Why are you here?

- Besides for the CEUs, of course...
- Provenance
- Growth potential
- Control requirements
- Control methods
Terminology

- Plant type
- Growth habit
- Plant parts
Plant type

- Woody
  - Rigid
  - Durable

- Herbaceous
  - Soft
  - Flexible
Growth habit

- **Emergent**
  - Rooted in the sediment
  - Some parts above the waterline

- **Submersed**
  - Rooted or anchored in the sediment
  - Most or all parts below the waterline

- **Floating**
  - Roots below the waterline but not anchored
  - Most or all other parts above the waterline
Plant parts

- Vegetative
  - Leaf shape
  - Leaf margin
  - Leaf arrangement
  - Other...

- Flowers

Leaves

- **Leaf parts**
  - Blade
  - Apex
  - Base
  - Petiole (no petiole = sessile)
  - Appendages (stipules, ligules)

- **Leaf type – simple vs. compound**

Illustrations from: http://www.vplants.org/plants/glossary/plate02.html
Leaf shape

- Based on apex and base
  - Elliptic – narrow oval; narrower at apex and base
  - Cordate – heart-shaped; notched base
  - Lanceolate – lance-shaped; length > width
  - Linear – long and narrow; parallel sides
  - Sagittate – arrowhead-shaped; basal lobes point down (hastate – basal lobes point out)

Illustrations from: http://www.echocamp.org/grounds/red/flower/term/leaf/shape.html
Leaf margin

- **Blade edge**
  - **Entire** – smooth
  - **Serrate** – sharp teeth pointing forward
  - **Cleft** – cut about halfway to the base
  - **Palmate** – deeply lobed from a common point

Illustrations from: http://www.vplants.org/plants/glossary/plate04.html
Leaf attachment

- How the leaf is attached to the stem
  - Basal/rosette – at the base of the plant
  - Alternate – one leaf per node
  - Opposite – two leaves per node
  - Verticillate (whorled) – three or more leaves per node

illustrations from: http://www.vplants.org/plants/glossary/plate02.html
Other vegetative traits...

- On stem or leaves
  - Hairs
  - Texture
  - Coloration, speckling
  - Stipules
  - Ligules
Flowers

- **Flower parts**
  - Petals (corolla)
  - Sepals (calyx)
  - Pistils (female)
  - Stamens (male)

- **Support**
  - Peduncle
  - Pedicels
  - Sessile

Illustrations from: http://www.vplants.org/plants/glossary/plate09.html
Flowers

- Solitary flower (peduncle)
- Inflorescence with multiple flowers
  - Panicle – branched
  - Raceme – unbranched with pedicellate flowers
  - Spike – unbranched with sessile flowers
  - Spathe and spadix – large bract surrounding a spike inflorescence

[Images of plant structures labeled as 'PANICLE', 'RACEME', 'SPIKE', and 'SPADIX with SPATHE']
Now for the main event...
Plants!

- Emergent
- Floating-leaved
- Shoreline – herbaceous and woody
- Floating – small and large
- Submersed – vascular and algae
- Grasses and grass-like
- Rushes
Emergent plants

- Rooted in the sediment
- At least part of the plant is above the waterline
- Examples:
  - Alligatorweed – *Alternanthera philoxeroides*
  - East Indian hygrophila – *Hygrophila polysperma*
  - Smartweed – *Polygonum* spp.
  - Bacopa – *Bacopa caroliniana, B. monnieri*
  - Creeping primrose willow – *Ludwigia repens*
  - Roundleaf toothcup – *Rotala roundifolia*
Alligatorweed 😞

- **Habitat**: shallow water, wet feet
- **Leaves**:
  - Simple
  - Elliptic
  - Smooth margins
  - Opposite
- **Hollow stems**
- **Small papery white flowers**
Alligatorweed 😞
East Indian hygrophila

- Habitat: streams and slow-moving water
  - Most of plant is submersed
  - Upper few inches above waterline

- Leaves:
  - Simple
  - Elliptic
  - Smooth margins
  - Opposite

- Square stems

- Small bluish-white to white flowers in leaf axils
East Indian hygrophila

Hygrophila polysperma

Photo by Ann Murray
Copyright 1999 Univ. Florida
Smartweed 😞 😊

- **Habitat:** fresh and brackish water
  - Mostly shallow water
  - Shoreline, ditches

- **Leaves:**
  - Simple, sessile, clasping
  - Lanceolate
  - Smooth margins
  - Alternate with swelling where leaf attaches to stem

- Small pink to white flowers borne on a spike
Smartweed 😞 😊

Knotwood
*Polygonum spp.*
Photo by A. Murray
Copyright 2002 Univ. Florida
Bacopa ☺

- Habitat: fresh and brackish water
  - Most of plant is submersed
  - Upper few inches above waterline

- Leaves:
  - Simple
  - Fleshy
  - Smooth margins
  - Opposite
Lemon bacopa 😊

- Nearly round leaves
- Blue flowers
Bacopa 😊

- Oblanceolate leaves
- White flowers
Creeping primrosewillow 😊

- Habitat: fresh and brackish water
  - Most of plant is submersed
  - Upper few inches above waterline

- Leaves:
  - Simple
  - Nearly round
  - Smooth margins
  - Opposite
  - Underside reddish

- Green stems
- Small yellow flowers
Creeping primrosewillow 😊
Rotala 😞

- Habitat: Shallow water, wet feet
- Leaves:***
  - Simple
  - Round
  - Smooth margins
  - Opposite
  - Submersed - lanceolate
- Bright red stems
- Bright rose flowers
  borne on terminal spike
Rotala 😞
Easily confused…

- Bacopa, primrosewillow and rotala
  - Fleshy green stems and leaves $\rightarrow$ bacopa
  - Thinner green stems, red under leaves $\rightarrow$ primrosewillow
  - Thin bright red stems $\rightarrow$ rotala
Floating-leaved plants

- Rooted in the sediment
- Most of the plant is below the waterline
- Examples:
  - Yellow waterlily – *Nymphaea mexicana*
  - Fragrant white waterlily – *Nymphaea odorata*
  - Banana lily – *Nymphoides aquatica*
  - Crested floatingheart – *Nymphoides cristata*
  - Water snowflake – *Nymphoides indica*
  - American lotus – *Nelumbo lutea*
  - Spatterdock – *Nuphar lutea*
Yellow waterlily ☀ FL, ☹ CA

- Habitat: still and slow-moving water
- Leaves:
  - Simple, up to 8”
  - Nearly round
  - Cleft
- Yellow flowers
- Basal peduncle
Yellow waterlily ☺ FL, ☹ CA
Fragrant white waterlily 😊

- Habitat: still and slow-moving water
- Leaves:
  - Simple, up to 8”
  - Nearly round
  - Cleft
- Fragrant white flowers
- Basal peduncle
Fragrant white waterlily 😊
Banana lily 🌷

- Habitat: still and slow-moving water
- Leaves:
  - Simple
  - Nearly round
  - Notched, round base
- Cluster of roots just below the leaves looks like a bunch of bananas
- Small white papery flowers
Banana lily 😊
Crested floatingheart 😞

- Habitat: still and slow-moving water
- Leaves:
  - Simple
  - Cordate, round base
  - Dark red markings
- Bananas below leaves
- Small white flowers with a central crest
Water snowflake 😞

- Habitat: still and slow-moving water
- Leaves:
  - Simple
  - Round to cordate, rounded base
- Bananas below leaves
- Small white or yellow “pipe-cleaner” flowers
Water snowflake 🙁
Easily confused…

- *Nymphoides* spp.
  - Green leaves, papery white flowers $\rightarrow$ *N. aquatica* 😊
  - Red on leaves, crested white flowers $\rightarrow$ *N. cristata* 😞
  - Green leaves, fuzzy white or yellow flowers $\rightarrow$ *N. indica* 😞

Banana lily
*N. aquatica*

Crested floatingheart
*N. cristata*

Snowflake lily
*N. indica*

*N. peltata* pic from http://www.victoria-adventure.org/aquatic_plants/david/nymphoides_peltata02_th.jpg
American lotus 😊

- Habitat: still and slow-moving water
- Leaves:
  - Simple, up to 12”
  - round
  - Peltate
  - Basal
  - Floating, emergent
- Rhizome – corn-dog
- BIG yellow flowers
- Basal peduncle
American lotus 😊
Spatterdock 😊

- **Habitat:** still and slow-moving water

- **Leaves:**
  - Simple, up to 10”
  - Cordate to sagittate
  - Basal
  - Floating, emergent, submersed

- **Yellow flowers that look partially open**

- **Basal peduncle**
Spatterdock 😊

Airboat in the spatterdock
*Nuphar advena*
Photo by Vic Ramey
Copyright 2000 Univ. Florida
Herbaceous shoreline plants

- Rooted in the sediment
- Most or all of the plant is above the waterline
- Somewhat soft and flexible

Examples:
- Wild taro – *Colocasia esculenta*
- Lizard’s-tail – *Saururus cernuus*
- Alligatorflag – *Thalia geniculata*
- Pickerelweed – *Pontederia cordata*
- Arrowhead – *Sagittaria lancifolia, S. latifolia*
Wild taro 🙁

- **Habitat:** shallow water, wet feet, terrestrial
- **Leaves:**
  - Simple, up to 2’ long
  - Sagittate
  - Peltate
  - Dark green and velvety
  - Petiole up to 4’ long
  - Basal
- **White to cream flowers**
- **Basal spathe and spadix**
Wild taro

Colocasia esculenta
Photo by Ann Murray
Copyright 1999 Univ. Florida
Lizard’s-tail 😊

- Habitat: shallow water, wet feet
- Plant height to 2’
- Leaves:
  - Simple, up to 4” long
  - Cordate to sagittate
  - Clasping
  - Alternate
- White flowers borne on a bottlebrush spike
Lizard’s-tail 🌱
Alligatorflag 😊

- Habitat: shallow water, wet feet
- Leaves:
  - Simple, up to 8” x 2.5’
  - Lanceolate, broad base
  - Petiole to 4’ long
  - Basal
- Pairs of inflorescences (scorpoid cyme) with small purple flowers borne on peduncles up to 7’ long
Alligatorflag 😊
Pickerelweed 😊

- **Habitat:** shallow water, wet feet
- **Leaves:**
  - Simple, up to 8” long
  - Cordate to lanceolate
  - Petiole to 4’ long
  - Basal
- **Blue, purple or white flowers borne on a raceme-like inflorescence**
Arrowhead 😊

- Habitat: shallow water, wet feet
- Leaves:
  - Simple, up to 2' long
  - Petiole to 4’ long
  - Basal
- White 3-petaled flowers
Arrowhead 😊

- Narrow-leaf arrowhead – lanceolate leaves
Arrowhead 😊

- Broad-leaf arrowhead – sagittate leaves
Woody shoreline plants

- Rooted in the sediment
- Most or all of the plant is above the waterline
- Rigid and woody (shrubby, tree-like)
- Examples:
  - Buttonbush – *Cephalanthus occidentalis*
  - Marsh hibiscus – *Hibiscus coccineus*
  - Peruvian primrosewillow – *Ludwigia peruviana*
Buttonbush 😊

- Habitat: shallow water, wet feet
- Plant height to 6’
- Leaves:
  - Simple, up to 3” long
  - Lanceolate
  - Coarse
  - Verticillate/whorled
- Nifty white to cream ball-shaped inflorescence
Buttonbush

*Cephalanthus occidentalis*

Photo by A. Murray
Copyright 2002 Univ. Florida
Marsh hibiscus 😊

- Habitat: shallow water, wet feet
- Plant height to 6’
- Leaves:
  - Simple, up to 6” long
  - Juvenile – cleft
  - Mature – palmate
  - Alternate
- Large red flowers
Marsh hibiscus 😊
Peruvian primrosewillow 😞

- Habitat: shallow water, wet feet
- Plant height to 7’
- Leaves:
  - Simple, up to 4” long
  - Lanceolate
  - Alternate
- Bright yellow flowers
Small floating plants

- Not rooted in the sediment
- Most or all of the plant is above the waterline except for the roots

Examples:
- Mosquitofern – *Azolla caroliniana*
- Common salvinia – *Salvinia minima*
- Giant salvinia – *Salvinia molesta*
- Landoltia duckweed – *Landoltia punctata*
- Native duckweeds – *Lemna* spp., *Spirodea polyrrhiza*
- Watermeal – *Wolffia* spp.
Mosquitofern 😊

- True fern
- Habitat: slow or still water
- Up to ½” across
- Roots up to 2” long
- Fronds:
  - Cleft/lobed
  - Green to red
Mosquitofern 😊
Common salvinia 😞

- True fern
- Habitat: slow or still high-organic water
- Up to $\frac{3}{4}$” across
- “Roots” = fronds
- Upper fronds:
  - Oval
  - Joined in pairs
  - Stiff hairs
Common salvinia 😞
Giant salvinia 😞

- True fern
- Habitat: slow or still high-organic water
- MUCH larger
- “Roots” = fronds
- Upper fronds:
  - “Egg-beater” hairs
Giant salvinia 😞
Landoltia duckweed 😞

- Old name: *Spirodela punctata*
- Habitat: still or stagnant water
- Smallish
- Up to 5 roots
- Leaves:
  - Shoe-shaped
  - Usually joined in pairs
  - May have red margin on the underside
Landoltia duckweed 😞
Native duckweeds 😊

- Habitat: still or stagnant water
- Giant (*Spirodea polyrrhiza*)
  - Larger than exotic
  - Many roots
  - Round leaves, dark red underside
- Common (*Lemna* spp.)
  - Small
  - Single root
  - Shoe-shaped leaves
Native duckweeds 😊...
Watermeal 😊

- Habitat: slow or still water
- REALLY tiny – smallest flowering plant
- Easier to feel than see
Watermeal 😊
Large floating plants

- Not rooted in the sediment
- Most or all of the plant is above the waterline except for the roots

Examples:
- Waterhyacinth – *Eichhornia crassipes*
- American frogsbit – *Limnobium spongia*
- Waterlettuce – *Pistia stratiotes*
Waterhyacinth 😞

- Habitat: almost any fresh water
- Height: up to 2’
- Leaves:
  - Round
  - Leathery
  - Spongy or inflated petioles
  - Basal
- Roots
  - Dark
  - Feathery
Waterhyacinth 😞
American frogsbit 😊

- **Habitat:** almost any fresh water
- **Height:** up to 2’
- **Leaves:**
  - Round or cordate
  - Leathery
  - Stiff petioles with ridges
  - Basal
- **Roots**
  - Lighter
  - Smoother
American frogsbit 😊
Easily confused…

- Waterhyacinth and American frogsbit
  - Inflated petioles, dark feathery roots → Waterhyacinth 😞
  - Stiff petioles, light smooth roots → American frogsbit 😊
Waterlettuce 😞? 😊?

- Habitat: almost any fresh water
- Width: up to 2’
- Leaves:
  - Thick
  - Dull green
  - Sessile
- Roots
  - Light
  - Feathery
Waterlettuce 😞? 😊?
Submersed vascular plants

- Rooted or anchored in the sediment
- Most or all of the plant is below the waterline

**Examples:**
- Coontail – *Ceratophyllum demersum*
- Fanwort – *Cabomba caroliniana*
- Parrotsfeather – *Myriophyllum aquaticum*
- Egeria – *Egeria densa*
- Hydrilla – *Hydrilla verticillata*
- Southern naiad – *Najas guadalupensis*
- Illinois pondweed – *Potamogeton illinoensis*
- Bladderwort – *Utricularia* spp.
- Tapegrass, eelgrass – *Vallisneria americana*
Coontail 😊

- Habitat: shallow to deep sluggish water
- Raccoon
- Leaves:
  - Finely cut
  - Verticillate/whorled
  - Feathery
  - Small teeth on midribs
  - Coarse feel
- No roots
  - Free-floating or may be anchored
- Flowers tiny and rare
Coontail 😊
Fanwort 😊 (🚫 in NE/NW)

- Habitat: shallow to deep sluggish water
- Leaves:
  - Finely cut
  - Opposite or verticillate
  - Feathery
  - Smooth/soft
- Rooted in sediment
- Flowers are pink, white or purple and up to ½” across
Fanwort

*Cabomba caroliniana*

Photo by Vic Ramey
Copyright 2002 Univ. Florida

😊
Easily confused...

- Coontail and fanwort
  - No roots, coarse feel, tiny flowers → coontail 😊
  - Rooted, smooth feel, larger flowers → fanwort 😊
Parrotsfeather

- Habitat: shallow water, shoreline
- Leaves:
  - Emergent – cut
  - Verticillate – 4 to 6 leaves
  - Feathery
  - Trail along surface
  - Erect at tips
- Rooted in sediment
Parrotsfeather

*Myriophyllum aquaticum*

Photo by Alison Fox
Copyright 1998 University of Florida
Egeria 😞

- Habitat: almost any water
- Leaves:
  - Strap-shaped
  - Serrate margin
  - Very fine teeth (lens)
  - Verticillate – 3 to 6 leaves
- Rooted in sediment
- White flower ¾” across on short peduncle
Hydrilla

- Habitat: almost any water
- Leaves:
  - Strap-shaped, pointed apex
  - Serrate margin
  - Coarse “saw-teeth”
  - Verticillate – 4 to 8 leaves
- Rooted in sediment
- Tiny white flower on long peduncle
Hydrilla
Easily confused...

- Egeria and hydrilla
  - Fine teeth on margin, large flowers $\rightarrow$ egeria 😞
  - Coarse teeth, small flowers $\rightarrow$ hydrilla 😞
Southern naiad 😊

- Habitat: still or slow-moving water
- Leaves:
  - Narrow (< 1/16” x 1”)
  - Serrate margin
  - Distinct tiny teeth (lens)
  - Opposite or verticillate
  - Green to purplish
- Rooted in sediment

![Image of Southern naiad](image.png)
Southern naiad 😊
Illinois pondweed 😊

- Habitat: almost any water
- Leaves:
  - Floating: elliptic, to 8”
  - Submersed: lanceolate
  - Long petioles
  - Opposite or verticillate
- Rooted in sediment
- Greenish flowers on short spike
Illinois pondweed

Potamogeton illinoensis

Photo by A. Murray
Copyright 2001 Univ. Florida
Bladderwort 😊

- **Habitat:** still or slow-moving water
- **Leaves:**
  - Finely cut
  - Opposite or verticillate
  - Feathery
  - Smooth/soft
- **No roots**
  - Free-floating or may be anchored
- **Bladders on leaf segments are carnivorous…**
- **Yellow or purple two-petaled flowers on long petioles**
Bladderwort 😊
Tapegrass, eelgrass 😊

- **Habitat:** almost any water
- **Leaves:**
  - Up to 1” wide
  - Long, strap-like
  - Rounded apex
  - Basal
- **Rooted in sediment**
- **Female flowers on long spiral peduncles**
Tapegrass 😊

Tape grass
Vallisneria americana
Photo by Vic Ramey
Copyright 2001 Univ. Florida
Submersed algae

- Look like vascular plants but they aren’t...
- Anchored in the sediment – no roots
- Examples:
  - Muskgrass – *Chara* spp.
  - Stonewort – *Nitella* spp.
Muskgrass 😊

- Habitat: almost any water
- “Leaves” (actually branchlets):
  - Very narrow, thread-like
  - Verticillate
  - Very coarse
- No roots – only anchored in sediment
- Aromatic…
- Mistaken for coontail and fanwort - smelly
Muskgrass 😊
Stonewort ☺

- Habitat: almost any water
- “Leaves” (actually branchlets):
  - Very narrow, thread-like
  - Verticillate
  - Soft
- No roots – only anchored in sediment
- Not aromatic…

image from http://www.victoria-adventure.org/victoria_images/outdoor_setup/nitella_th.jpg
Stonewort 😊

image from http://www.okstate.edu/artsci/biol3253/boomer/NITELLA.JPG
Grasses and grass-like plants

- Rooted in the sediment
- Most or all of the plant is above the waterline
- Examples:
  - Maidencane – *Panicum hemitomon*
  - Torpedograss – *Panicum repens*
  - Giant reed – *Arundo donax*
  - Paragrass – *Urochloa mutica* (*Brachiaria purpurascens*)
Maidencane 😊

- Habitat: shallow water, wet feet
- Stem length to 6’
- Leaves:
  - Simple, up to 1” x 12”
  - Linear
  - Loose smooth or hairy ligule
  - Bright green
- Small green flowers on inflorescence up to 12”
Maidencane 😊
Torpedograss 😞

- **Habitat:** shallow water, wet feet
- **Stem length** to 2 ½’
- **Leaves:**
  - Simple, up to ¼” x 10”
  - Linear
  - Clasping hairy ligule
  - Bluish cast
- **Small yellow flowers** on inflorescence up to 9”
Torpedograss 😞

Photo by Vic Ramey
Torpedo grass
Panicum repens
Easily confused...

- Maidencane and torpedograss
  - Wider bright green leaves, loose ligule → maidencane 😊
  - Narrow bluish leaves, clasping ligule → torpedograss 😒
Giant reed 😞

- Habitat: shallow water, wet feet
- Stems to 2” x 20’ (!!!)
- Leaves:
  - Simple, up to 2” x 3’
  - Lanceolate
  - Papery ligule with hairy margin
- Dense feathery whitish to brown inflorescence up to 2’ long
Giant reed

Arundo donax

Photo by A. Murray
Copyright 2001 Univ. Florida
Paragrass 😞

- Habitat: shallow water, wet feet
- Stem length to 12’
- Leaves:
  - Simple, up to $\frac{3}{4}” \times 12”$
  - Linear
  - Loose hairy overlapping ligule
- Small purplish flowers on inflorescence
Paragrass 😞
Rushes

- Rooted in the sediment
- Most of the plant is above the waterline
- Examples:
  - Spikerushes – *Eleocharis cellulosa, E. cellulosa*
  - True rushes – *Juncus effusus, J. megacephalus*
Spikerushes (*Eleocharis*)

- Habitat: Shallow water, wet feet
- No leaves – just a sheath at the base of the stem
- No branching
- Inflorescence is a single spikelet borne on the tip of the stem
Jointed spikerush

*Eleocharis interstincta*

Photo by Vic Ramey
Copyright 2001 Univ. Florida
Club-rush 😊
True rushes (*Juncus*)

- Habitat: Shallow water, wet feet
- May have leaves (or not…)
- Open sheath at the base of the stem
- Rounded stems
- Multi-branched inflorescence
Soft rush 😊
Big-headed rush 😊
Resources

- Plant Identification Terminology: An Illustrated Glossary (Harris and Harris)

- CAIP website: http://plants.ifas.ufl.edu

- vPlants: A Virtual Herbarium of the Chicago Region: http://www.vplants.org/plants/glossary/index.html
That’s all, folks…

- You can remember all that, right?
- Questions?
- Check out the plants!

Thank you!!!
Thank you!

- Thanks for coming to the 2013 Aquatic Weed Control Short Course – see you next year!

Lyn Gettys, Ph.D. • lgettys@ufl.edu • Go GATORS!!!