

1

# Contact Information

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2

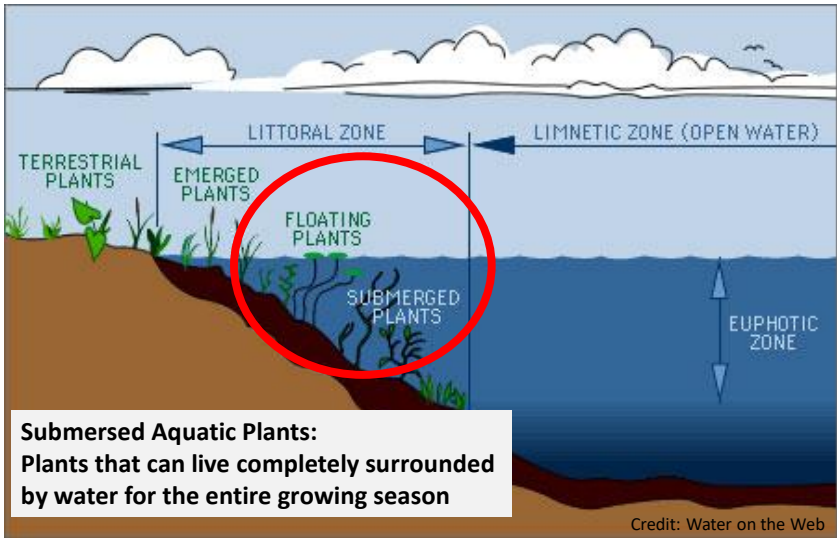
# Outline for Today

- 9:00 – 10:00
  - Aquatic Plant Identification: the basics
- 10:00 – 10:30
  - Practice!
- 10:30 – 11:00
  - Break
- 11:00 – 11:30
  - Invasive species & CLMP overview
- 11:30 – Noon
  - More practice & plant pressing



3

## Plant Identification - Plant Communities



4

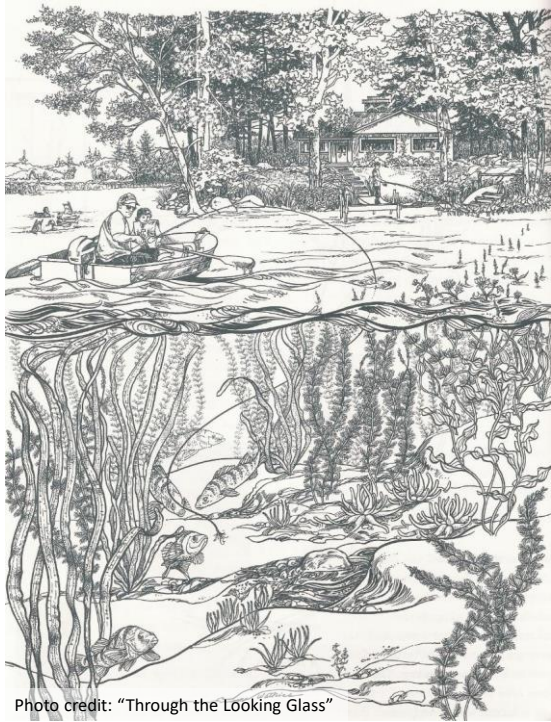


Photo credit: "Through the Looking Glass"

# An Underwater Forest

## Michigan trivia

- 28 pondweed species
- 10 submersed carnivorous species
- 8 milfoil species

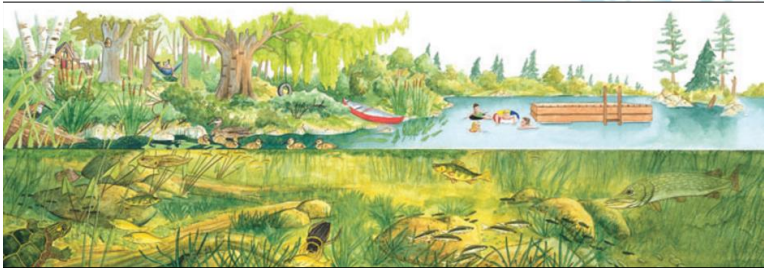
# IMPORTANCE OF AQUATIC PLANTS

- Shoreline & Sediment Protection



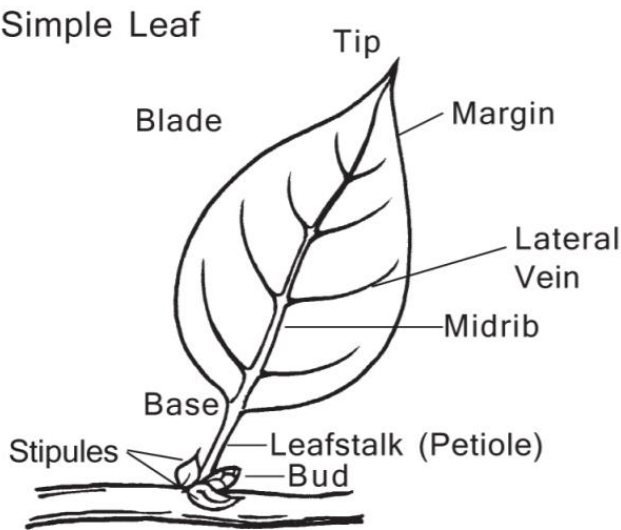
# LAKE STEWARDSHIP

1. Protect native plants
- Reduce disturbance & removal
  - Avoid seawalls
2. Enjoy them!
- Snorkeling
  - Fishing
  - Etc...



7

# General Plant Identification



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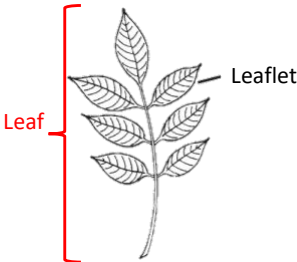
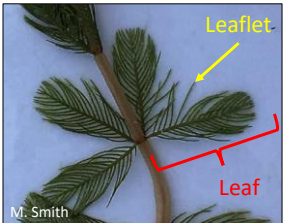
8

AQUATIC PLANT ANATOMY –  
LEAF TYPE

• Simple



• Finely Divided (compound)



University of Minnesota Extension

9

Finely Divided Leaves



Forked



Feather-like  
or  
Christmas Tree like

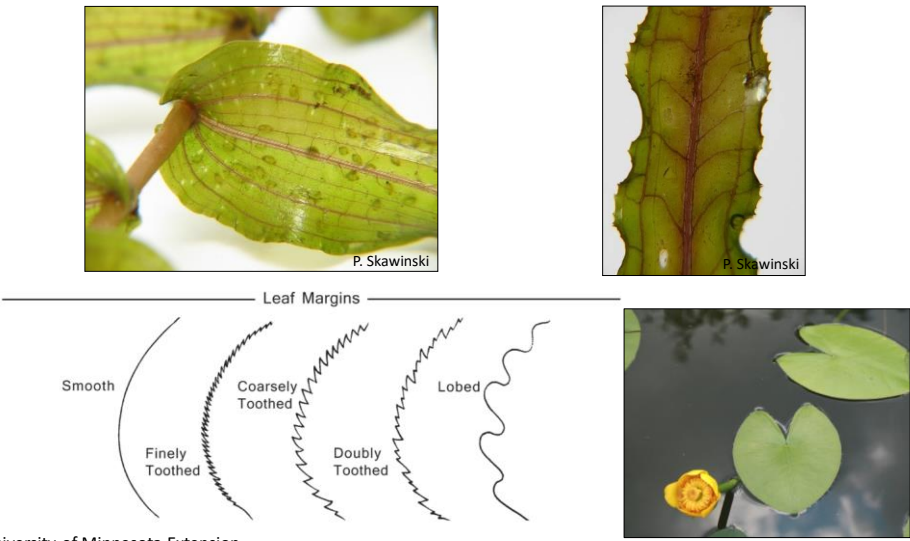


Branched (forked multiple times)

P. Skawinski

10

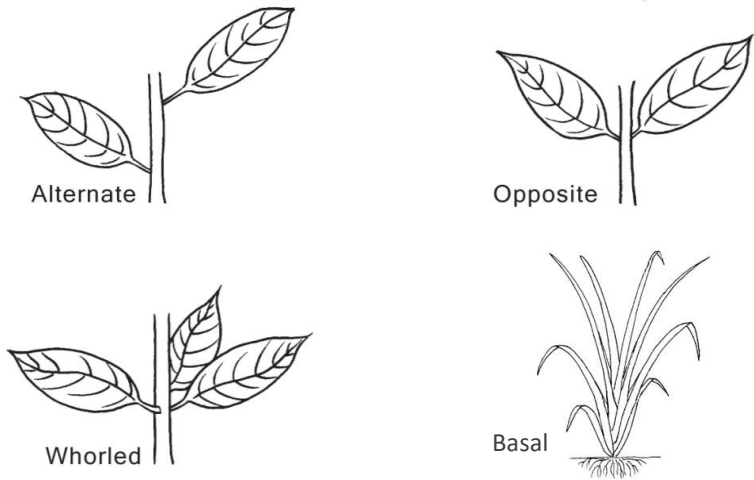
# Aquatic Plant Anatomy – Leaf Margin



University of Minnesota Extension

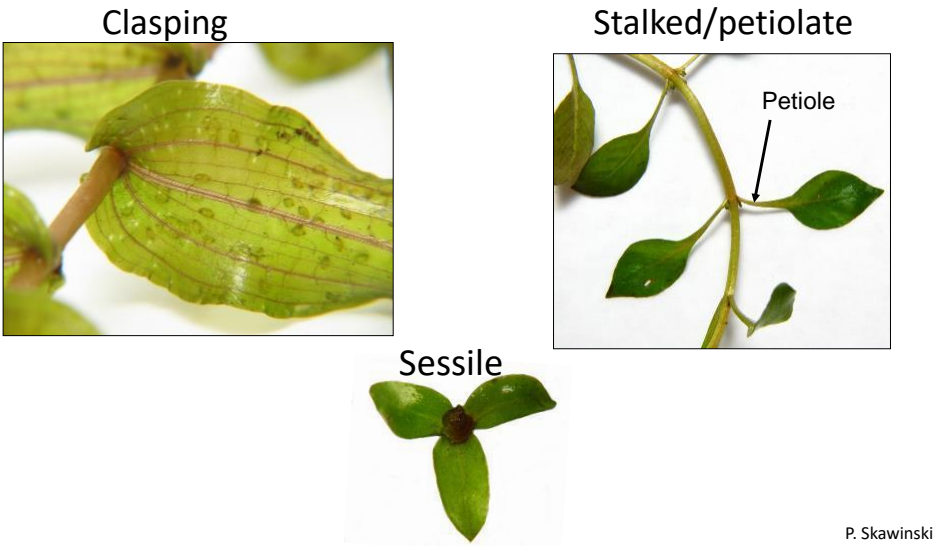
11

# Aquatic Plant Anatomy – Leaf Arrangement



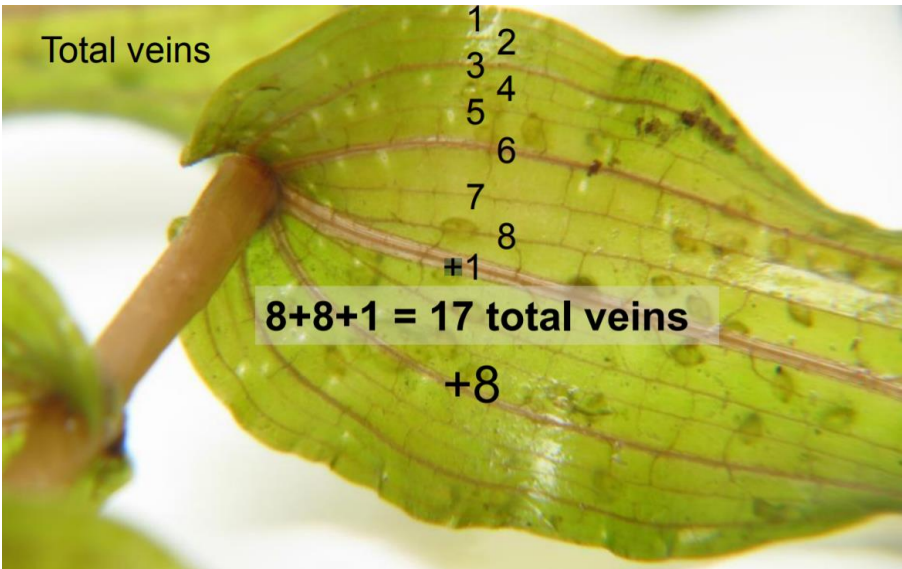
University of Minnesota Extension

# Aquatic Plant Anatomy – Leaf Attachment



13

## Counting Veins



14

Other Features



15

Other Features

Rhizomes and Roots



16



## 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?



17

## Quick Aquatic Plant ID

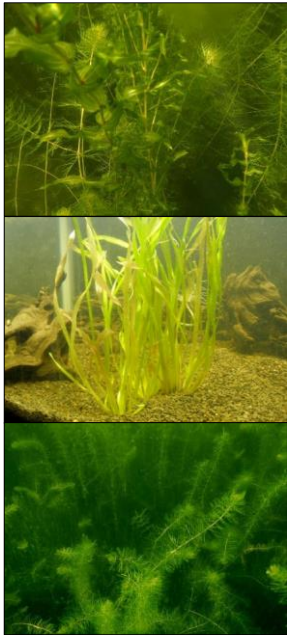
- **Emergent** (e.g. Cattail)
- **Free-floating** (e.g. Star Duckweed)
- **Floating leaf** plants (e.g. Water Shield)
- **Submersed** (e.g. Whitestem Pondweed)



18

# Submersed Plants

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



19

## Simple Leaves - Alternate with Midvein

28 Species in Michigan! Pondweeds  
(*Potamogeton* spp.)

Broad leaf  
(Whitestem Pondweed)



Narrow leaf/ thread-like  
(Fries Pondweed)



20

Other Pondweed Features



21

Simple Leaves-  
Alternate, without Midvein

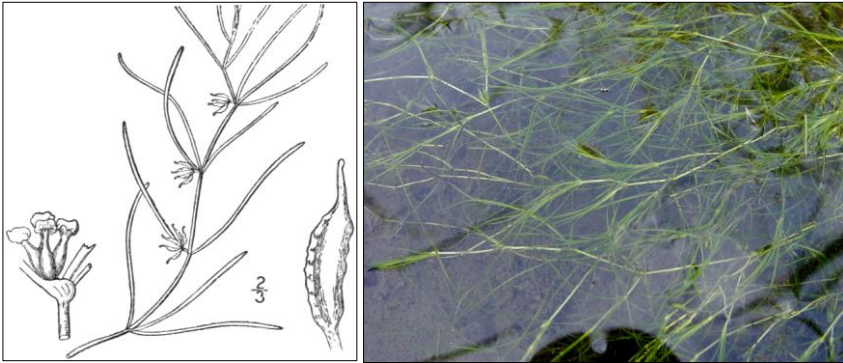
Water Stargrass  
(*Zosterella dubia*)



22

Simple Leaves- Opposite/Whorled

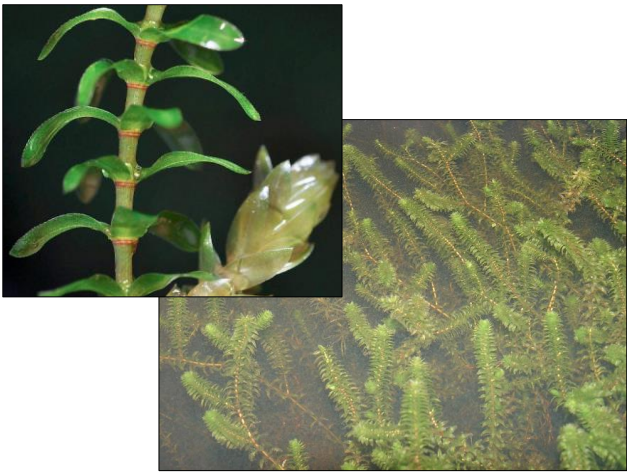
Horned Pondweed  
(*Zannichellia palustris*)



23

Simple Leaves- Whorled

Waterweed  
(*Elodea canadensis*)



Invasive look-alike  
(*Hydrilla verticillata*)



24



Simple Leaves- Whorled

☹️

Starry Stonewort

Musk Grasses: Characeae  
Chara



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

25

Submersed Plants

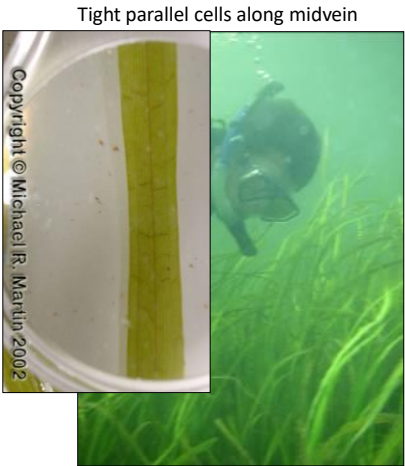
- Plants with **simple** leaves
  - **Opposite, whorled, or alternate** leaf arrangement
- Plants with **simple** leaves
  - **Basal** leaf arrangement
- Plants with **finely divided** leaves



26

# Simple Leaves- Basal (aka rosette)

Water Celery  
(*Vallisneria americana*)



Quillwort (*Isoetes* spp.)  
Pipewort (*Eriocaulon* spp.)



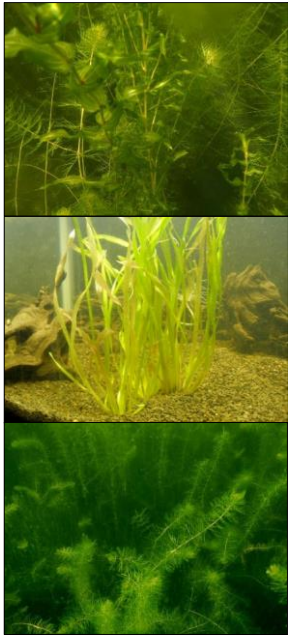
27

## Submersed Plants

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

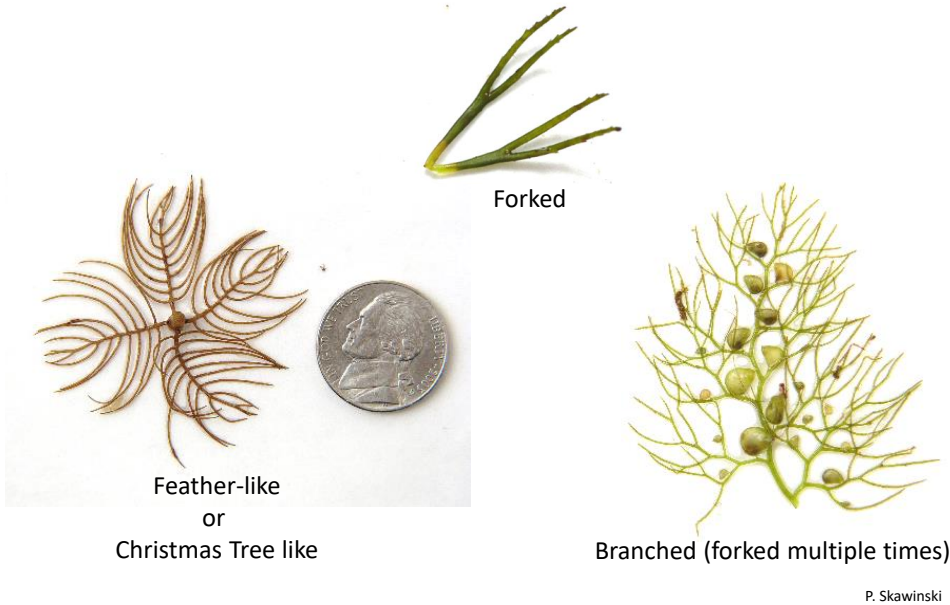
- Plants with **simple** leaves
  - **Basal** leaf arrangement

- Plants with **finely divided** leaves



28

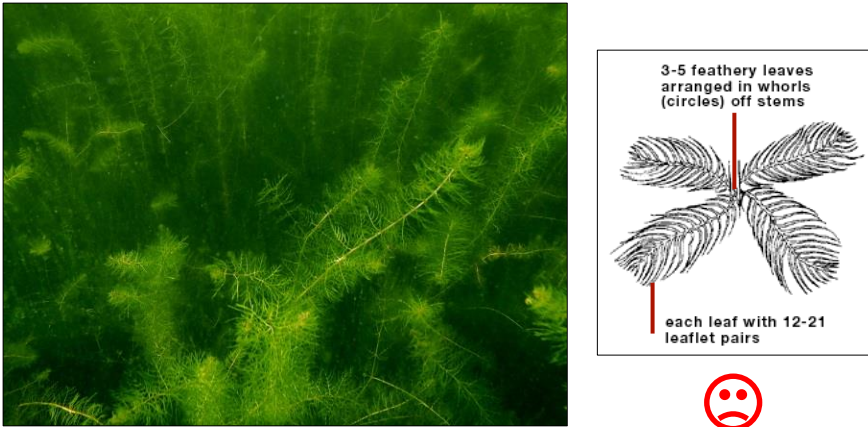
Finely Divided Leaves



29

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”

30

Finely Divided- Forked Leaves

Coontail  
(*Ceratophyllum demersum*)



31

Finely Divided- Branched, Alternate

Alternate  
Buttercup  
(*Ranunculus longirostris* )



Alternate with bladders  
Bladderworts  
(*Utricularia* spp.)

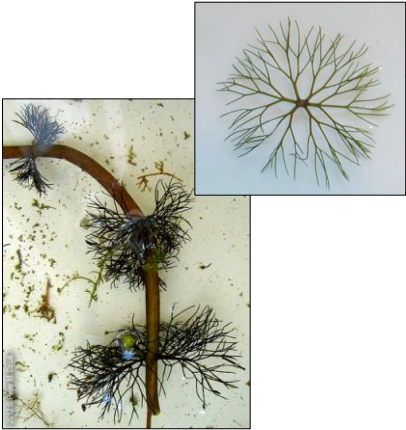


32

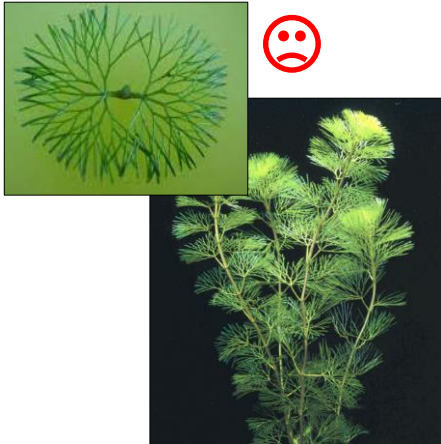


Finely Divided- Branched, Opposite

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



Opposite  
**Fanwort**  
(*Cabomba caroliniana*)



33

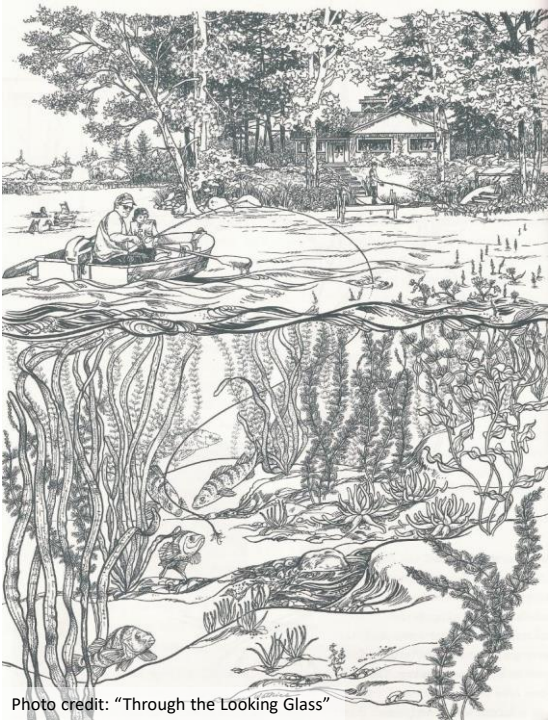


Photo credit: "Through the Looking Glass"

34

An  
Underwater  
Forest

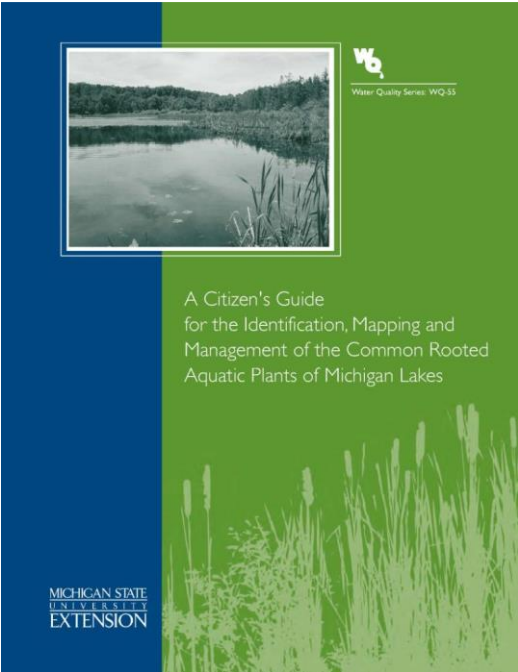
"In the end, we will only conserve  
what we love... we will love only  
what we understand... we will  
understand only what we are  
taught"

Chinese Philosopher, Lao-Tsu

# Available Resources



35



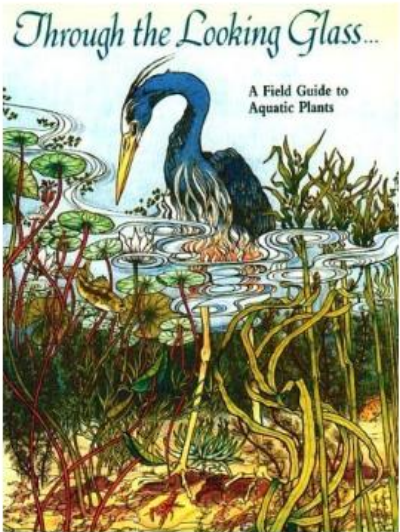
MSU Extension  
WQ-55

36

Available through University of Wisconsin-Extension Lakes Program or Amazon

\$29.95

[www.uwsp.edu/uwexplakes](http://www.uwsp.edu/uwexplakes)

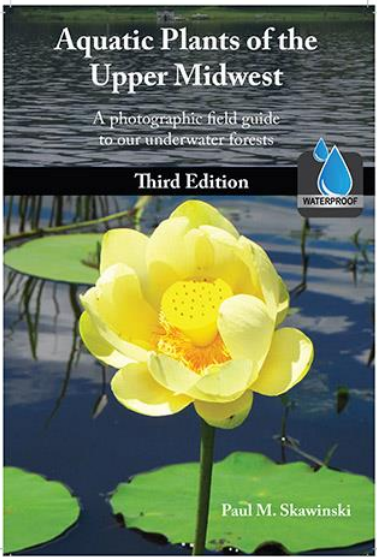


37

Available through University of Wisconsin-Extension Lakes Program or Amazon

\$48.00

[www.uwsp.edu/uwexplakes](http://www.uwsp.edu/uwexplakes)

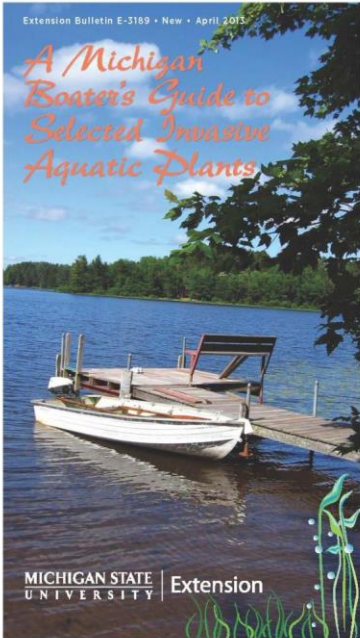


38

PDF at [www.MiCorps.net](http://www.MiCorps.net)

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

<http://shop.msu.edu>



39

Page 13

Plants that float on or grow above the water surface.		
Part One	(See page 14.)	Free-floating Plants — Plant floats free in the water; not attached to the lake bottom in any way. Plants small, less than 1/2 inch in size. (See figures on page 15.)
Part Two	(See page 16.)	Plants with Leaves that Extend Above the Water — Plant with leaves that extend out of the water. (See figures on pages 17 and 18.)
Part Three	(See page 19.)	Plants with Floating Leaves — Plant with a small or large leaf that floats on the surface of the water. (See figures on page 20.)
Plants growing entirely below the surface of the water. Possible exception is a small flower/seed stem that extends a short distance out of the water.		
Part Four	(See page 21.)	Plants with Leaves Thread- or Needle-like — Submerged leaves thread- or needle-like. (See figures on page 22.)
Part Five	(See page 23.)	Plants with Long, Ribbon-like Leaves — Submerged leaves long and ribbon-like— about 10 times longer than wide. (See figures on page 24.)
Part Six	(See page 25.)	Plants with Complex and Finely Divided Leaves — Submerged leaves complex and finely divided. (See figures on pages 26 and 27.)
Part Seven	(See page 28.)	Plants with Oval, Oblong or Lanceolate Leaves — Submerged leaves oval, oblong or lanceolate, as small as 1/2 inch or as long as 8 inches. (See figures on pages 30 and 31.)

40







41

Plants that float on or grow above the water surface.		
Part One	(See page 14.)	Free-floating Plants — Plant floats free in the water; not attached to the lake bottom in any way. Plants small, less than ½ inch in size. (See figures on page 15.)
Part Two	(See page 16.)	Plants with Leaves that Extend Above the Water — Plant with leaves that extend out of the water. (See figures on pages 17 and 18.)
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42

Part Five

Plants with Long, Ribbon-like Leaves

#1	<p>Choose one of the following:</p> <p>All leaves arising from base of plant (Fig. 3.31 and Plate 2). <i>Vallisneria americana</i> (wild celery).....see Portrait 34</p> <p>Leaves arising from a stem (Figs. 3.32, 3.34 and 3.35).....go to #2</p>	
#2	<p>Choose one of the following:</p> <p>Stem flat (Figs. 3.32 and 3.33 and Plate 2). <i>Potamogeton zosteriformis</i> (flat-stemmed pondweed).....see Portrait 33</p> <p>Stem round.....go to #3</p>	
#3	<p>Choose one of the following:</p> <p>Leaves extending in nearly opposite directions in a single plane so that the entire plant appears somewhat flat, forming the shape of a hand fan or fern plant, particularly as seen in the water (Fig. 3.34 and Plate 2). <i>Potamogeton robbinsii</i> (fern pondweed).....see Portrait 22</p> <p>Leaves of plant not arranged in a pattern to form the shape of a hand fan or fern plant but scattered along the stem (Fig. 3.35 and Figs. 3.52 and 3.53 in Part Seven of the key, "Plants with Oval, Oblong or Lanceolate Leaves").....go to #4</p>	
#4	<p>Choose one of the following:</p> <p>Leaves short, less than 4 inches long, and leaf margins finely toothed (see Figs. 3.52 and 3.53 and Plate 3). <i>Potamogeton crispus</i> (curly-leaf pondweed)....see Portrait 51</p> <p>Leaves long and flexible and leaf margins not finely toothed (Fig. 3.35 and Plate 2). <i>Heteranthera dubia</i> (water star grass) (also known as <i>Zosterella dubia</i>) .....see Portrait 35</p>	

Page 23

43

Plants with Long, Ribbon-like Leaves

#1	<p>Choose one of the following:</p> <p>All leaves arising from base of plant (Fig. 3.31 and Plate 2). <i>Vallisneria americana</i> (wild celery).....see Portrait 34</p> <p>Leaves arising from a stem (Figs. 3.32, 3.34 and 3.35).....go to #2</p>	←
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44

Practice with Plants!

45

Invasive Plants

46

ESTABLISHED AQUATIC INVASIVE  
PLANTS IN MICHIGAN

Eurasian milfoil  
*Myriophyllum spicatum*

Curly-leaf pondweed  
*Potamogeton crispus*

Starry stonewort  
*Nitellopsis obtusa*



Michigan Clean  
Water Corps



Cooperative Lakes  
Monitoring Program

Modified from MiCorps Exotic Aquatic Plant Watch

47

EURASIAN WATERMILFOIL  
*MYRIOPHYLLUM SPICATUM*

Photo by  
Richard Old  
www.xdservices.com

Key Characters:

- Feather-like leaves
- Leaves with **12 – 21** pairs of leaflets
- Leaves limp out of water
- Pinkish stem

Trivia:

- Originally from Europe
- First described by Carlos Linnaeus in 1753
- Reproduces readily by fragmentation
- Has difficulty invading lakes with well developed native plants



Allison ... egwood.org

48



CURLY-LEAF PONDWEED

POTAMOGETON CRISPUS



P. Skawinski

Key Characters:

- Simple leaves
- Obvious midvein
- Alternate leaf arrangement
- Serrated leaf margin





Trivia:

- Native to Eurasia, Africa, and Australia
- First discovered in North America in 1880

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

49

STARRY STONEWORT



B. Grabill

- Tiny star-shaped, tan or white **bulbils** produced on rhizoids (clear filaments)
- Long, **uneven** length branchlets
- Smooth stem
- Brittle

P. Skawinski

50



Scott Brown

51

STARRY LOOK-A-LIKE: NATIVE MUSKGRASS (*CHARA*)

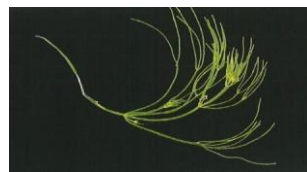
- Macroalgae
- **No star bulbils**
- “Smells skunky”
- **Shorter ‘branching’**  
(i.e. reach) of the plant compared to Starry
- Rough feel



A. Dow

52

STARRY LOOK-A-LIKE: NATIVE NITELLA



- Macroalgae
- No star bulbils
- Even branching
- Shorter 'branching' (i.e. reach) of the plant compared to Starry



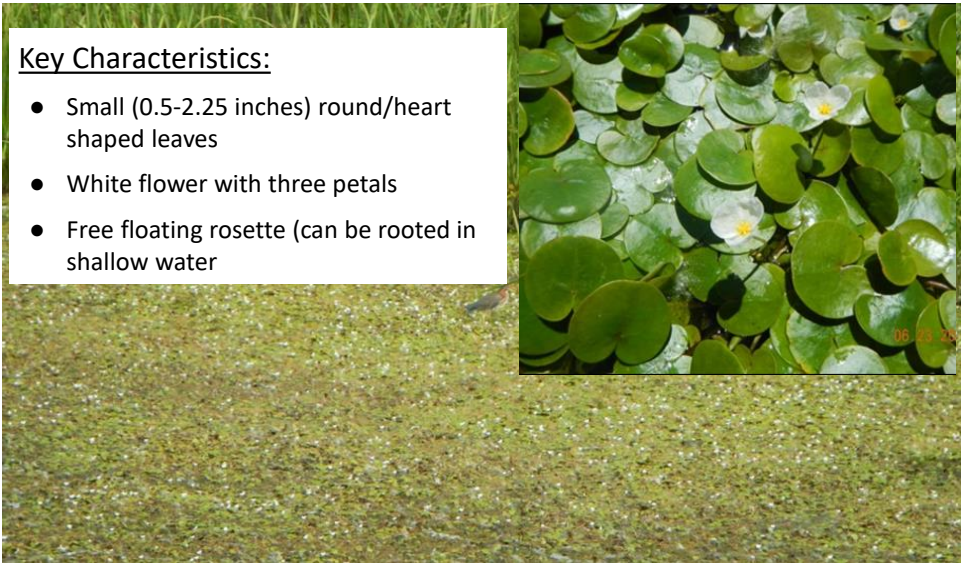
Nitella mucronata

53

EUROPEAN FROG-BIT

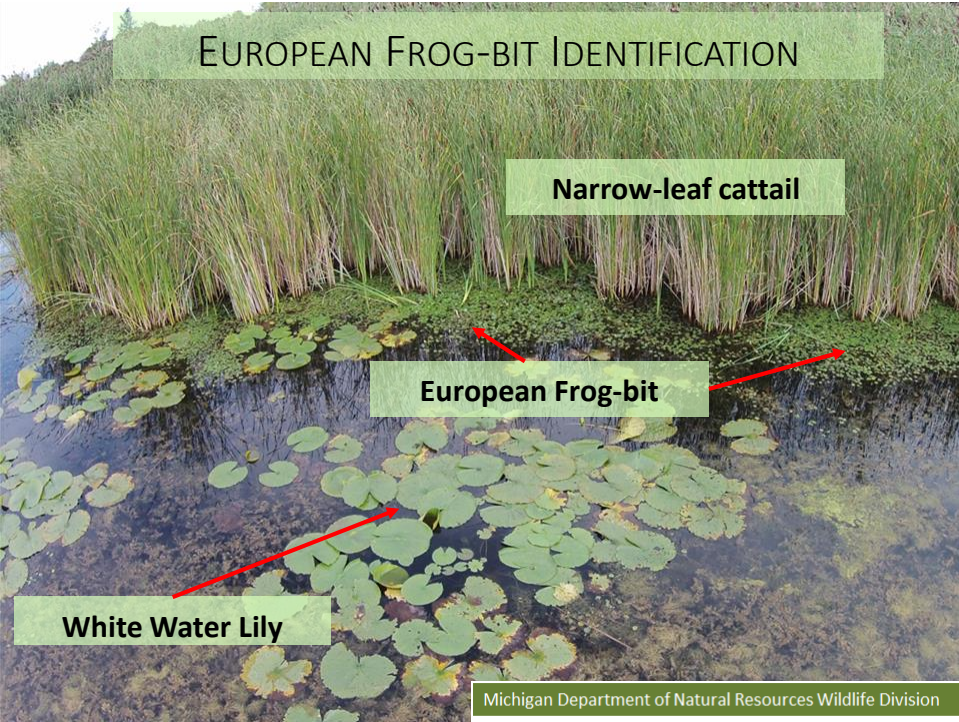
Key Characteristics:

- Small (0.5-2.25 inches) round/heart shaped leaves
- White flower with three petals
- Free floating rosette (can be rooted in shallow water)



54





55

WATCH FOR THESE

Aquatic Invaders!

<div>HYDRILLA</div> <div><p>Leaves are whorled in groups of 4-8 Leaves are rough and have visible saw-toothed margins</p><p><small>Photo: Brian Bogan, University of Maryland, Aquatic Botany</small></p></div>	<div>WATER CHESTNUT</div> <div><p>Green, floating leaves with sharply serrated edges Small, white 4-petaled flowers</p><p><small>Photo: Lynda J. Bennett, University of Maryland, Aquatic Botany</small></p></div>
<div>BRAZILIAN ELODEA</div> <div><p>Generally 4 leaves per whorl Submerged</p><p><small>Photo: V. Wiegman, PSU/CLE</small></p></div>	<div>EUROPEAN FROGBIT</div> <div><p>Leathery, heart-shaped leaves Free-floating Leaf size 1 1/2 - 2 1/4 in. across</p><p><small>Photo: V. Wiegman, PSU/CLE</small></p></div>
<div>WATER HYACINTH</div> <div><p>Rounded, thin green leaves with spongy stalks Lavender flowers with central yellow disk Free-floating</p><p><small>Photo: MDC/9</small></p></div>	<div>WATER SOLDIER</div> <div><p>Leaves are 1 1/2 in. long, sword-shaped, sharply serrated edges, bright green Leaves may be emergent or submerged</p><p><small>Photo: Brian Bogan</small></p></div>
<div>WATER LETTUCE</div> <div><p>Free-floating - forms a rosette of leaves that resembles an open head of lettuce Fuzzy light green leaves with long feathery roots</p><p><small>Photo: MDC/2</small></p></div>	<div>PARROT FEATHER</div> <div><p>Spikes of stiff, feathery leaves grow in whorls of 4-6 Bright green upper stem emerges up to 1 foot above water</p><p><small>Photo: MDC/2</small></p></div>
<div>EUROPEAN WATER CLOVER</div> <div><p>Resembles a four-leaf clover Leaves are smooth and can be floating, submerged, or emergent Leaf size up to 1 in. across</p><p><small>Photo: MDC/3</small></p></div>	<div>YELLOW FLOATING HEART</div> <div><p>Flowers are bright yellow with 5 petals Leaves are 2-4 in. across with scalloped edges</p><p><small>Photo: MDC/6</small></p></div>


These 10 species are high on the list for sale and possession. Please only report sightings outside of cultivation.

For more information and to report sightings, visit [michigan.gov/invasives](http://michigan.gov/invasives)

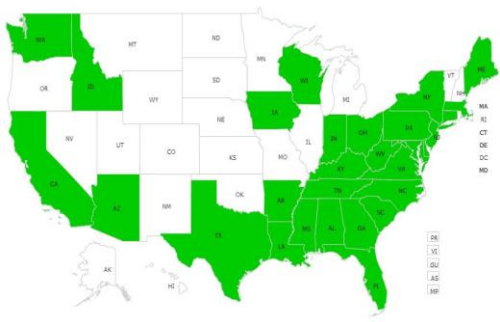
56



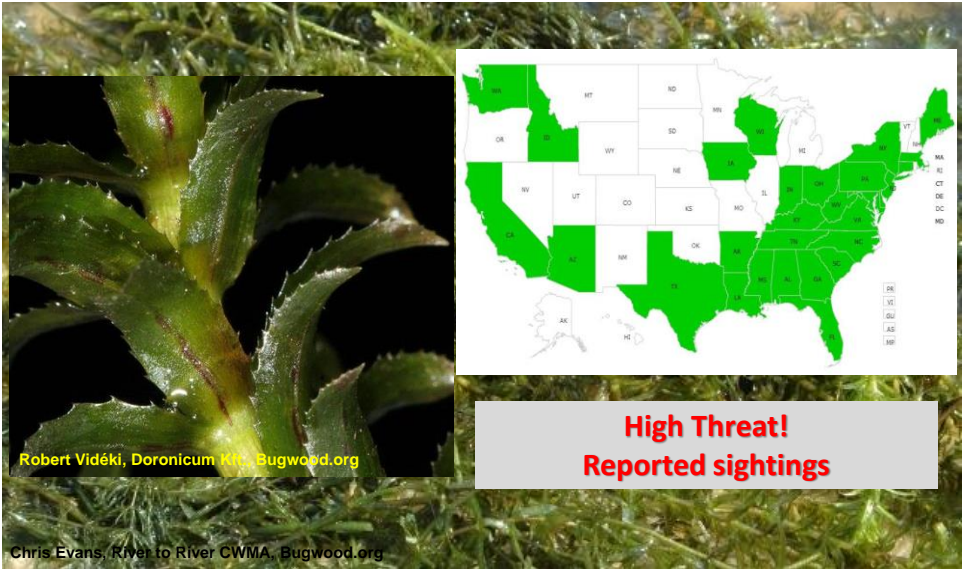
MAJOR THREAT:  
HYDRILLA— *HYDRILLA VERTICILLATA*



Robert Vidéki, Doronicum Kft., Bugwood.org











High Threat!  
Reported sightings



Chris Evans, River to River CWMA, Bugwood.org

57

Hydrilla (exotic)		Elodea (native)	
			
<div>Four or more leaves at each node.</div>			<div>Three leaves at each node.</div>
<div>Leaves margins clearly toothed and spines on mid vein.</div>			<div>Leaves margins not clearly toothed and no spines on mid vein.</div>

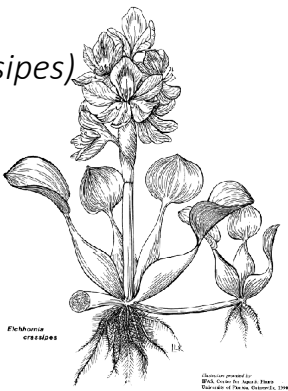
58

# WATER HYACINTH (*Eichhornia crassipes*)

Key Characters:

- Leaf Arrangement: basal rosette, free-floating
- Leaf stem/ petiole: Inflated petiole
- Flower: 6 blue-violet petals. Top petal has a yellow blotch. Fade with age

Occurrences: SE Michigan



59

# WATER LETTUCE (*Pistia stratiotes*)

Key Characters:

- Leaf Arrangement: basal rosette, free-floating
- Leaf Characteristics: grayish-green, fleshy, spongy near their base. Covered in dense tiny hairs
  - Parallel veins
- Occurrences: SE Michigan



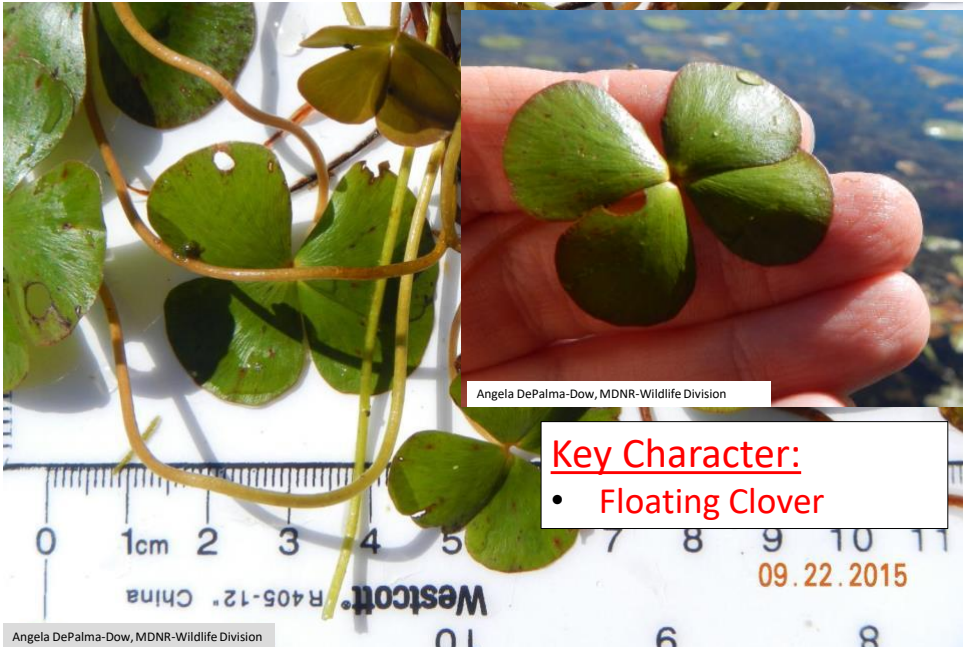
60

WATER LETTUCE INVASION  
IN SE MICHIGAN



61

EUROPEAN WATER-CLOVER (*Marsilea quadrifolia*)



62



PARROT FEATHER (*Myriophyllum aquaticum*)

Key Characters

- Bright green feather-like leaves extend above water surface
- Occurrences: Southern Michigan



63

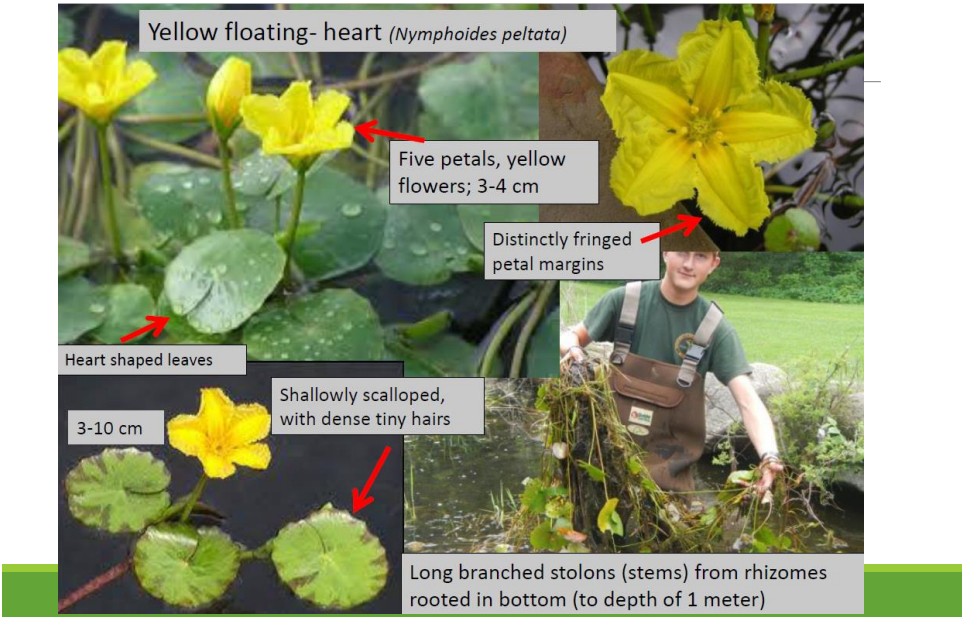
PARROT FEATHER



64




Yellow floating-heart – *Nymphoides peltata*




65

COOPERATIVE LAKES MONITORING PROGRAM  
TRAINING FOR


Aquatic Plant Identification  
and Mapping


Michigan Clean Water Corps

EGLE

Great Lakes Commission

Huron River Watershed Council



MICHIGAN STATE UNIVERSITY

66

# Why map aquatic plants?



- ❑ Plants are a beneficial part of a lake ecosystem
- ❑ Excess nutrients, invasive species, and other disturbances can upset their balance
- ❑ A plant map provides a basis for comparison, informs management, and reveals problems

67

## Benefits of enrolling in the CLMP Aquatic Plant Identification and Mapping program

- ❑ Standard procedure
- ❑ Hands-on training
- ❑ One day of field assistance from MiCorps staff
- ❑ Ongoing assistance with plant ID, field procedures, and data reporting
- ❑ Data are shared with EGLE
- ❑ Baseline information for future lake management
- ❑ 2019 enrollment cost –\$250

68

## Making a Plant Collection

- Helps with identification when mapping the lake
- Educational tool for your community or lake association
- Can be a reference for future work

69

## What's growing in your lake?



Oh, no! It's Eurasian Milfoil!

70