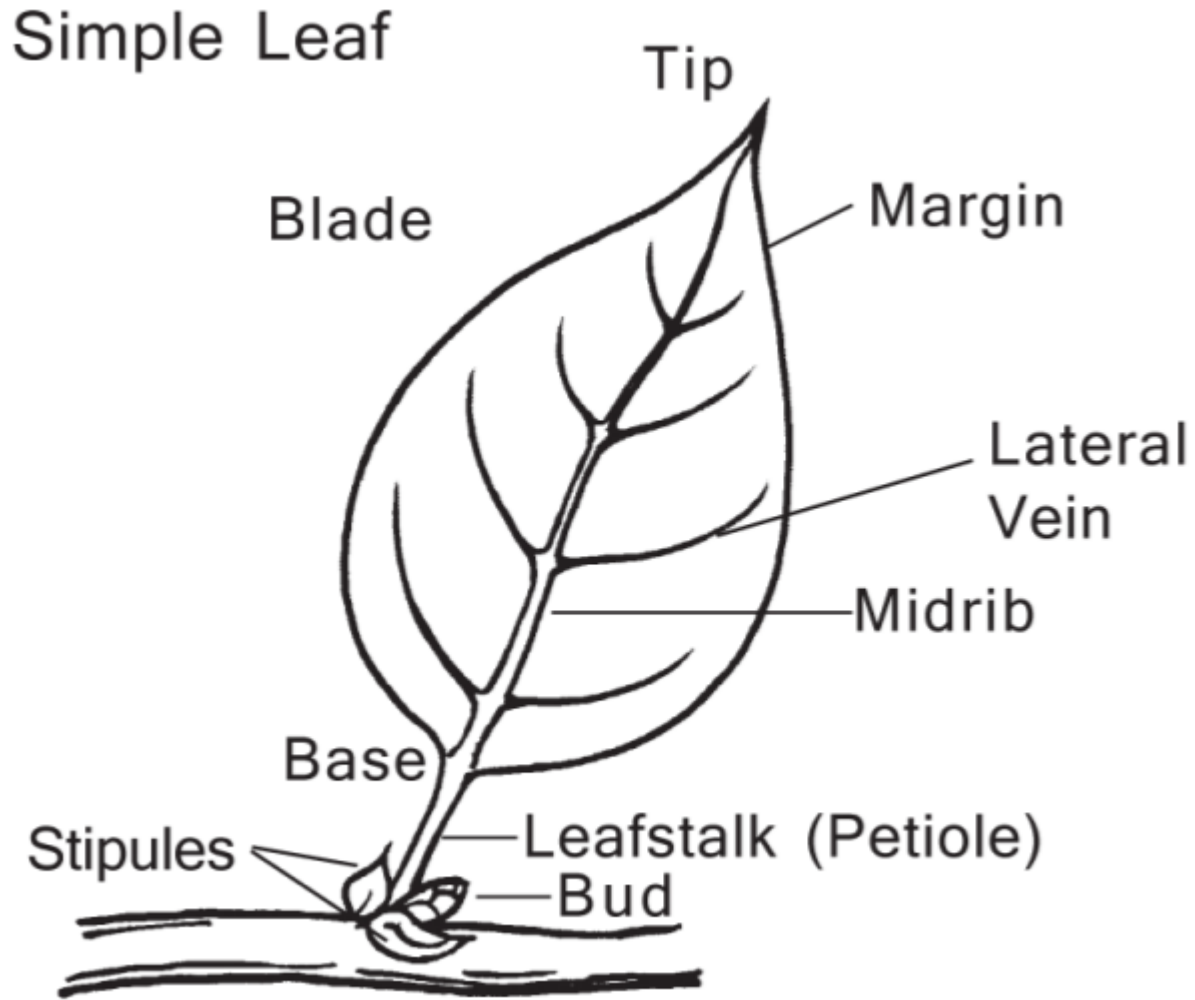
- Shoreline Protection
- Water Quality
- Nutrient Cycling
  - Use Phosphorous
  - Compete with Algae
- Oxygen production
- Habitat for fish & insects
- Beauty



# Plant Communities



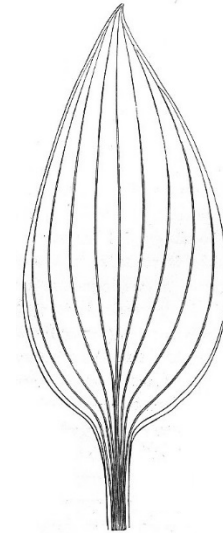
# General Plant Identification



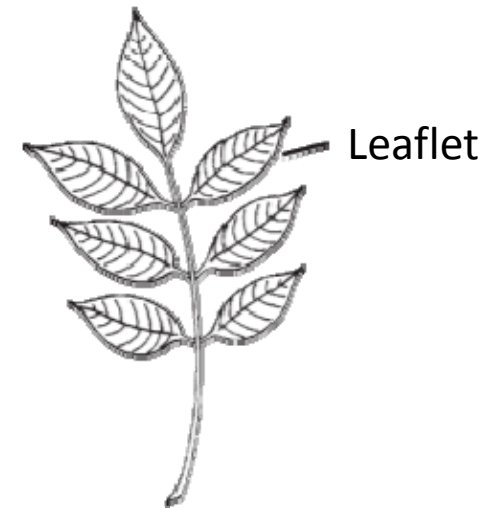


# Aquatic Plant Anatomy – Leaf Type

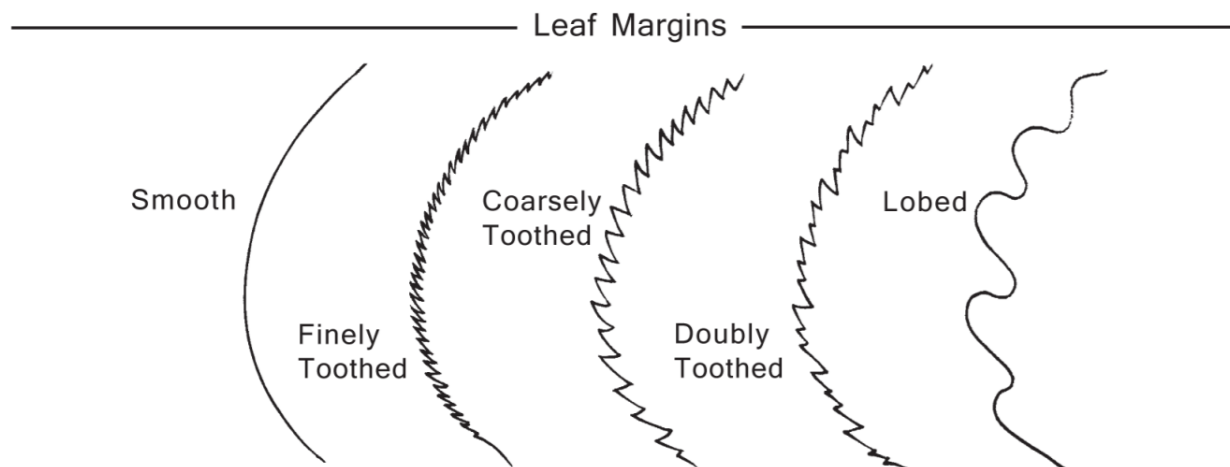
- Simple



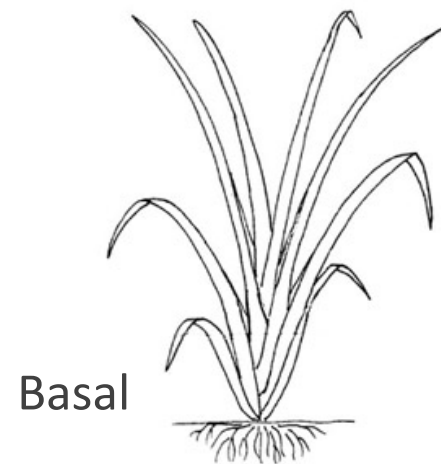
- Finely Divided (compound)



# Aquatic Plant Anatomy – Leaf Margin



# Aquatic Plant Anatomy – Leaf Arrangement





# Aquatic Plant Anatomy – Leaf Attachment

Clasping



Stalked/petiolate



Sessile



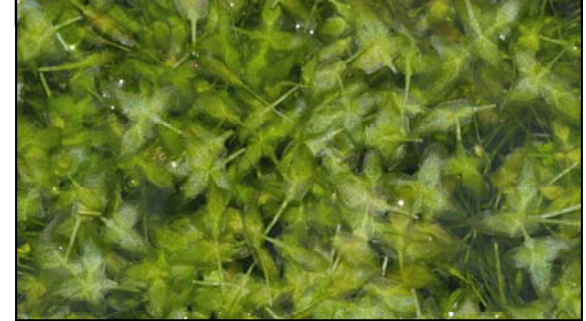
# Quick Aquatic Plant ID

- **Emergent** (e.g. Flowering Rush) 😞

- **Free-floating** (e.g. Star Duckweed)

- **Floating leaf** plants (e.g. Water Shield)

- **Submersed** (e.g. Whitestem Pondweed)



# Submersed Plants

- Plants with **simple** leaves
  - **Opposite, whorled, or alternate** leaf arrangement
- Plants with **simple** leaves
  - **Basal** leaf arrangement
- Plants with **finely divided** leaves





# Simple Leaves - Alternate with Midvein

28 Species in Michigan!

Pondweeds  
(*Potamogeton* spp.)

Broad leaf  
(Whitestem Pondweed)



Narrow leaf  
(Fries Pondweed)



# Pondweed Features



# Simple Leaves- Alternate, without Midvein

Water Stargrass  
(*Zosterella dubia*)





# Simple Leaves- Opposite/Whorled

Horned Pondweed  
(*Zannichellia palustris*)

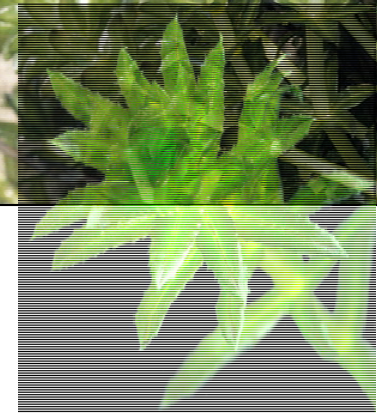


# Simple Leaves- Whorled

Waterweed  
(*Elodea canadensis*)



Invasive look-alike  
(*Hydrilla verticillata*)



Hydrilla  
*Hydrilla verticillata*  
Photo by Mic Rasmey  
© 1995 University of Florida

# Simple Leaves- Whorled

Musk Grasses: Characeae



Starry Stonewort

Chara



P. Skawinski



R. Vanderhoff

“It was grayish-green, coated with lime, and smelled like a skunk.”



# Submersed Plants

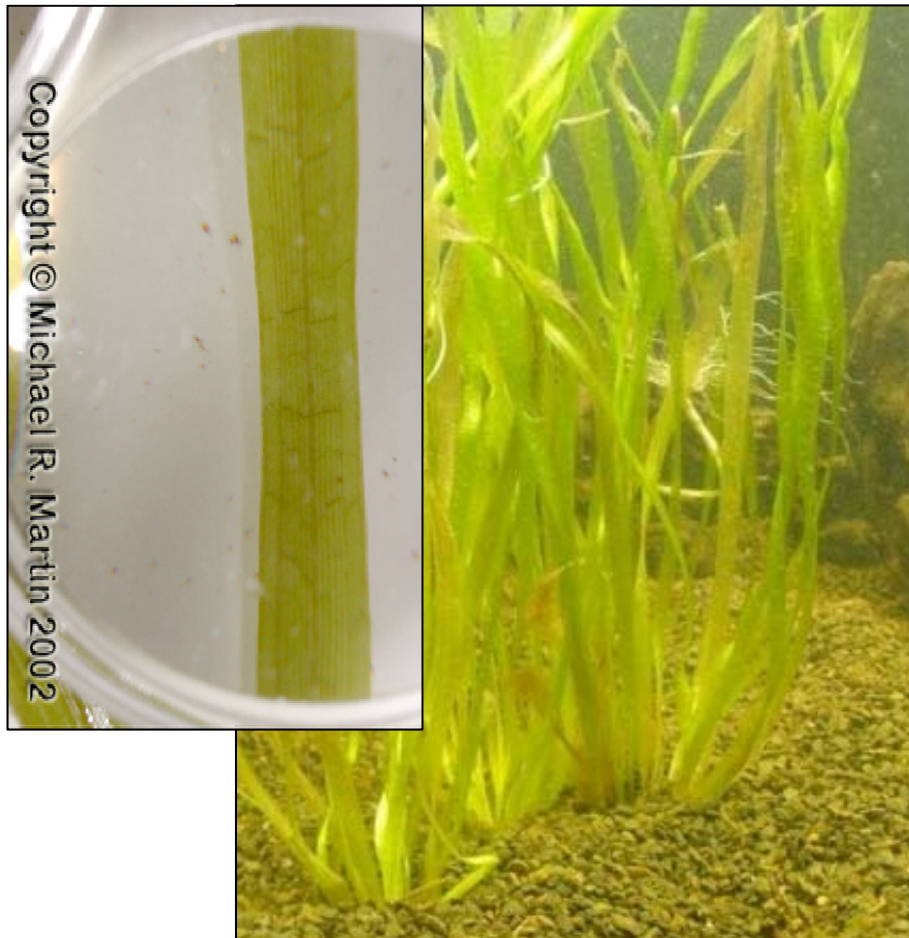
- Plants with **simple** leaves
  - **Opposite, whorled, or alternate** leaf arrangement
- Plants with **simple** leaves
  - **Basal** leaf arrangement
- Plants with **finely divided** leaves



# Simple Leaves- Basal

Water Celery  
(*Vallisneria americana*)

Tight parallel cells along midvein



Quillwort  
(*Isoetes* spp.)



# Submersed Plants

- Plants with **simple** leaves
  - **Opposite, whorled, or alternate** leaf arrangement
- Plants with **simple** leaves
  - **Basal** leaf arrangement
- Plants with **finely divided** leaves





# Finely Divided Leaves



Forked



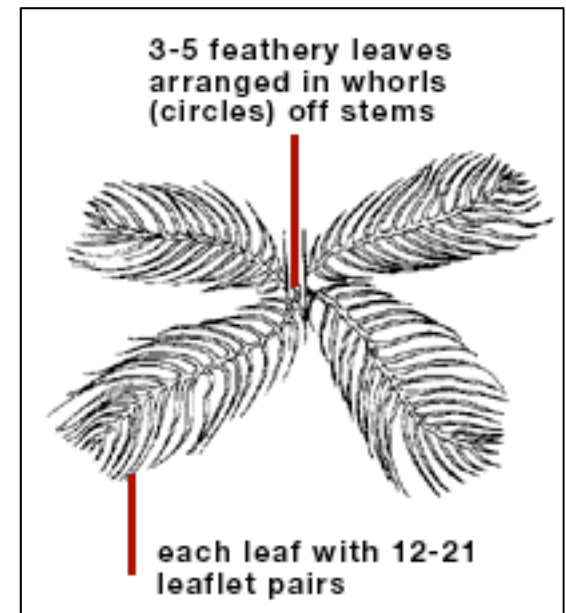
Feather-like  
or  
Christmas Tree like



Branched

# Finely Divided- Feathered Leaves

Water-milfoil  
(*Myriophyllum* spp.)



“The feathery stems of northern watermilfoil rose from the soft bottom like spires on a gothic cathedral”



# Finely Divided- Forked Leaves

Coontail  
(*Ceratophyllum demersum*)





# Finely Divided- Branched, Alternate

Alternate  
Buttercup

(*Ranunculus longirostris*)

Alternate with bladders

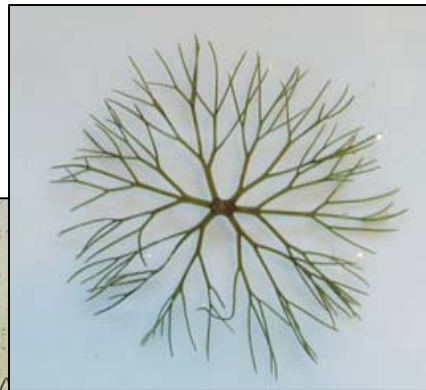
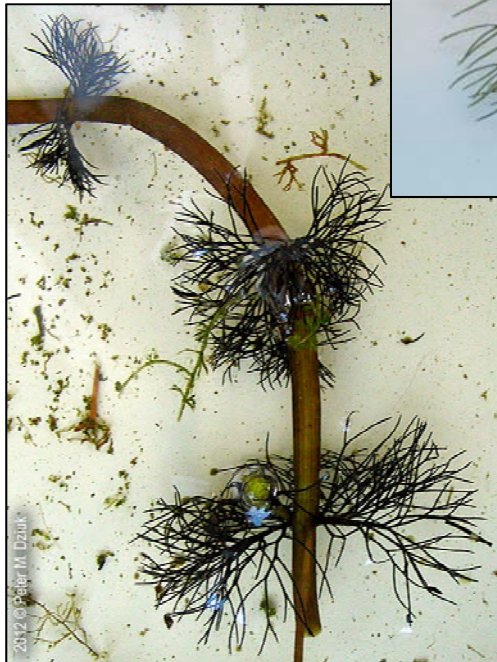
Bladderworts

(*Utricularia* spp.)

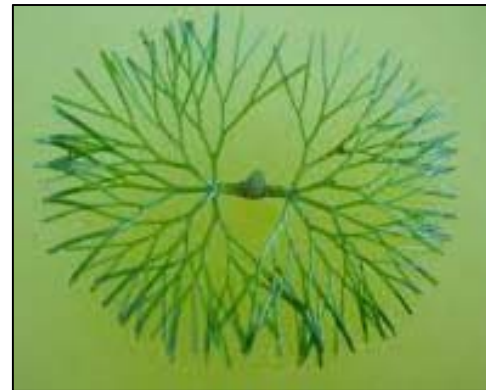


# Finely Divided- Branched, Opposite

Opposite,  
but looks whorled  
Water marigold  
(*Bidens beckii*)



Opposite  
Fanwort  
(*Cabomba caroliniana*)



# Aquatic Plant Identification Tips

## Tips

- Identify fresh specimens
- Collect entire plant (flowers and seeds if present)
- Be aware of plasticity

## Ask the following questions:

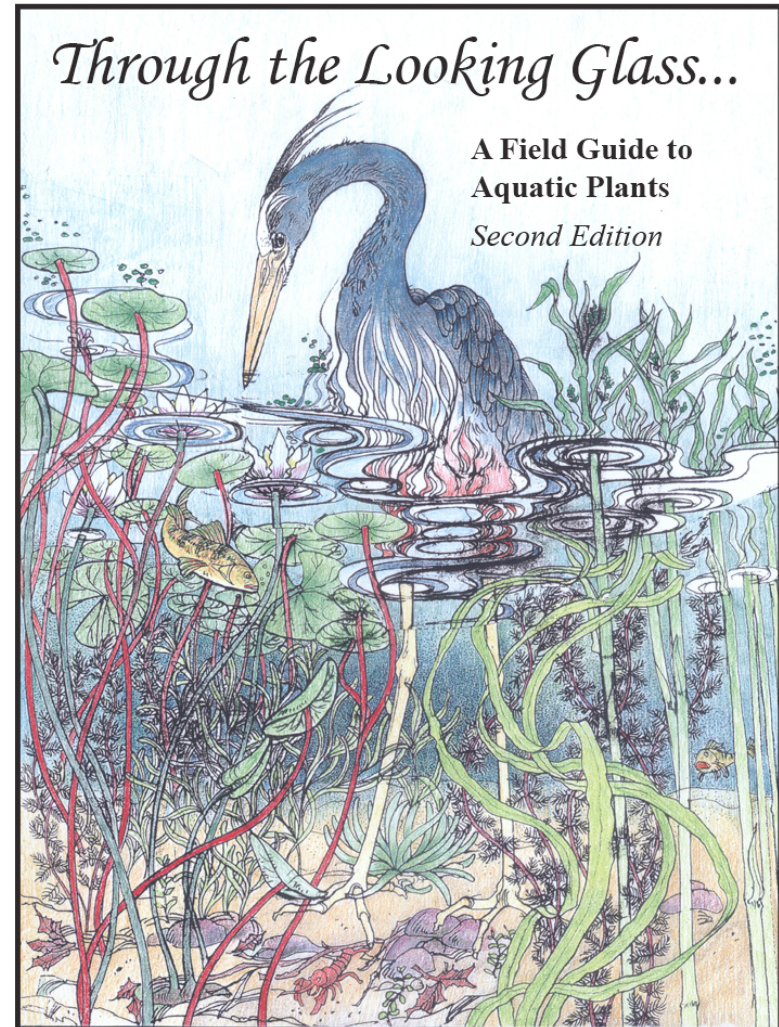
1. What plant community did the specimen come from?
2. What is the leaf arrangement?
3. Simple or finely divided leaf?





# Good Aquatic Plant Books

- Through the Looking Glass
  - Borman et al. 1997 (Univ. of Wisconsin Extension)
- Aquatic and Wetland Plants of Northeastern North America, Vol. I and II
  - Crow and Hellquist 2006
- A Treatise on Limnology, Vol. III
  - Hutchinson 1973
- Aquatic Plants of the Upper Midwest Second Edition
  - Skawinski 2014





# MiCorps Plant Monitoring

- ❑ Exotic Aquatic Plant Watch
- ❑ Aquatic Plant Identification and Mapping





## Purple Loosestrife



# The Buckthorns



Common Buckthorn



Glossy Buckthorn



Narrow Leaved Cattail



Broad Leaved Cattail  
(NATIVE)

Hybrid Cattail



# *Phragmites australis*



**Non-native**



**Native**



# Reed Canary Grass (*Phalaris arundinacea*)



Gary D. Tothhouse



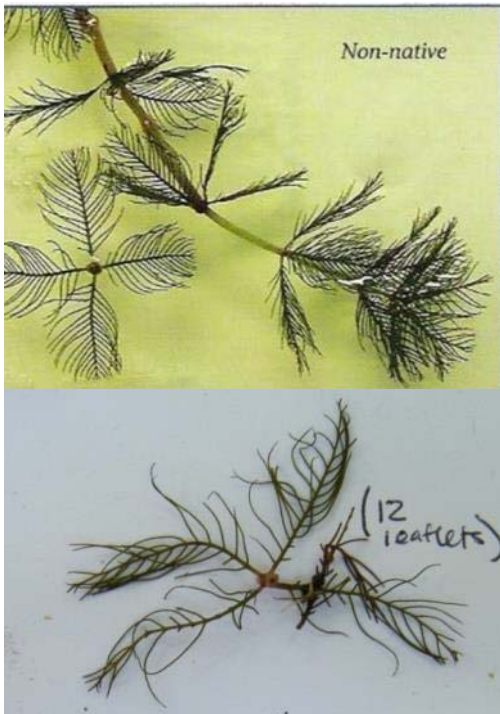
# Japanese Knotweed





# MiCorps Exotic Aquatic Plant Watch

Eurasian milfoil  
(*Myriophyllum  
spicatum*)



Curly-leaf pondweed  
(*Potamogeton  
crispus*)



Starry stonewort  
(*Nitellopsis  
obstusa*)

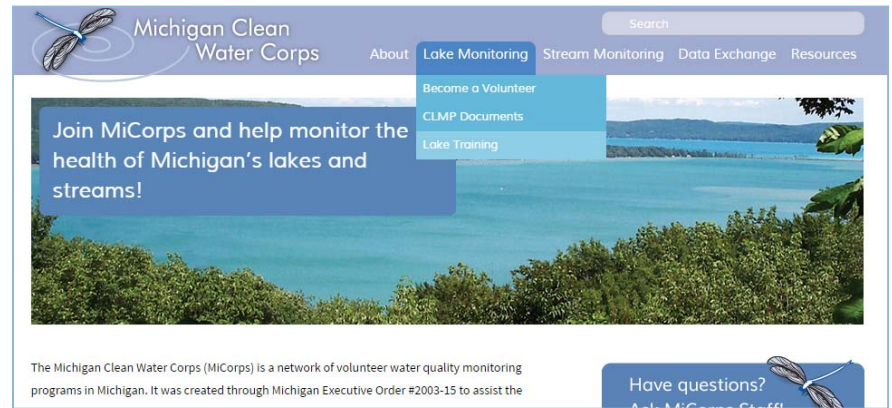


**Hydrilla**  
**(*Hydrilla*  
*verticillata*)**



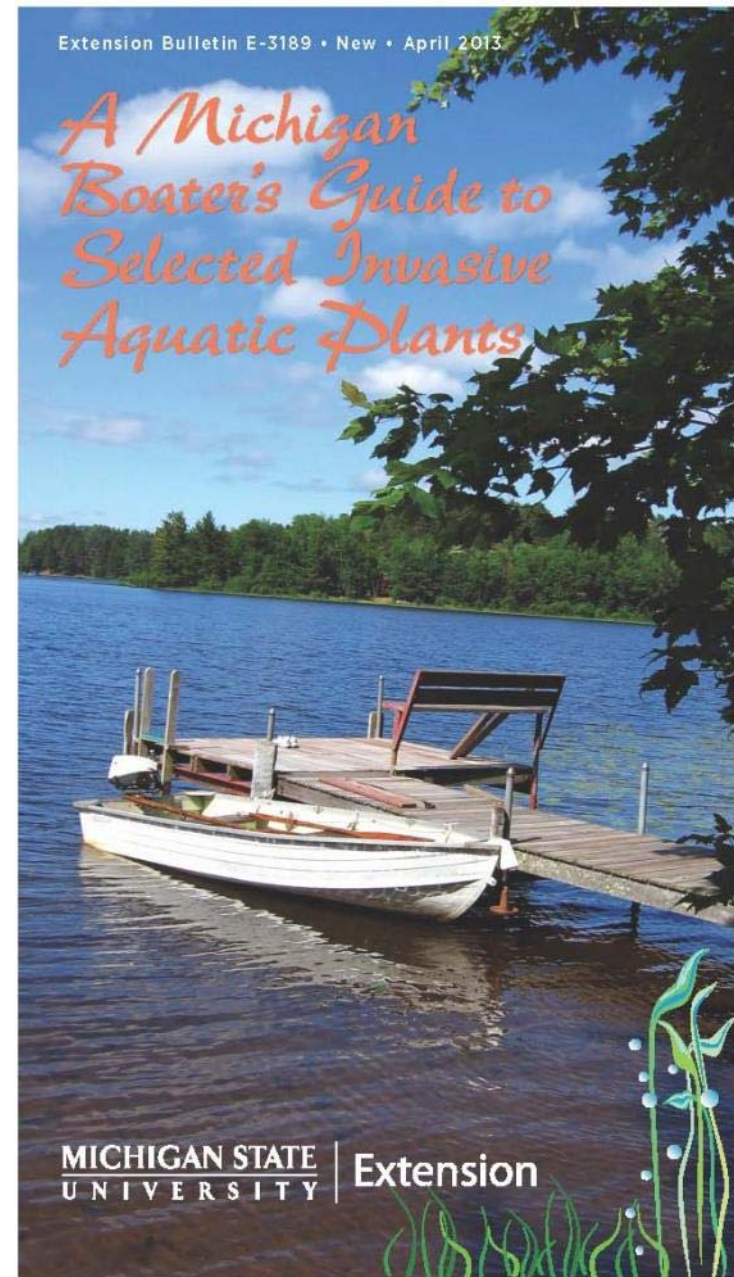
# NEW EAPW Video!

- Program description
- ID tips and tricks
- Review sampling protocol
- On the “Lake Training” page on [www.micorps.net](http://www.micorps.net)



Additional copies available  
for \$10 through the  
MSU Extension Bookstore

**<http://shop.msu.edu>**







Water Quality Series: WQ-55

A Citizen's Guide  
for the Identification, Mapping and  
Management of the Common Rooted  
Aquatic Plants of Michigan Lakes

MICHIGAN STATE  
UNIVERSITY  
EXTENSION

# MSU Extension WQ-55

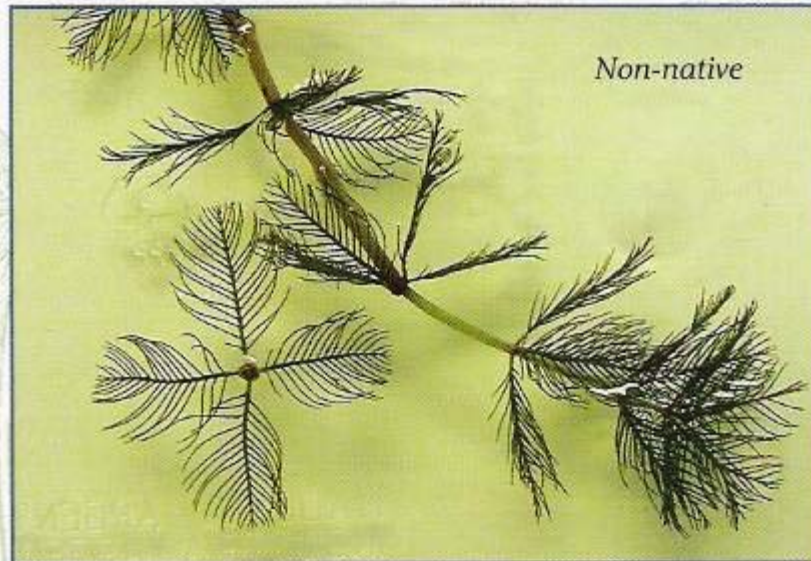
# Eurasian Watermilfoil





## Eurasian Water-Milfoil

(*Myriophyllum spicatum*)



Non-native

*Highly invasive plant, able to form dense mats near the surface that entangle motor boat propellers and interfere with swimming. Spread by watercraft and trailers.*

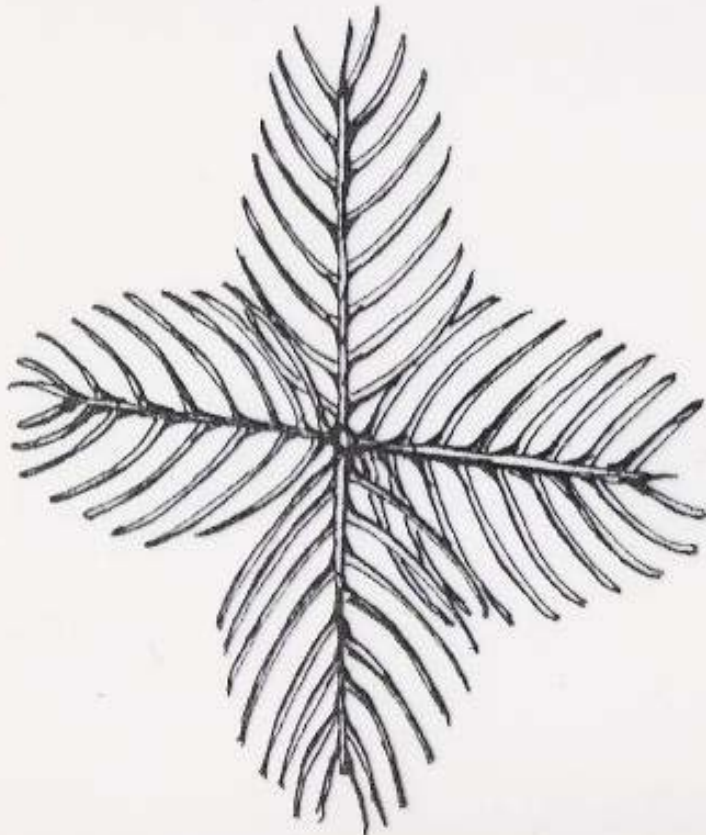
- Delicate feather-like leaves. Leaflets are mostly the same length.
- Leaves are usually limp when out of water.
- Leaves arranged in whorls (circles) of 3 to 5 around stem.
- Usually 12 to 21 leaflet pairs per leaf.
- Long spaghetti-like stems.



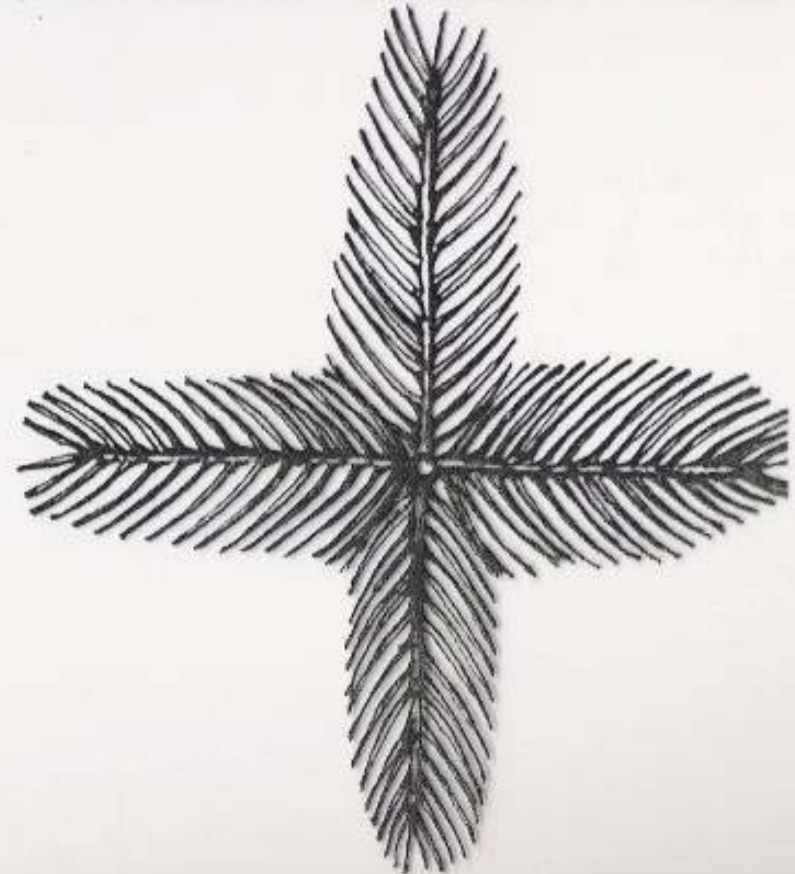
*If you suspect a new infestation, report it to your local DNR service center.*



Native Milfoil



Eurasian Milfoil



What about "Hybrid Milfoils"??

# Curly-leaf Pondweed

Photo by:  
Richard Old  
[www.xidservices.com](http://www.xidservices.com)



Leslie J. Mehrhoff,  
University of Connecticut, [Bugwood.org](http://Bugwood.org)



**Curly-leaf  
Pondweed**

*Potamogeton crispus*

(harmful exotic)

Leaf two to three inches long, 1/4 to 3/8 inches wide and very wavy. Margins of leaf are very finely toothed along the edge.



Photograph from *A Field Guide to Valuable Underwater Aquatic Plants of the Great Lakes* (MSU Extension Bulletin E-1902)



# Starry Stonewort



G. Douglas Pullman, Aquest Corporation

# Starry Stonewort

- Macroalgae
- Long, uneven length branches
- Tiny star-shaped, tan or white bulbils may appear at joints
- Eurasian invasive; found in the St. Lawrence River in 1978
- Forms mats several feet thick, at depths 3-20'
- Crowds out other plants
- Prevents fish spawning





# Starry Stonewort

*Nitellopsis obtusa*

(harmful exotic)

Long, uneven-length branches. Ragged appearance; forms mats. May have tiny, star-shaped “bulbils”.

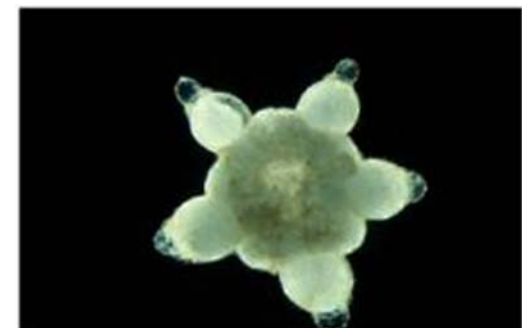
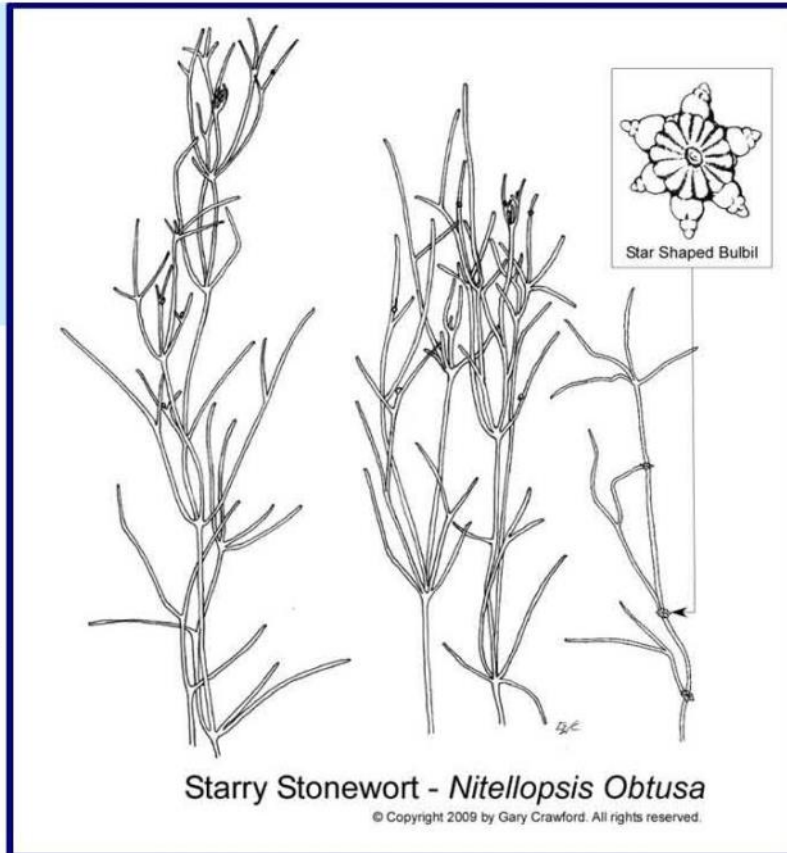
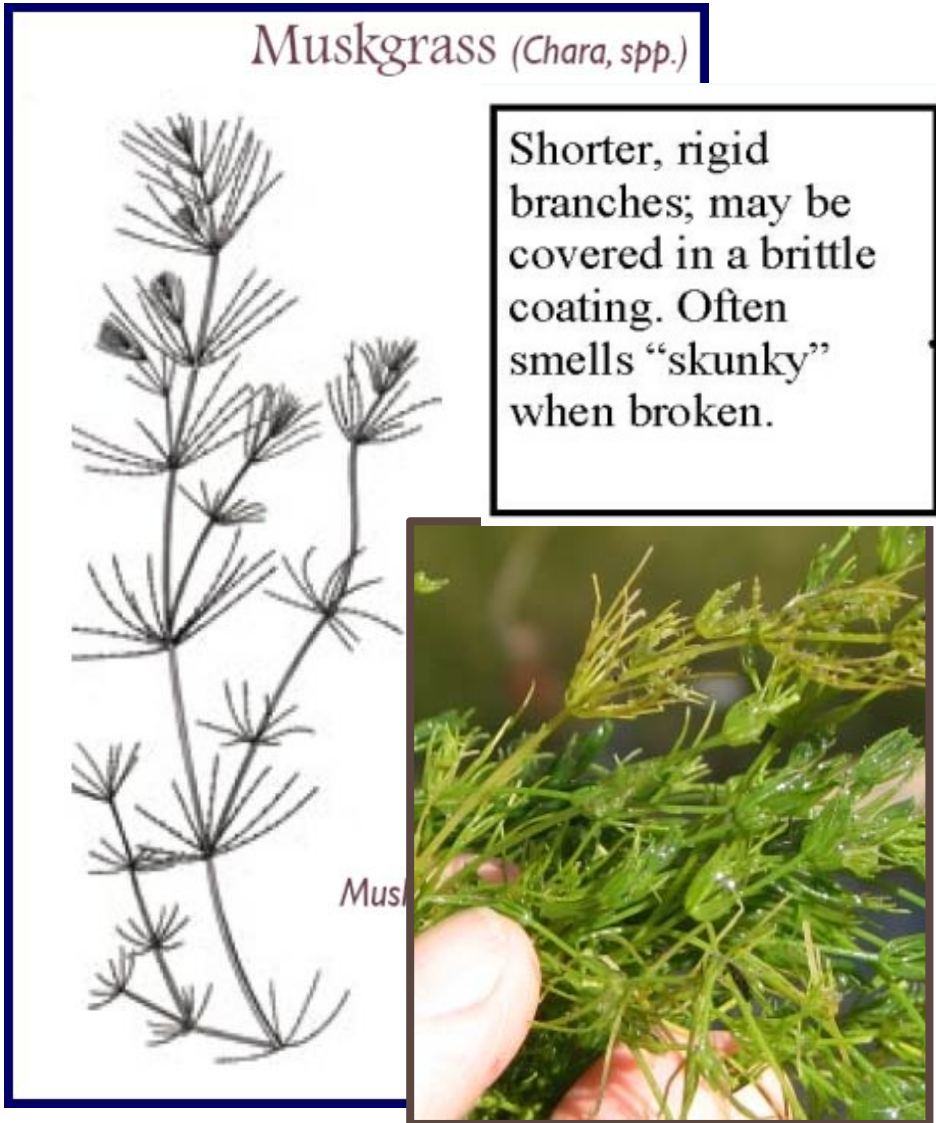


foto Adri van Beem



# Muskgrass (*Chara*) = **NATIVE!**



Drawing: Cayuga Lake Watershed Network. Photo: Texas A&M AgriLife Extension.





# Starry look-a-like = **NATIVE *Nitella***



**Starry Stonewort**



*Nitella furcata* stem section.

J. M. DiTOMASO



*Nitella clavata* stem section.

J. M. DiTOMASO



# Hydrilla



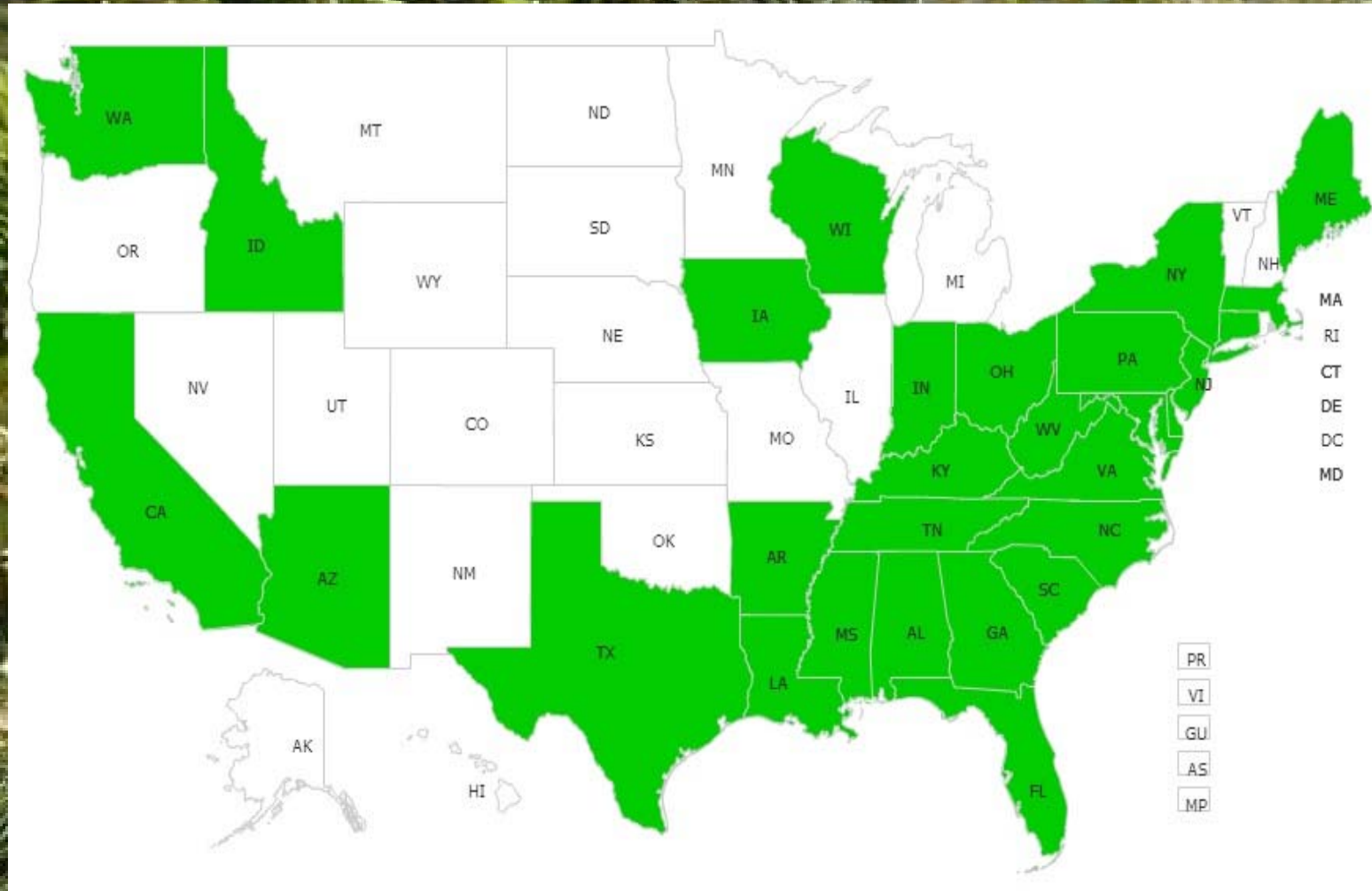
Robert Vidéki, Doro Kft., Bugwood.org

Chris Evans, River to River CWMA, Bugwood.org



# Hydrilla

**High Threat  
Report to DNR ASAP!**



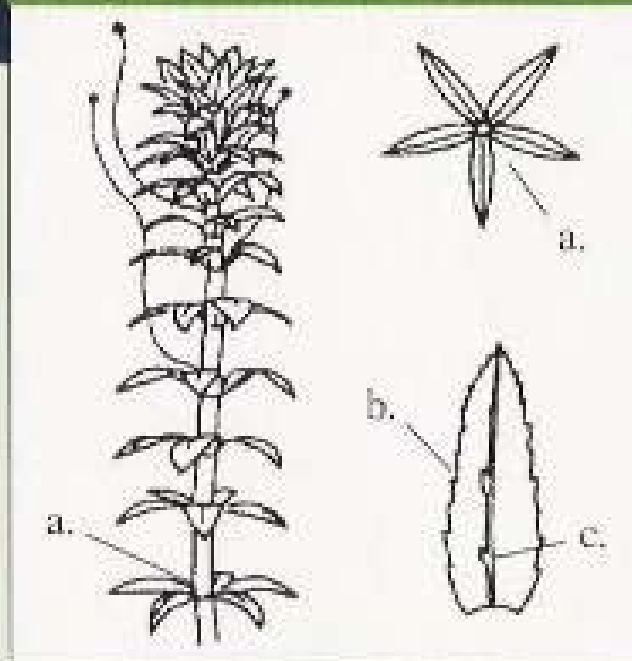
## Hydrilla or Elodea? Read the Leaves to Tell the Difference



David Webb 7/01

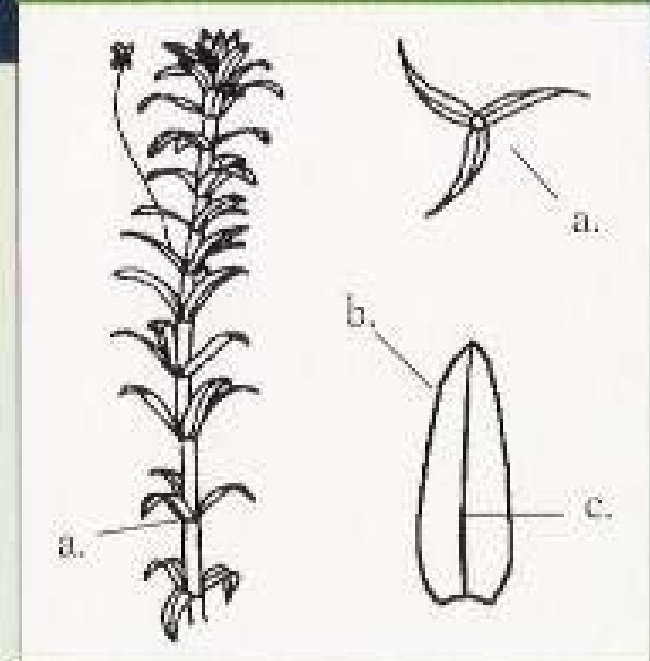
### Hydrilla

#### Hydrilla (Exotic)



- a. 4 or 5 leaves at each node
- b. Leaves have visible teeth
- c. Leaf vein has small spines

#### Elodea (Native)



- a. Only 3 leaves at each node
- b. Leaf edges appear smooth
- c. Leaf vein is smooth underneath

Hydrilla (exotic)

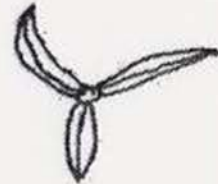
Elodea (native)



**Four or more leaves at each node.**

**Three leaves at each node.**

**Leaves margins clearly toothed and spines on mid vein.**



**Leaves margins not clearly toothed and no spines on mid vein.**











# Michigan's Aquatic Invasive Plant Watch List

Aquatic invasive species on the watch list have been identified as being an immediate and significant threat to Michigan's natural resources. These species either have never been confirmed in the wild in Michigan or have a limited known distribution. Early detection and timely reporting are crucial for preventing establishment and limiting impacts. For more information on these plants, visit: [www.misin.msu.edu](http://www.misin.msu.edu)

**Be on the lookout for these invasive species!**

|   |  |   |   |   |
|---|--|---|---|---|
| <p><b>Yellow Floating Heart</b><br/><i>Nymphoides peltata</i></p>  | <p><b>Water-chestnut</b><br/><i>Trapa natans</i></p>    | <p><b>Parrot Feather Water-milfoil</b><br/><i>Myriophyllum aquaticum</i></p>  <p><a href="http://www.invasive.org">www.invasive.org</a></p> | <p><b>Water Soldier</b><br/><i>Stratiotes aloides</i></p>  <p>Leif Willey, UFL</p>   | <p><b>Hydrilla</b><br/><i>Hydrilla verticillata</i></p>  <p><a href="http://www.invasive.org">www.invasive.org</a></p> |
| <p><b>Brazilian Water-weed</b><br/><i>Egeria densa</i></p>        | <p><b>European Frog-bit</b><br/><i>Hydrocharis morsus-ranae</i></p>  <p><a href="http://www.dnr.wi.gov">www.dnr.wi.gov</a></p> | <p><b>Water Lettuce</b><br/><i>Pistia stratiotes</i></p>  <p><a href="http://www.invasive.org">www.invasive.org</a></p>                    | <p><b>Water Hyacinth</b><br/><i>Eichhornia crassipes</i></p>  <p><a href="http://www.invasive.org">www.invasive.org</a></p> | <p><b>European Water-clover</b><br/><i>Marsilea quadrifolia</i></p>   |

These species are currently allowable for sale and possession. Please contact the DNR if these plants are observed outside of cultivation.

**If you have seen any of these aquatic invaders, note their location and contact:**

Michigan DNR Wildlife Division  
Phone: 517-243-4077  
[www.mi.gov/invasivespecies](http://www.mi.gov/invasivespecies)



Questions about other aquatic invasive plants? Contact the DEQ Aquatic Nuisance Control Program at 517-284-5593, [www.mi.gov/anc](http://www.mi.gov/anc)



# Starry Stonewort



G. Douglas Pullman, Aquest Corporation

# Starry Stonewort

- Macroalgae
- Long, uneven length branches
- Tiny star-shaped, tan or white bulbils may appear at joints
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- Forms mats several feet thick, at depths 3-20'
- Crowds out other plants
- Prevents fish spawning





# Parrot Feather Milfoil



Photo by:  
Richard Old  
[www.xidservices.com](http://www.xidservices.com)





# Parrot Feather Milfoil

- Grows partially or fully submerged
- Height: Up to 1' above water's surface
- Leaves:
  - 2" long with many divisions
  - Emergent leaves are darker, longer
  
- Aquarium plant
- Shades out beneficial algae
- Choice habitat for mosquito larvae
- Hinders recreation



Matt Preisser



# Fanwort (*Cabomba*)



Graves Lovell, Alabama DCNR, Bugwood.org



Troy Evans, Eastern Kentucky University, Bugwood.org

# Fanwort (*Cabomba*)

- Submerged plant
- Leaves:
  - Branched, fan-shaped
  - Opposite pairs
- Native to North America, north to s. Michigan
- Thick beds hinder recreation
- Challenging to control
- Reproduces rapidly when cut



Paige Filice



# Water Lettuce



Robert Burns

Karen Brown, University of Florida, Bugwood.org

# Water Lettuce

- Floating plant
- Leaves:
  - Thick, dull green
  - Hairy with ridges
  - Approx. 6" long
- Popular ornamental pond plant
- Forms dense floating mats
- Clogs waterways
- Crowds out native species



Paige Filice



# Water Hyacinth



Willey Durden,  
USDA Agricultural Research Service, Bugwood.org

# Water Hyacinth

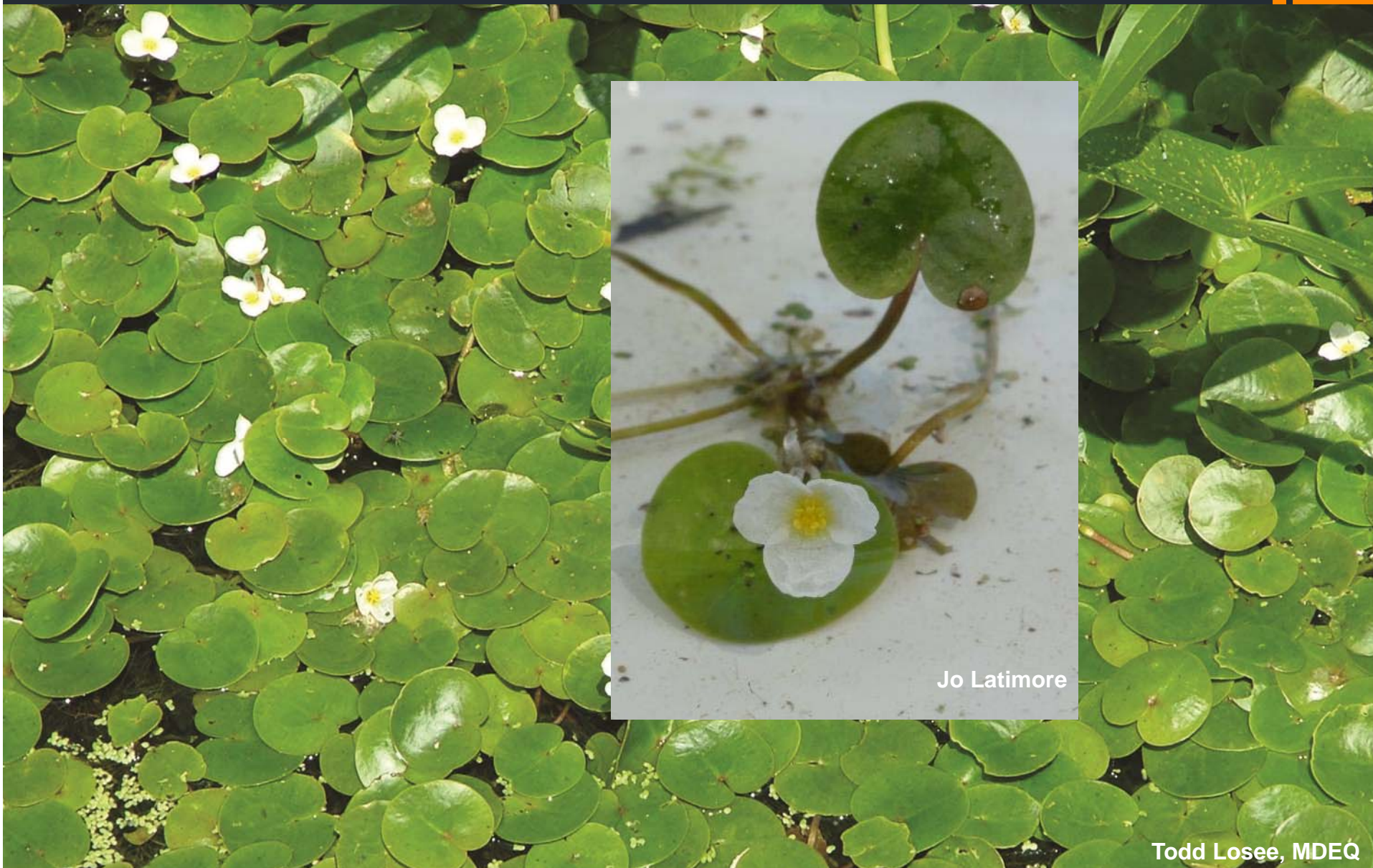
- Height: Up to 20"
- Leaves:
  - Dark green, thick, cup-shaped, waxy
- Stem:
  - Spongy, inflated
- Flowers:
  - Showy, lavender blue
  - Flower spike up to 12" tall
- South American native
- Popular ornamental in landscape ponds
- Creates thick mats on water surface
- Can double in size in 6-18 days
- Impedes recreation
- Crowds out native species



Paige Filice



# European Frog-bit



Jo Latimore

Todd Losee, MDEQ

# European Frog-bit

- Resembles a miniature water lily
- Floats on water
- Leaves:
  - Kidney shaped
  - Spongy beneath
- Flowers:
  - 3 white petals
  - Yellow center
  - Blooms midsummer.
- Dense mats prevent light penetration
- Hinder movement of fish, waterfowl, and boats
- Crowds out native plants



Jo Latimore



# New Invasive Species Campaign in Michigan

- RIPPLE (Reduce Invasive Pet and PLant Escapes)
- Educating retailers about proper pet and plant containment options
- Encourage your local retailers to participate in the program and to display educational materials!
- To learn at [bit.ly/miripple](http://bit.ly/miripple) or [facebook.com/miripple](https://facebook.com/miripple)



# Prevent Escapes from Water Gardens

- Non-native plants are commonly sold in the water garden trade
- Inspect and rinse aquatic plants- they can contain seeds, plant fragments and snails
- Build water gardens away waterways
- Seal plants for disposal in a plastic bag
- Give or trade with another hobbyists or environmental learning centers





# Contain Your Pets and Plants

- **Never release unwanted pets or plants into the environment**
- Release can:
  - Spread disease
  - Create Michigan's next most wanted invasive species!



# Brazilian Waterweed (*Egeria*)



Richard Old, XID Servicex, Inc.

Leslie J. Mehrhoff, University of Connecticut, Bugwood.org





# Brazilian Waterweed

- Stems grow to water surface then branch to form mats
- Leaves:
  - Up to 1" long
  - Whorls of 3-8
  - Tiny teeth
- Flowers:
  - Large, showy, white
  - On water's surface
- Don't confuse with native American waterweed (*Elodea*)
- South American
- Aquarium plant
- Dense beds interfere with recreation
- Crowds out native species
- Restricts water movement

# Hydrilla



Robert Vidéki, Doronicum Kft., Bugwood.org

Chris Evans, River to River CWMA, Bugwood.org



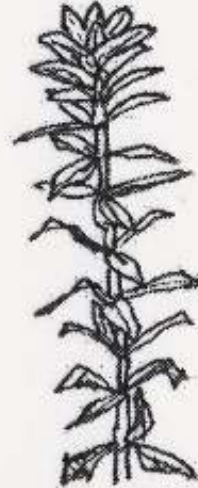


Hydrilla infestation  
on Rodman Reservoir  
Photo by W.T. Haller

2003 Center for Aquatic and Invasive Plants

Hydrilla (exotic)

Elodea (native)



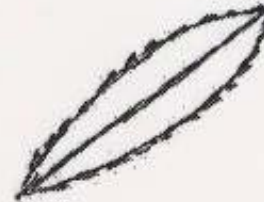
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Three leaves at each  
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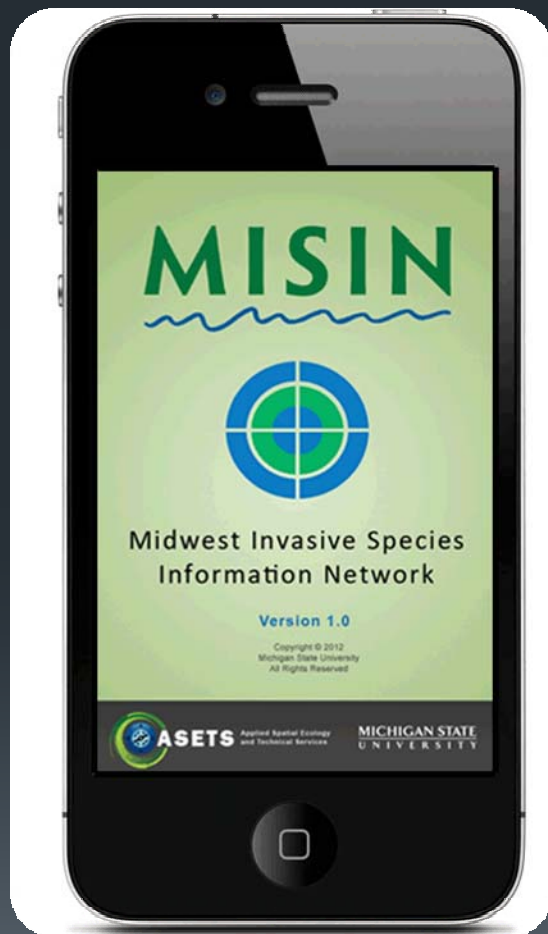
Leaves margins  
clearly toothed and  
spines on mid vein.

Leaves margins not  
clearly toothed and  
no spines on mid  
vein.





# Learn and Report



### Most Wanted Aquatic Invasive Plants

**Be on the lookout for these invasive species!**

Michigan Natural Features Inventory and the Michigan Department of Natural Resources are collaborating on the development of an Early Detection Rapid Response program. The program seeks to locate and eradicate occurrences of the following priority aquatic invaders.

|   |   |   |   |
|---|---|---|---|
| <b>Flowering Rush</b><br><i>Butomus umbellatus</i><br><br><a href="http://www.kingcounty.gov">www.kingcounty.gov</a> | <b>Starry Stonewort</b><br><i>Najasopsis obtusa</i><br><br><a href="http://www.aquawood.com">www.aquawood.com</a>  | <b>Parrot Feather Water-milfoil</b><br><i>Myriophyllum aquaticum</i><br><br><a href="http://www.invasive.org">www.invasive.org</a> | <b>Fanwort</b><br><i>Cabomba caroliniana</i><br><br>Paige Filice, MSU  |
| <b>Water Lettuce</b><br><i>Pistia stratiotes</i><br><br><a href="http://www.invasive.org">www.invasive.org</a>       | <b>Water Hyacinth</b><br><i>Eichhornia crassipes</i><br><br><a href="http://www.invasive.org">www.invasive.org</a> | <b>European Frog-bit</b><br><i>Hydrocharis morsus-ranae</i><br><br><a href="http://www.dnr.nj.gov">www.dnr.nj.gov</a>              | <b>Brazilian water-weed</b><br><i>Egeria densa</i><br><br><a href="http://www.grayshuber.wa">www.grayshuber.wa</a> |

**If you have seen any of these aquatic invasives, note their location and extent and contact:**  
Matt Ankeny  
Early Detection and Rapid Response Coordinator  
Michigan Department of Natural Resources  
Phone: (517) 641-4903 ext. 260, Email: [ankneym2@michigan.gov](mailto:ankneym2@michigan.gov)

