

The background of the slide is a photograph of submerged aquatic plants, likely seagrass, with long, thin, green blades and some reddish-brown structures. A large, semi-transparent white rectangular box is centered over the image, containing the title and presenter information.

Submersed Aquatic Plants

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FLMS June 2017

Thanks: Some slides modified from Nathalie Visscher, FWCC
Elements of presentation by Ashley O'Neal, DEP

Help!



Outline

1. **Whorled, dissected leaves** *Cabomba*, *Ceratophyllum*, *Myriophyllum*, *Limnophila*
2. **Whorled, simple leaves** *Hydrilla*, *Egeria*, *Mayaca*, *Hygrophila*
3. **Macroalgae** *Chara*, *Nitella*
4. **Slender submersed** *Najas*, *Potamogeton*
5. **Strap-leaf submersed** some *Sagittaria species*, *Vallisneria*
6. **Bladderworts** *Utricularia*
7. **Spikerushes** some *Eleocharis species*

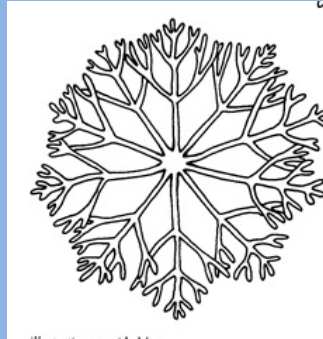
1. Whorled, dissected leaves

Cabomba caroliniana



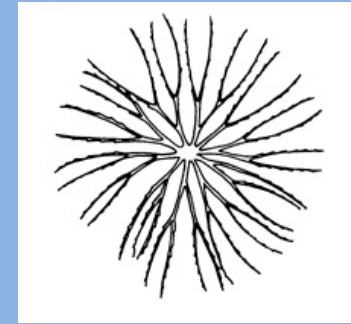
Opposite, palmately
branched

*Limnophila
sessiflora*



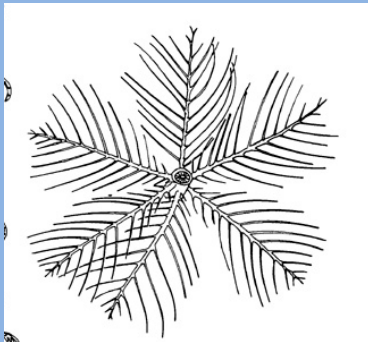
Whorled, tree branching

*Ceratophyllum
demersum*



Whorled, forked

Myriophyllum sp.



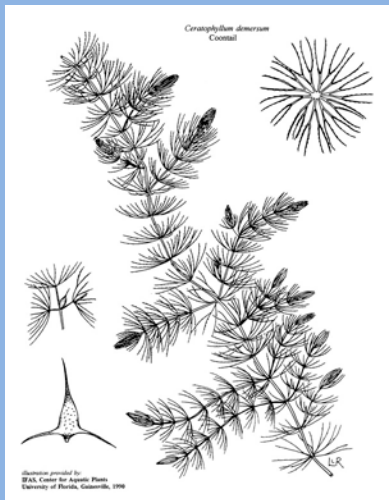
Whorled, pinnately
branched

NOTE: Some *Utricularia* species have coontail-like appearance in water. However, they will have bladders, and are usually slimy and limp out of the water.

Ceratophyllum demersum

Coontail

- Green stems, **plant holds shape out of water**
- Leaves: - dichotomously branched (tuning fork)
 - in whorls on stem
 - several teeth on midribs (rough feeling)
 - bright green to blackish color
- Flowers: - very small, at leaf base



Ceratophyllum
demersum
Coontail



Other *Ceratophyllum* species

RARE

- *C. echinatum* and *C. muricatum*
 - Each from 4 counties, scattered
 - Leaves can be branched 3-4 times (3rd -4th order)
 - **Leaves fine-textured**
 - Fruits winged (bigger in *echinatum*)



Cabomba caroliniana

Fanwort

- Purple/red stems, **plant loses shape out of water**
- Leaves: fan shaped, opposite
 - purple, red, or green color
- Flowers: light pink, showy above surface; accompanied by tiny floating leaf



Cabomba caroliniana

Fanwort

COMMON



Cabomba caroliniana

COMMON

Fanwort



COMMON

Cabomba with flowers



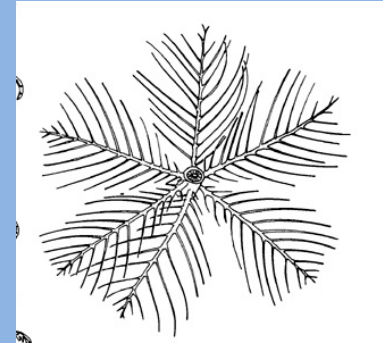
Cabomba caroliniana* vs. *Myriophyllum



Myriophyllum

- 5 species recognized in Florida
- 2 non-native
 - Green stems
 - Smooth stems
 - Fruiting tips different from native
- 3 native
 - Reddish stems
 - Rough stems
 - Leaves in whorls of 3-6
 - Includes *M. heterophyllum*, *M. laxum*, and *M. pinnatum*
 - Leaves with 12-28, 8-10, and 11-21 divisions (cannot distinguish these 3 without fruiting tips)
 - Fruiting tips with bracts of various sizes, stick up above water surface

Myriophyllum sp.



Whorled, pinnately
branched

Myriophyllum heterophyllum

Variable-leaf water milfoil

- Stem: thick, submersed
- Leaves:
 - Deeply divided and feathery, 2" long
 - In whorls of 4 to 6 along stem
- Flower:
 - Very tiny, reddish
 - In whorls of 4-6 at emergent end of stem
 - Subtended by bright green leaf-like bracts
 - Bracts clearly visible, longer than space between bracts



Myriophyllum heterophyllum



Bracts of inflorescence longer than space between bracts.

Myriophyllum laxum

Loose water milfoil

- Stems: - submersed, reddish, slender
- Leaves: - divided, very finely, feathery
 - in whorls of 4 to 5
- Flowers: - pink to reddish
- Bracts subtending flowers very short



Myriophyllum laxum

COMMON



Space between fruiting segments
longer than bracts subtending fruits

Myriophyllum laxum



Stems less robust than *M. heterophyllum*

Myriophyllum pinnatum

Cutleaf water milfoil

- Stems: - submersed, reddish, slender
- Leaves: - divided, very finely, feathery
 - in whorls of 4 to 5
- Flowers: - pink to reddish
- Bracts subtending flowers very short



Native *Myriophyllum*

	<i>heterophyllum</i>	<i>laxum</i>	<i>pinnatum</i>
leaves/whorl	4-6	4-5	3-4
leaf segments	12-28	11-21	8-10
bract shape	serrate, not dissected	dissected to entire moving up stem	dissected
bract size	visible, longer than internode	barely visible, shorter than internodes	visible, longer than internode

M. heterophyllum
has more robust
stems

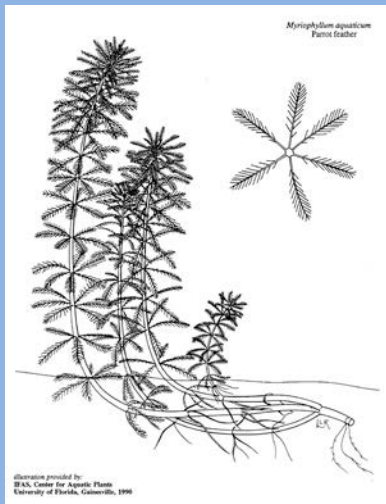


Myriophyllum aquaticum

Parrot feather

NON-NATIVE

- Emerged plant
- Stems: - can be 5' long
 - trail along the ground or water surface
 - become erect and leafy at the ends
- Leaves: - oblong, deeply cut and feathery looking
 - bright blue-green
 - in whorls of 4 to 6

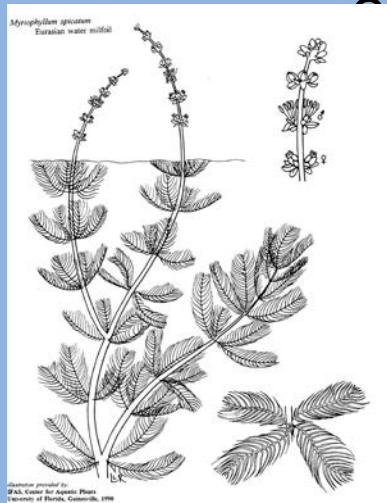


Myriophyllum Spicatum

Eurasian water milfoil

NON-NATIVE

- Submersed
- Stems: - branched, long, 6 to 9 feet long
 - dark green to grayish
- Leaves: - deeply divided, soft, feather-like, 2" long
 - arranged in whorls of 3 to 6 around stem
- Flowers: - very small, reddish, bracts tiny
 - on flower spike above water



Myriophyllum Spicatum

OCCASIONAL

Eurasian water milfoil

NON-NATIVE



Myriophyllum spicatum

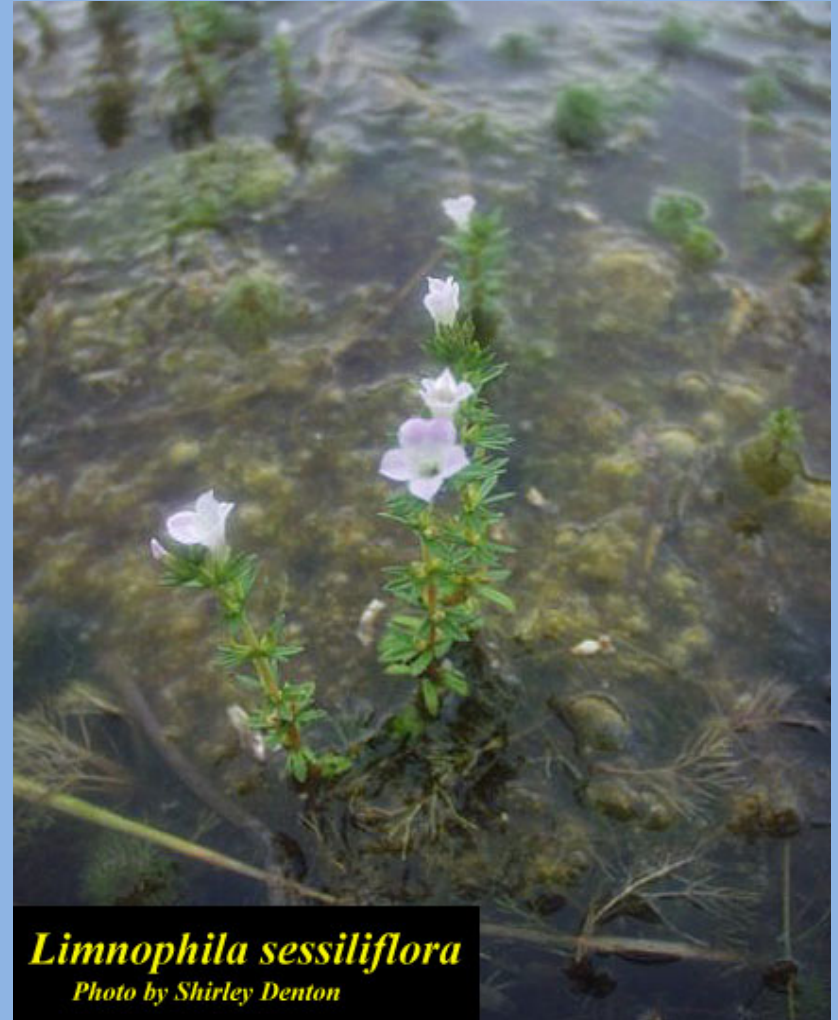
Eurasian water milfoil



Limnophila sessiliflora

Limnophila

- Stems up to 12 feet long, with a few inches emerged
- Submersed leaves whorled, finely divided and feathery, 1" long
- Floating leaves whorled, lance-shaped, dissected
- Flowers single pink, violet, or blue flower on emerged part of stem



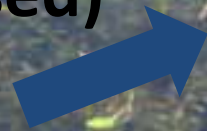
Limnophila sessiliflora
Photo by Shirley Denton

OCCASIONAL

Limnophila sessiliflora



Limnophila vs. *Hydrilla*

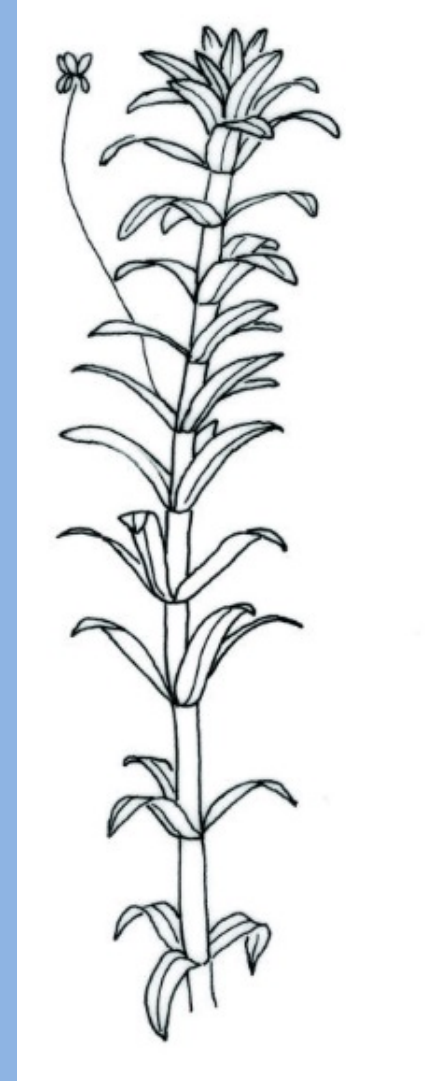


***Limnophila* (emergent)**
Emergent portions can look like
***Myriophyllum aquaticum*!**

Hydrilla
(submersed)

2. Whorled, simple leaves

- *Hydrilla*
- *Egeria*
- *Mayaca*
- *Hygrophila*



Hydrilla verticillata

Exotic FLEPPC 1

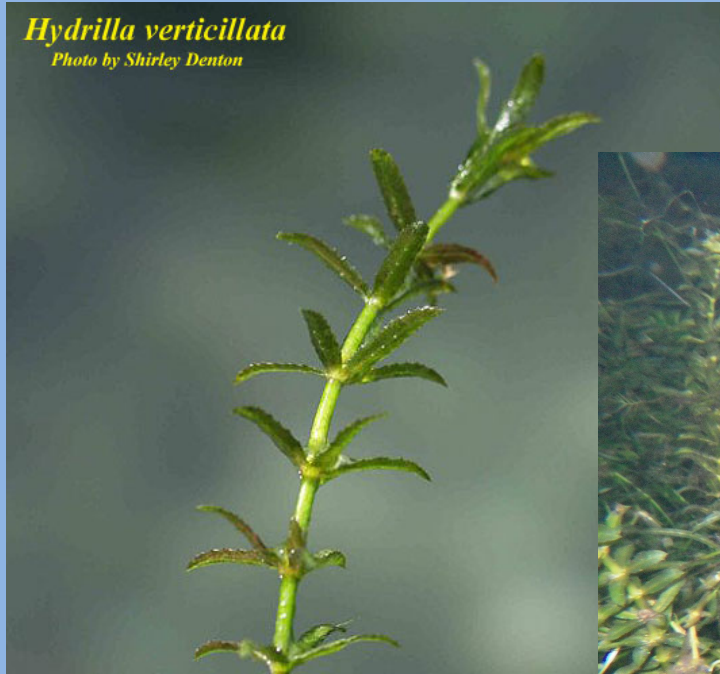
- **Rooted**
- **Stems:** slender, branched and up to 25 feet long.
Often grows to water surface and shades out others.
- **Leaves:** - small, strap-like and pointed
 - in whorls of 4 to 8
 - saw-toothed leaf margins
 - 1 or more sharp teeth along leaf mid-rib
- **Flowers:** - only female in Florida
 - tiny, white on long stalks
- **Turions:** - greenish bud-like at leaf axils
- **Tubers:** - potato-like attached at the roots

COMMON
TOP TEN

Hydrilla verticillata

Exotic FLEPPC 1

Hydrilla verticillata
Photo by Shirley Denton



Hydrilla verticillata

COMMON
TOP TEN



Can be smaller, lack teeth, and have a bright green “aquarium” appearance after herbicide treatment.

Egeria densa

Brazilian waterweed

NON-NATIVE

OCCASIONAL

- Rooted, submersed plants
- Stems: - Slender, usually a foot or two long
 - Does not branch as prolifically as hydrilla
- Leaves: - strap-shaped
 - whorls of 3 to 6
 - toothed leaf margins
 - smooth midrib
- Flowers: - short stalks 1" above water
 - 3 white petals
 - $\frac{3}{4}$ " across



Egeria densa
NON-NATIVE



Mayaca fluviatilis

Bog moss

- **Stems:** - several feet long
 - whitish-green, flexible
- **Leaves:** - emergent are mossy
 - submersed are thread-like
 - densely arranged in spirals on stem

Flowers: - solitary, on stalks 2” long

- small, 3 petals
- whitish to pink



COMMON
TOP TEN



bog moss
Mayaca fluviatilis
Photo by Vic Ramey
© 1999 University of Florida

Mayaca fluviatilis



Mayaca fluviatilis

bogmoss



COMMON
TOP TEN

Mayaca fluviatilis



Hygrophila polysperma

East Indian hygrophila

- Found in streams and slowly moving waters
- Submersed with few inches sometimes emerged
- Stems: - square, up to 6 feet long
- Leaves: - opposite, pointed
 - 1 ½" long, ½" wide
- Flowers: - at leaf axils
 - bluish-white to white

lips





Hygrophila polysperma @ Little Econ

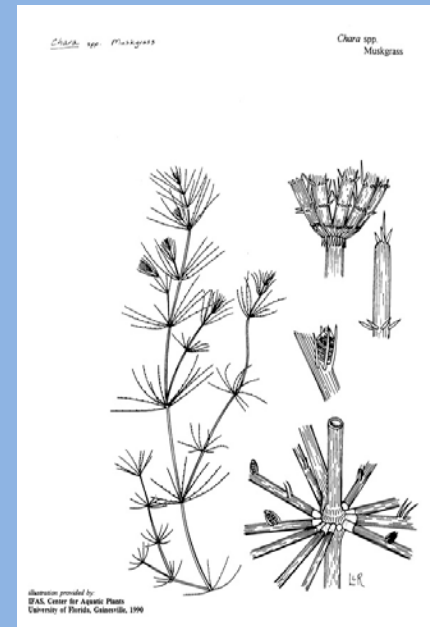


3. Macroalgae

- *Chara*
- *Nitella*

Chara sp.

Muskgrass



- Ponds, lakes and ditches
- Macro-alga = NO TRUE LEAVES
- Branches and branchlets:
 - Made of single column shaped cells
 - Spiny cells + calcium deposit (rough feeling)
 - In whorls
- Garlic-y odor



Chara frotus catch



Nitella sp.

- **Green macro-alga = NO TRUE LEAVES**
- **Branches and Branchlets:**
 - Smooth translucent stems
 - No smell
 - In whorls, at regular intervals along the main branches
 - Sporangia: reproductive part at the end of branches

Nitella sp. Stone wort

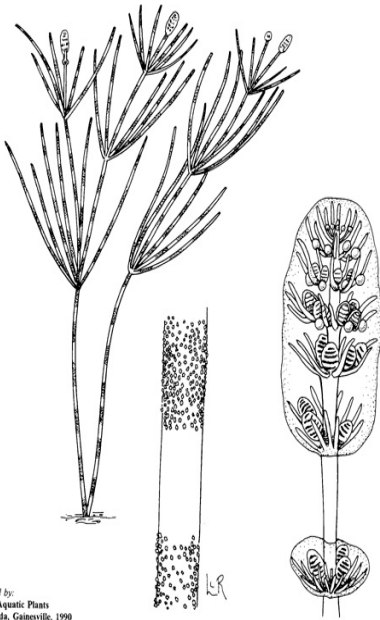
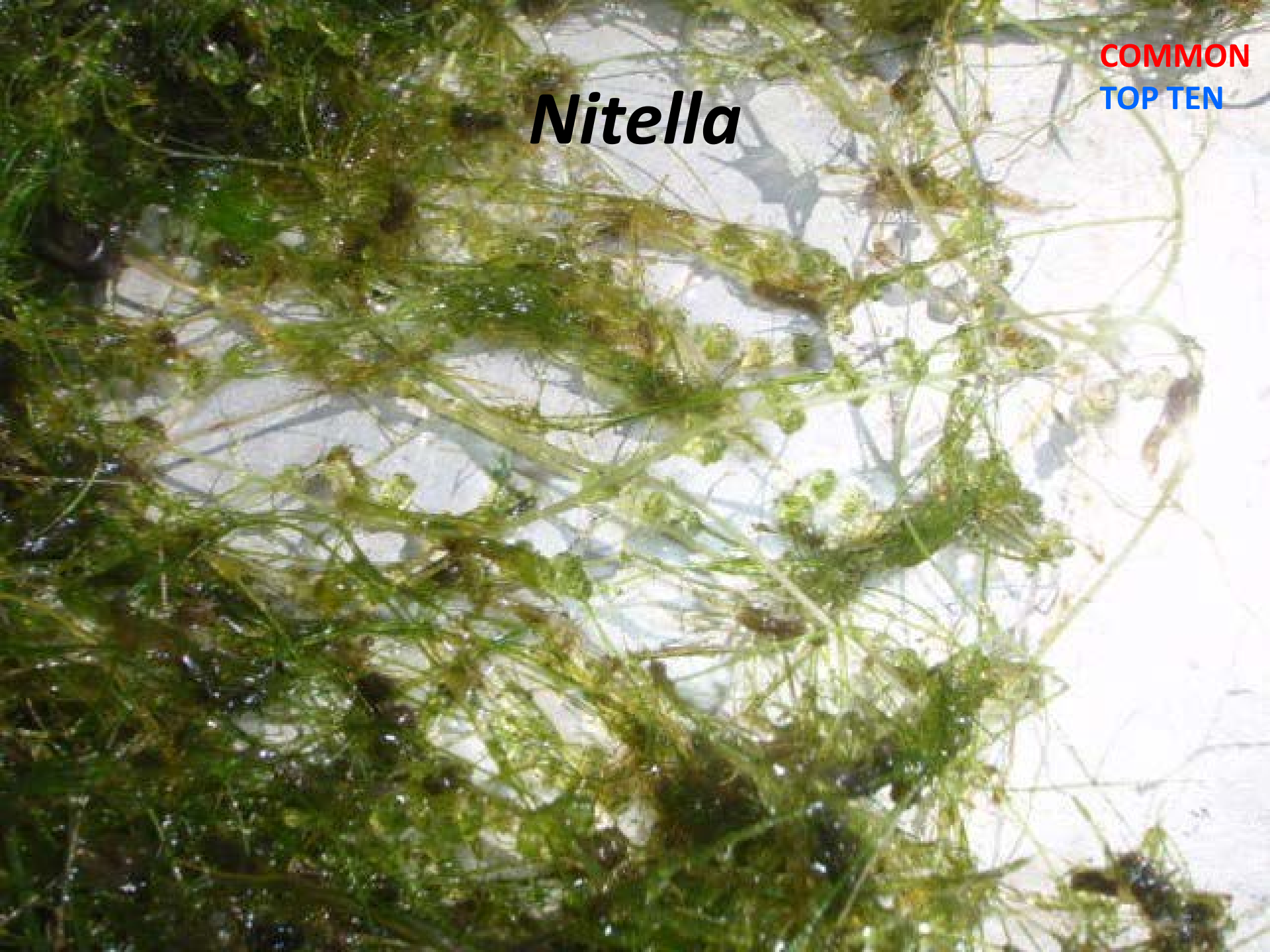


Illustration provided by:
IFAS, Center for Aquatic Plants
University of Florida, Gainesville, 1990



Nitella

COMMON
TOP TEN



Nitella frotus catch



4. Slender submersed

- *Najas*
- *Potamogeton*

Najas vs. *Potamogeton*

- Both genera have species that are very slender with very thin leaves
- *Najas*
 - Opposite leaves
 - Teeth of various sizes, but visible to naked eye
- *Potamogeton*
 - Alternate leaves
 - Stipules visible and useful in identification

Najas



Potamogeton



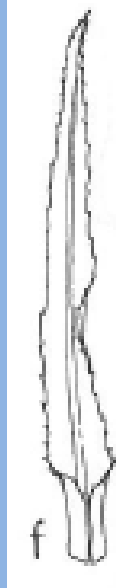
***Najas* in Florida (5 species)**

- *Najas marina* – largest and very different from others, brackish
- *Najas guadelupensis* – most common
- *Najas filifolia*
 - Endangered, tracked by FNAI
- *Najas minor*
 - Exotic, rare, nearly identical to *N. filifolia*
- *Najas wrightiana*
 - Only from Collier, Monroe, Broward

Najas guadalupensis

Southern naiad

COMMON
TOP TEN



- Stems: - submersed, very long
 - slender, very branched
- Leaves: - arranged opposite or whorls of 3
 - very narrow (1-3.4 mm wide), 1 inch long
 - small teeth on leaf margins
- Flowers: - very small on axils
 - inconspicuous



Ludwigia arcuata submersed
could be initially confused with *Najas*



Emergent portion



Opposite leaves, no teeth, longer than *Najas*, often reddish

Najas filifolia

OCCASIONAL

slender naiad (*N. ancistrocarpa* in G&W)

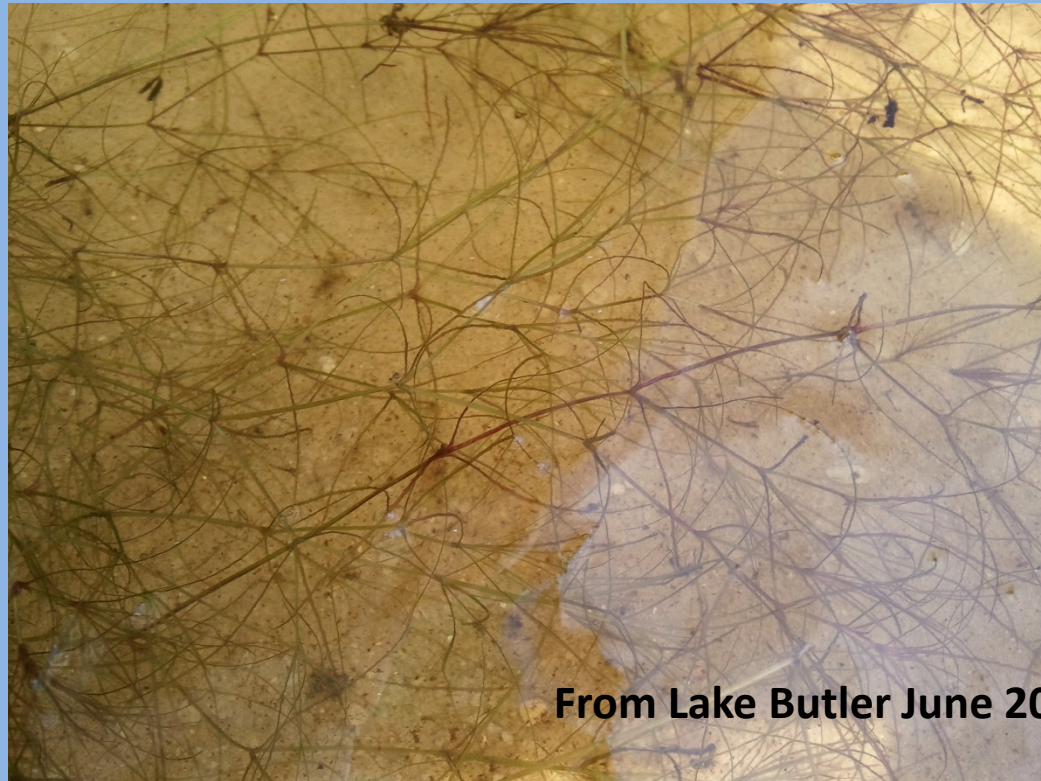
- Very fine leaves (0.1-0.7 mm wide) slightly recurved; Minute teeth, 5-9 per side
- **Fruit prominently curved – only *Najas* with curved fruit



Leaf



Fruit



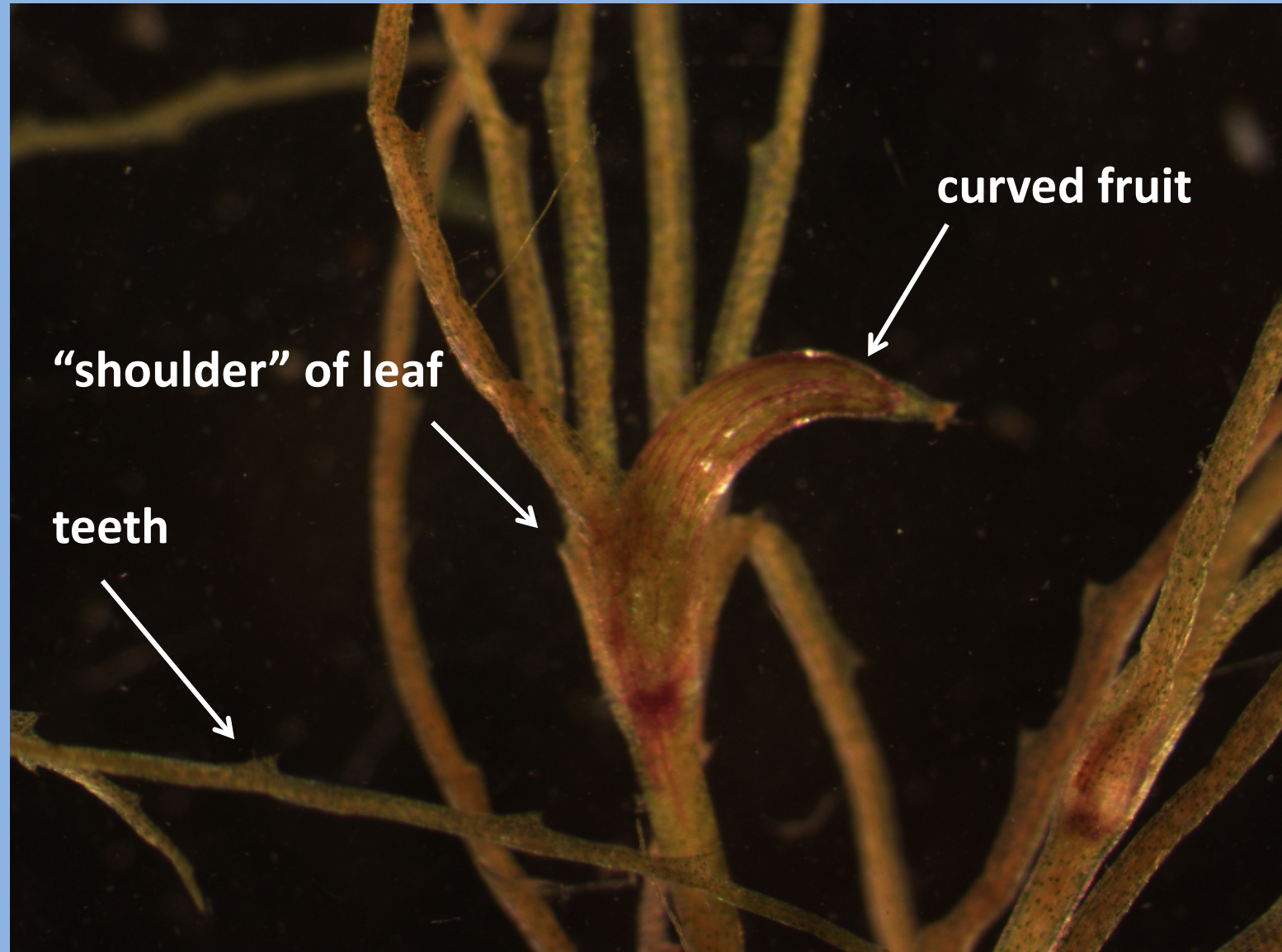
From Lake Butler June 2013

Najas filifolia (slender naiad)



Najas filifolia (12x)

OCCASIONAL



Najas minor

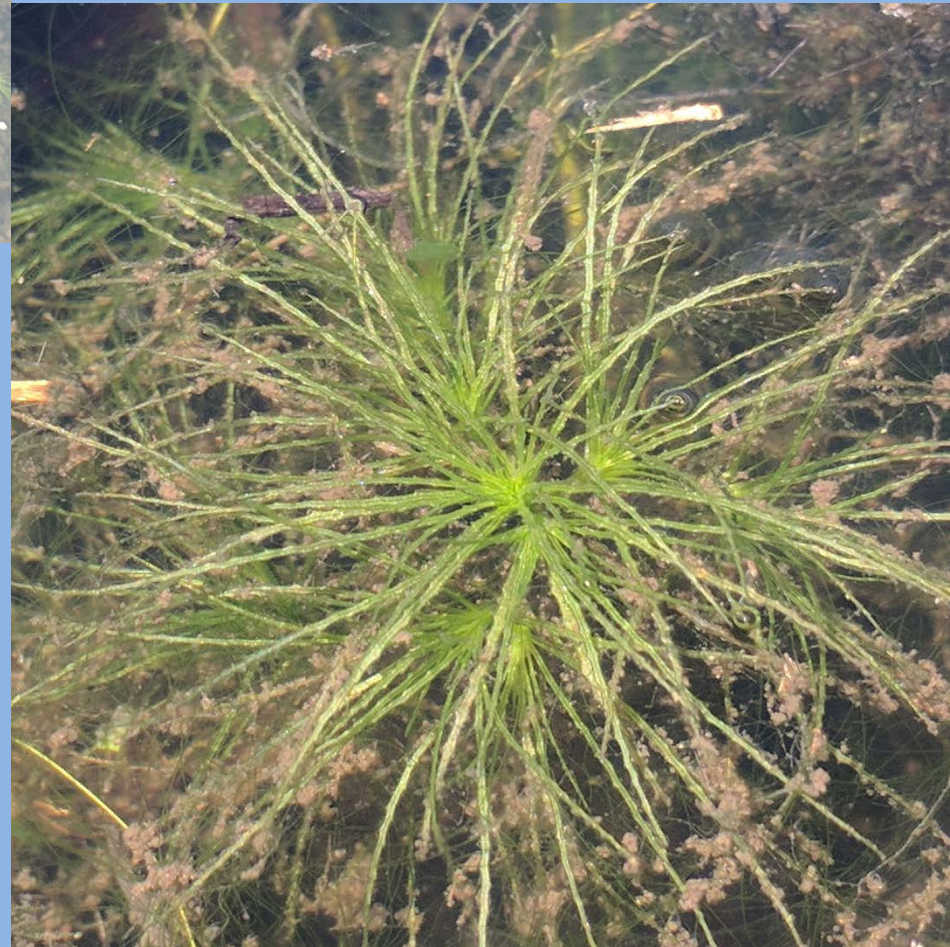
NOT NATIVE

- Thin leaves (0.1-1.2 mm); Coarse teeth to 0.4 mm, 7-15 per side
- Noxious in some SE states, not positively ID'd in many FL counties
- Leaves can be recurved
- Much like *N. filifolia* except Fruits not recurved



OCCASIONAL

Najas minor
(probably)



Najas marina

Spiny naiad

- Stems: - brittle up to about 0.5 m long
 - often branched toward the upward portion
 - conspicuous, brownish, prickly teeth at internodes.
- Leaves: - opposite or sometimes in whorls of three
 - triangular teeth along the leaf margins
 - prickles along the midrib on the underside
- Flowers: - solitary in the leaf axils
- Plants: dioecious with the male and female flowers on separate individuals.



Potamogeton

- 10 species known to Florida
 - 9 native
 - 1 exotic
- Some species only have submersed lvs, some with submersed and floating
- Leaf stipules important for ID
 - Free and sticking out
 - Close to stem, appear like leaf sheath

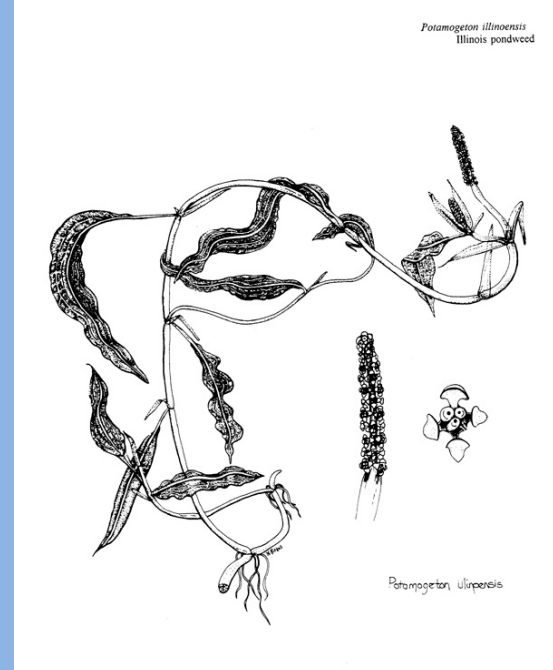
Potamogeton illinoensis

COMMON

Illinois Pondweed

- Common and visible
- Leaves:
 - Alternately arranged
 - Floating and submersed lvs same
 - Elliptic in shape
 - Much longer than wide (8" long)
 - Petioles < 4 cm
 - Pointed tips and bases
- Flower: - greenish on spike
 - 1 to 3" long

P. nodosus similar



COMMON

Potamogeton illinoensis

Illinois Pondweed

Potamogeton diversifolius

Waterthread pondweed

- Small plant
- Leaves alternate, 2 styles
 - Small elliptic floating
 - Thin threadlike submersed
- Fruits on tight spike
- Grows in calm waters
- Can grow in large quantities



Potamogeton diversifolius
Photo by Ann Murray
Copyright 1998 University of Florida



Potamogeton diversifolius

Potamogeton crispus

NOT NATIVE

- Submersed, only one style of leaf
- Only *Potamogeton* species with teeth
- Not widespread in FL(?)



Potamogeton pusillus

Small pondweed

- Leaves: - Submersed, alternate
 - linear leaves, 2-7 cm long, 0.5-2 mm wide
 - pointed/rounded tips and 3 veins.
 - **stipules free from leaf base, appear to stick out in leaf axils**
- Stem: - Slender and profusely branched
 - with small paired yellowish glands at leaf base
- Flower: - in 1-4 whorls on spikes measuring 3-15 mm long;
 - spikes not always above the water;
 - on stalks to 5 cm long, often curved at the base.



Potamogeton pectinatus?



5. Strap-Leaved Submersed

- Some *Sagittarias*
- *Vallisneria*

Sagittaria filiformis

(*S. stagnorum* in Godfrey & Wooten)

- Can have phylloidial (strap-like) and spatulate floating lvs
- Phylloidia flat, 1-15 mm, maybe 1-3 ridges
- Stalks of fruiting heads recurved, pedicels 1.5-6.5 cm



Sagittaria filiformis
Photo by Belinda Lambert

Sagittaria isoetiformis

Quillwort Arrowhead

- Stalks of fruiting heads **ascending**
- Phylloidal lvs 0.5-5 mm wide
- Can have longer phylloidal leaves in deep water
- **Does not produce small floating leaves**



Specimens



Sagittaria graminea

Grassleaf arrowhead

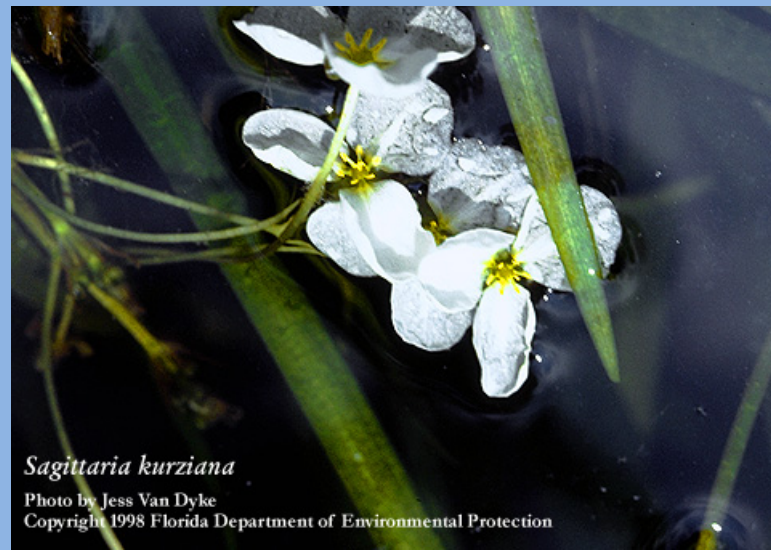
- Highly variable, typically narrow emerged lvs
- Separated from *S. lancifolia* by size and flower filaments (dilated at base in *S. graminea*)



Sagittaria kurziana

Strap-leaf Sagittaria

- Occurs only in spring-fed systems (?)
 - Leaves: - $\frac{3}{4}$ " wide
 - Sharp, pointed tips (*Vallisneria* = rounded)
 - 3 to 5 prominent ridges that run the entire length of the leaf
 - Flowers: - Emerged/floating on branched stalks
 - 3 white petals
- stalk of fruiting head recurved



Sagittaria kurziana

Photo by Jess Van Dyke

Copyright 1998 Florida Department of Environmental Protection

Vallisneria vs. *Sagittaria kurziana*

Leaves: thick midsection

Leaf tips: rounded

leaf size varies for both!

Flowers: spiral peduncle,
single thick unit

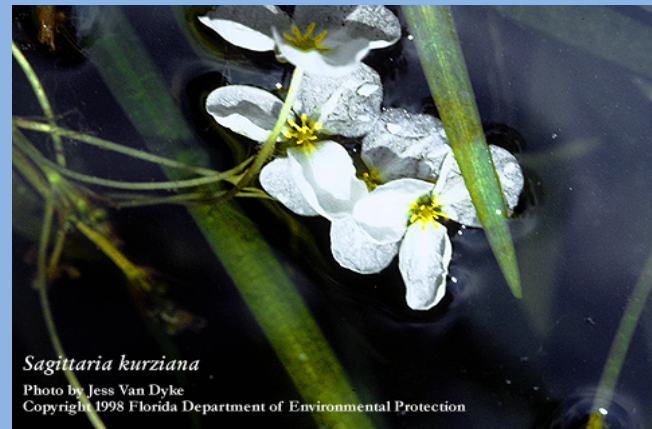
5 distinct ridges

pointed

several white flowers
on straight peduncle



Vallisneria americana
Photo by Shirley Denton



Sagittaria kurziana

Photo by Jess Van Dyke
Copyright 1998 Florida Department of Environmental Protection

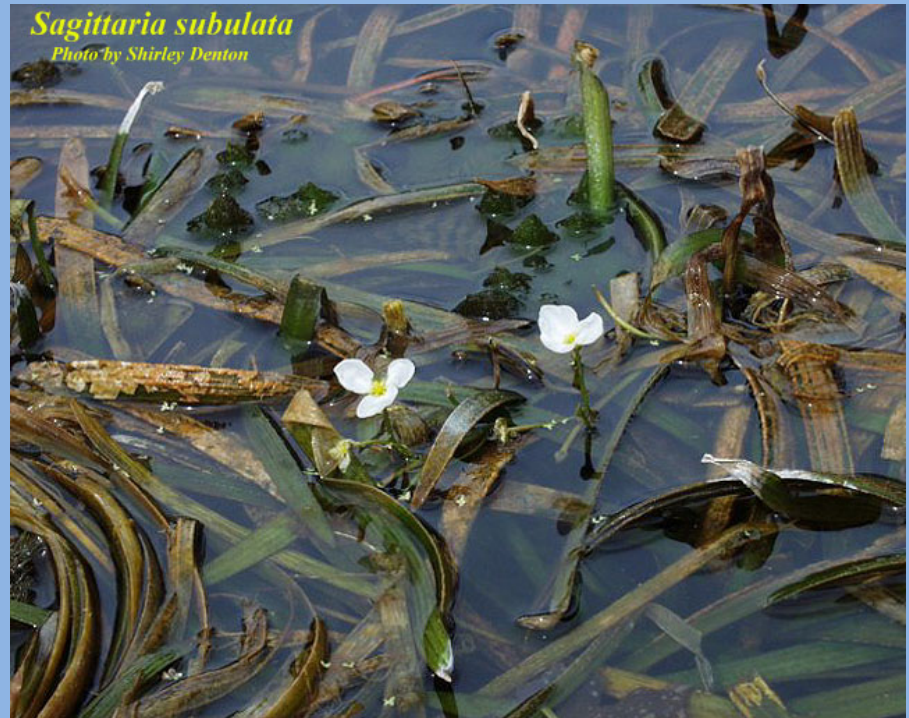
Vallisneria

COMMON
TOP TEN



Sagittaria subulata

- Found in shallow brackish tidal areas
- Phylloidia lens shaped in cross section
- Fruiting pedicels 0.2-1.1 cm
- Does not form spatulate leaves



Sagittaria subulata



Photo by Dr. Loran Anderson, St. Johns River

What is this?



Lilaeopsis chinensis (Apiaceae)

- Small, carpet forming, leaves resemble *Sagittaria*
- Fruits in umbel
- Usually found in tidal waters and brackish marshes



What do we have here?

6. Bladderworts

Utricularia

- 14 Species in Florida, all native
- 7 species commonly found in lakes
 - CAN be identified without flowers!!
- Distinguishing characteristics
 - Growth form
 - Flower color and features
 - Size
 - Branching pattern
 - Bladders

Species Matrix for AQUATIC *Utricularias*

(modified from D. Denson)

Species	Habit	Flower	Lf branching
<i>U. inflata</i>	floating, floating petioles	Yellow, 9-14 fls/raceme, scape below float 15-35 cm long	Primary divisions of leaflike branches unequal
<i>U. radiata</i>	floating, floating petioles	Yellow, 3-4 fls/raceme, scape below float <13 cm long	Primary divisions of leaflike branches equal
<i>U. foliosa</i>	floating, large and leafy	Yellow	Thick flat main stem , then fernlike leaves (bladder & lf)
<i>U. floridana</i>	Rooted, appears floating	Yellow	Round stems, foxtails, bladder and leafy branches
<i>U. purpurea</i>	floating	Purple	Whorls of 4
<i>U. gibba</i>	Grows freely on bottom or other veg, usually tangled mat	Yellow	Thin strands with single short leaves
<i>U. olivacea</i>	Free in water, single strands with bladders, confused with <i>U. gibba</i>	White (1 mm)	Thin strands with single short leaves- tiny plant

Species Matrix for ROOTED *Utricularias*

Bladders in soil or sediment

Species	Habitat	Fl color	Lf branching
<i>U. gibba</i>	Grows in stands, flowers when stranded	Yellow	Thin strands with single short leaves
<i>U. resupinata</i>	Ponds, ditches, can be caught on froth	Purple, 1 fl/scape	Lvs grass-like w/ segments, green above and white w/ bladders near rhizome
<i>U. cornuta</i>	Lake margins, pine flatwoods	Yellow	
<i>U. subulata</i>		Yellow	Lvs paddle-like
<i>U. simulans</i>	Pine flatwoods	Yellow, bracts and sepals fimbriate	Lvs paddle-like
<i>U. amethystina</i>	Pine flatwoods	Purple/white, > 1 fl/scape	Lvs in rosette

COMMON

U. inflata (big)



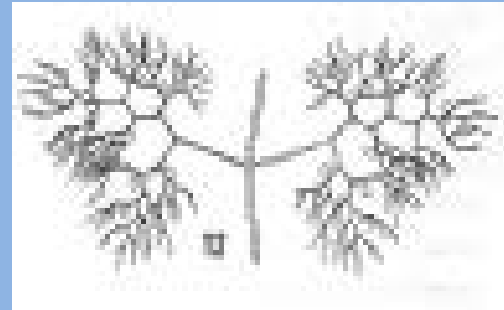
Photo credit: Diana Marti, DEP

OCCASIONAL

U. radiata (small)



U. inflata (big) *U. radiata* (small)



U. inflata – Unequal branching

U. radiata – Equal branching

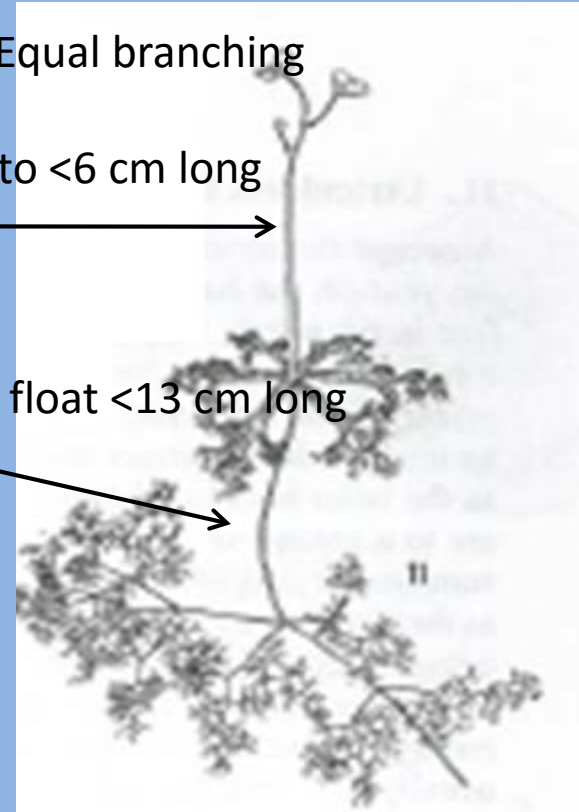
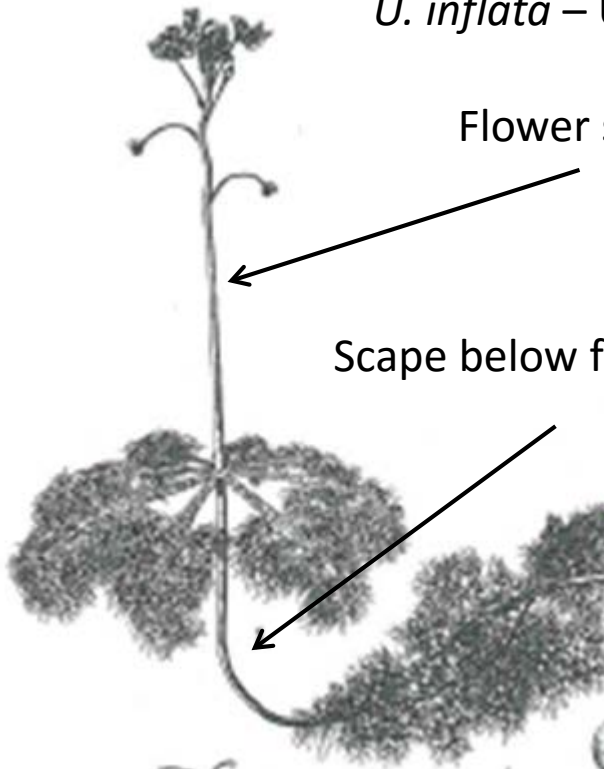
Flower stalk to 15 cm long

Flower stalk to <6 cm long

Scape below float 15-35 cm long

Scape below float <13 cm long

Bladders similar



COMMON

U. Inflata (big)

- Unequal branches



OCCASIONAL

U. radiata (small)

- Equal branches



U. Inflata
frotus catch

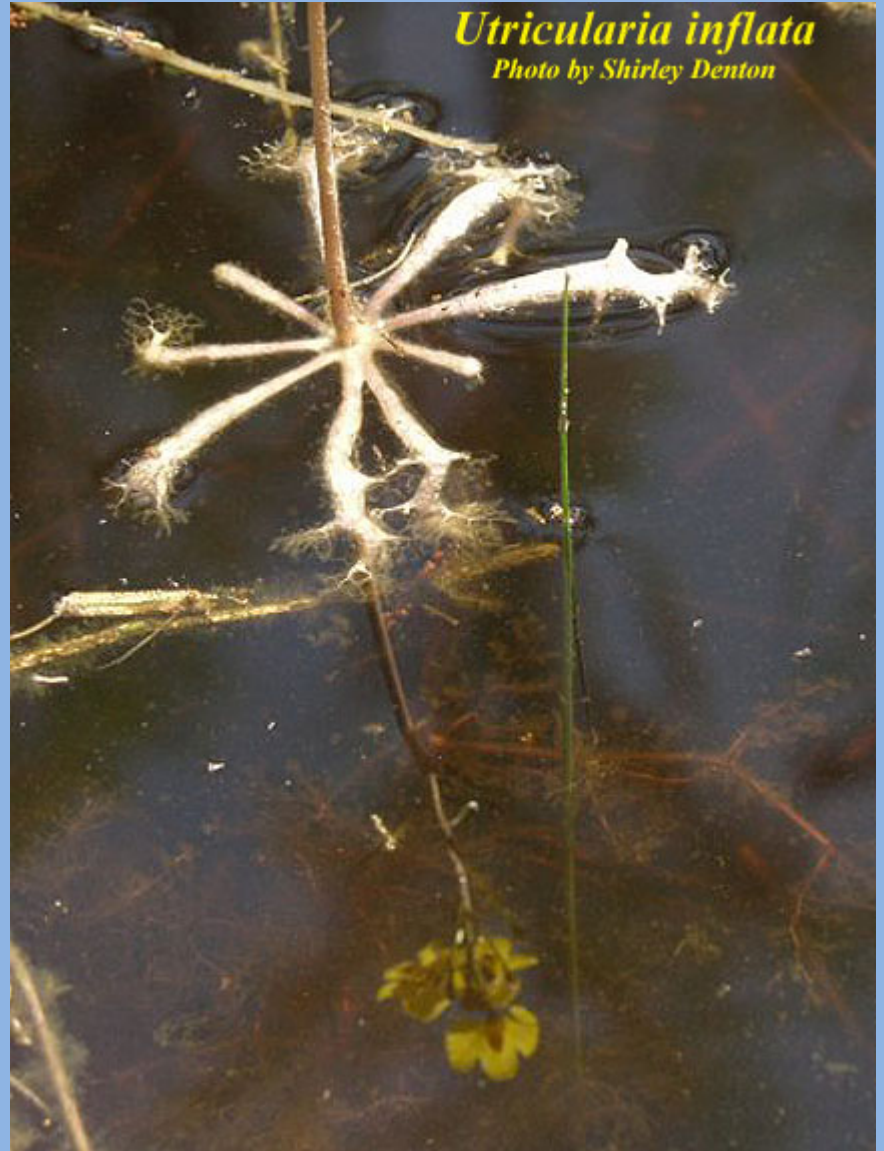


Utricularia inflata

Utricularia inflata
Photo by Shirley Denton



Utricularia inflata
Photo by Shirley Denton



Utricularia
radiata



Utricularia foliosa

- Leafy bladderwort
- Thick, strong, flat, slimy main stem
- Bladder branches and foliar branches



COMMON
TOP TEN

U. foliosa

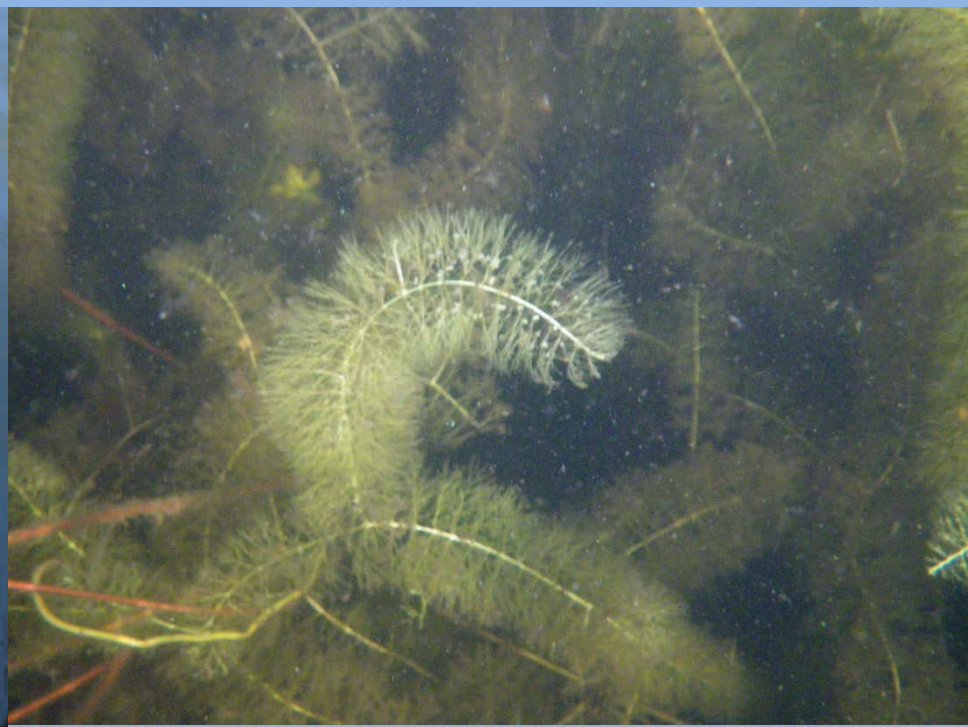


**Some branches with leaves,
some branches with bladders**



Utricularia floridana

- Foxtails, bladder branches and foliar branches
- Flowers appear to be floating, but stems rooted
- Locally abundant
- Coloration green to purple



COMMON

Utricularia floridana at Porter Pond, Jackson County, 2010

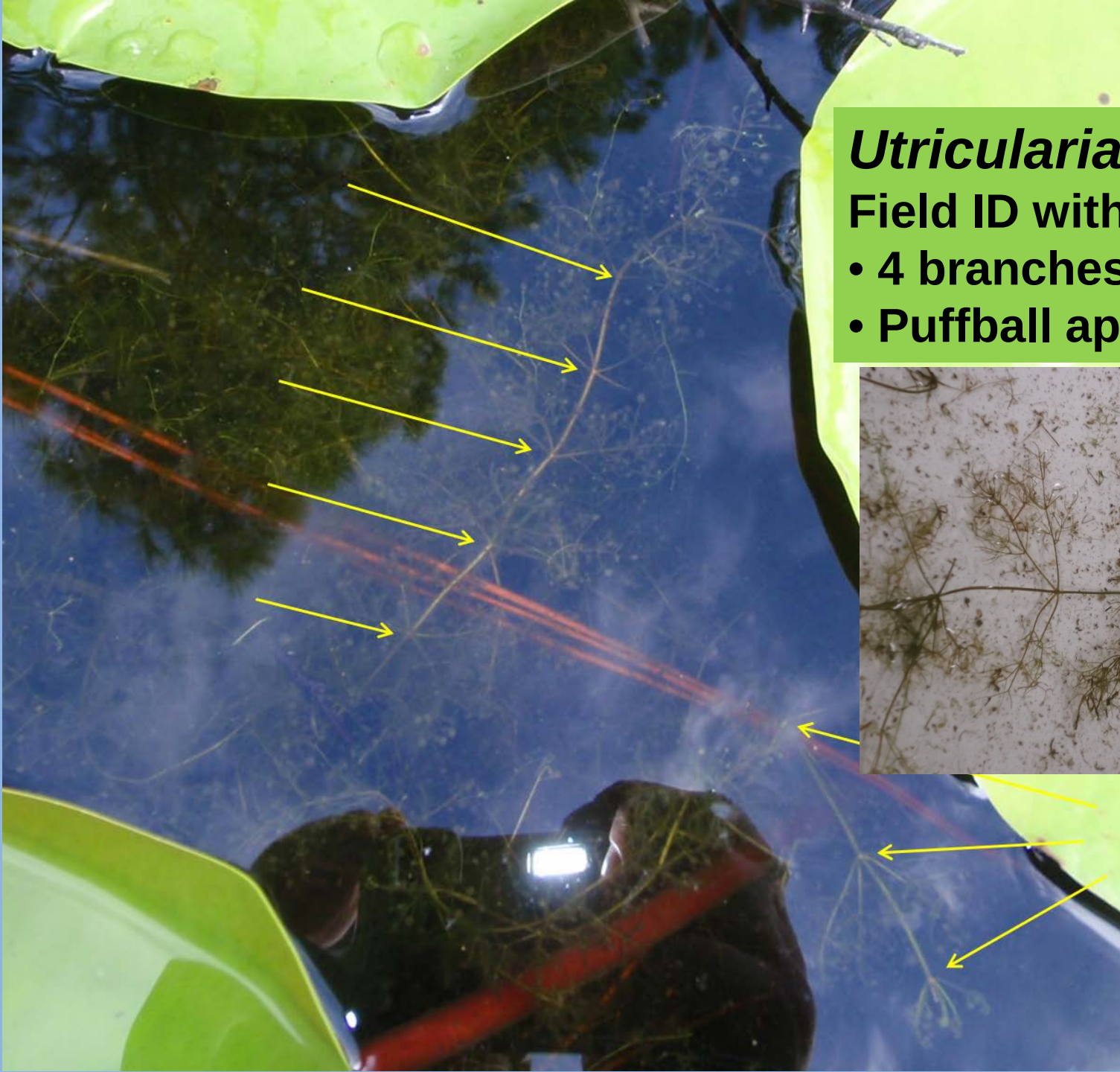
Utricularia purpurea

- Smaller in stature than *U. foliosa* and *U. floridana*
- Whorled branches, usually 4 per whorl (puff balls)
- Purple flowers
- Floating



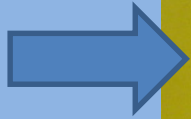
Utricularia purpurea
Field ID without flowers

- 4 branches per node
- Puffball appearance

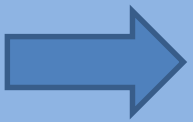


U. floridana vs. *U. purpurea*

U. floridana



U. purpurea



Utricularia gibba (biflora)

- Very small stems, often seen in mats, with or without flowers
- Yellow fls in pairs
- Small leaves as lateral branches, 1-2 times forked



COMMON

Utricularia gibba
(humped bladderwort)



COMMON

Utricularia gibba

38

40

42

44

15

16

17



RARE

Utricularia olivacea

- TINY!!! Flowers 1 mm wide
- No leaves, just tiny stems with bladders
- Found tangled in other vegetation or stranded on mudflats



U. olivacea
vs. *U. gibba*

Photo credit: Leif Boman, DEP



Utricularia resupinata

- Flowers in shallow waters, but found in deeper
- Froetus catches it!



Utricularia resupinata



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Bladderworts without flowers

- Don't be scared to try to ID them to species
- Branching patterns
- Growth form
- Bladders? (some drawings in G&W)

Eleocharis species

- We are going to cover the **submersed** *Eleocharis* taxa:
 - Some vegetatively reproduce and are very difficult to ID to species
 - Other are more robust and can be ID'ed in the field or the lab
 - Growth form can be completely submersed or submersed/emergent

OCCASIONAL ***E. robbinsii*** and ***E. elongata*** **COMMON**
submersed/emergent, long and skinny

- ***E. robbinsii***
 - Restricted to panhandle
 - Triangular stems
 - Spike same color as stem, very papery
 - Can have submersed hair-like sterile stems
- ***E. elongata***
 - Very similar in growth form to *E. robbinsii*, but stems not triangular
 - Often no spikes present
 - Can have submersed hair-like sterile stems

Eleocharis robbinsii

- Triangular stem tips
- Fleshy stems, easy to crush
- Can grow in very deep water (2 m)
- Green above surface, orange below surface
- Fruiting tip not wider than stem





St. Marks NWR lake: *Rhynchospora tracyi*, *Eleocharis elongata*, *Fuirena scirpoidea*

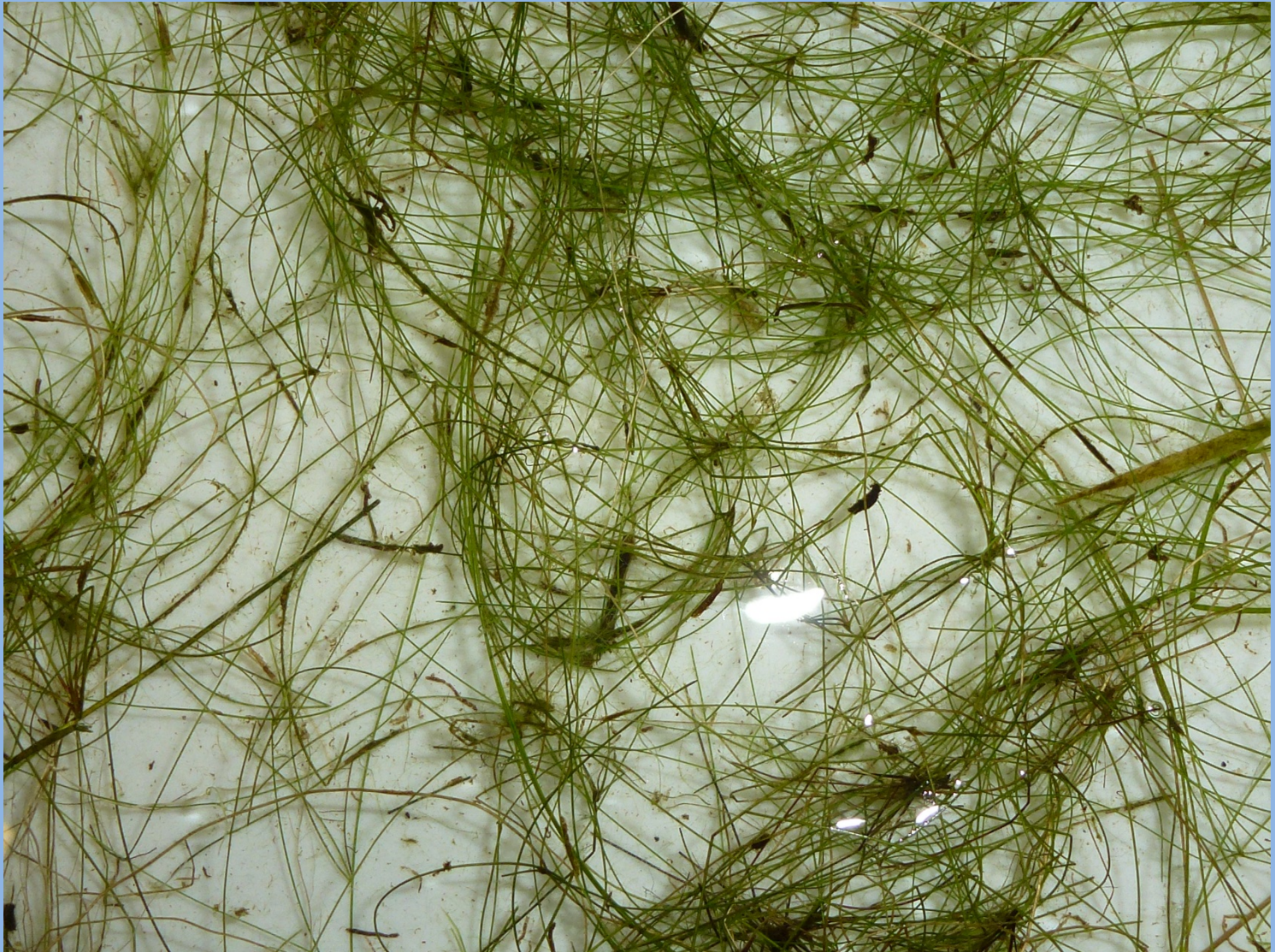


Eleocharis elongata and *Nymphaea odorata*

Eleocharis (submersed viviparous)

- These are submersed species with delicate, wiry stems, and they produce new plantlets at their tips (they are clonal). They have a CC score assigned as “submersed viviparous” and can be left at that level
- *E. acicularis*
- *E. vivipara* has red spots on sheaths
- *E. baldwinii* – no red spots

Eleocharis (submersed viviparous)



Emergent, mat-forming growth form of
Eleocharis baldwinii



Websteria confervoides

sedge closely related to *Eleocharis*, with wiry, whorled branchlets



Websteria confervoides

OCCASIONAL



Websteria confervoides

OCCASIONAL



Zannichellia palustris

Horned Pondweed

- Small plant, grows as carpet
- Fruits in pairs or clusters
- St. Johns River, Kings Bay, Chass. River



Stuckenia pectinata

(*Potamogeton pectinatus*)

Sago pondweed

- Submersed plant with no floating leaves
- Arise from thick matted rhizomes with terminal tuberos bulbs
- Stems: - branched
 - long and slender
- Leaf blades: - alternate
 - filiform, margins entire
 - 8 cm long, 1 mm wide
 - originated at the apex of the sheath
 - stipules not free, like sheaths 2-5 cm long around stem



What is this?



***Ruppia maritima*, expected in brackish waters**

Ruppia vs. *Stuckenia*

Stipular sheaths on
Stuckenia pectinatus



31.
A. *Ruppia maritima* L. Seestrands-Ruppia.
B. *Potamogeton pectinatus* L. Fadenblättriges Samkraut.

By Kurt Stüber

What's this?

06.04.2013 09:53