# Aquatic Invasive Plants

## Watch List for Ontario

Ontario Invasive Plant Council

Invasive Species Centre

Ontario

# 2016 Best Management Practices Webinars

**The complete 2016 Webinar series includes**:

- *Phragmites* Management in Lambton Shores
- *Phragmites* Management in Municipal Drains in the City of Kingsville
- Invasive *Phragmites:* Best Management Practices
- Clean Equipment Protocol: Inspecting and Cleaning Equipment for the Purposes of Invasive Species Prevention
- Grow Me Instead: Beautiful, Non-Invasive Plants for Your Garden
- Wild Parsnip: Best Management Practices
- Aquatic Invasive Plant Watch List for Ontario
- Japanese Knotweed: Best Management Practices
- Community Engagement in an Urban Greenspace: Stewardship Successes & Struggles in Invasive Species Management

# Ontario Invasive Plant Council (OIPC)

- Formed in 2007
- Provides a coordinated, provincial response to the growing threat of invasive plants
- Created by, and consists of, representatives from:
  - All levels of government
  - Non-government organizations
  - Academia
  - First Nations
  - Industry

Ontario Invasive Plant Council

- Three staff members take direction from Board of Directors and members
- Projects delivered with help of partners, who sit on the 6 OIPC committees (Fundraising, Policy, Research and Control, Ontario *Phragmites* Working Group, Horticultural Outreach Collaborative, Communications)

# Aquatic Watch List for Ontario

## Goals of the Workshop

To provide land managers with the information they need to accurately identify and report new aquatic invasive species in Ontario.

## Plants to be Covered

- ✓ European lake sedge
- ✓ Rough mannagrass
- ✓ Water mosses
- ✓ Water lettuce
- ✓ Water chestnut
- ✓ Water soldier
- ✓ Water hyacinth
- ✓ Parrot's feather
- ✓ Hydrilla
- ✓ Brazilian waterweed

Brazillian Waterweed

Photo by: Amy Richard

# Definitions

## Native (indigenous):

- A species that has existed in a given area prior to European settlement (native flora and fauna have evolved inter-dependently over eons = balance)

## Non-native (alien/exotic):

- A species that has been introduced by human action  from another geographic region to an area outside its natural (past or present) distribution

## Invasive:

- Harmful alien species whose introduction or spread threatens the environment, the economy or society, including human health

Water Soldier in the Trent River

Photo by Francine MacDonald

# Impacts of Invasive Plants

These 10 species all form large, dense floating mats which can:

- Out-compete native plants for light and nutrients
- Change the physical and chemical characteristics of lakes, streams, rivers, ponds etc.
- Restrict water flow
- Interfere with irrigation or infrastructure
- Disrupt storm drainage or hydro-electrical generation
- Increase flood potential
- Impede recreational activities
- Reduce oxygen levels in the water, impacting fish & other aquatic organisms
- Reduce biodiversity
- Can create ideal breeding habitat for mosquitoes
- Threaten species at risk

# Impacts of Invasive Plants

Water hyacinth

- Mats of water hyacinth increase evapotranspiration (water from earth into the atmosphere) leading to losses of water from dams, reservoirs and lakes

Water chestnut

- Seeds of water chestnut have sharp, barbed spines which may cause injuries to swimmers and others recreationists

Water soldier

- Sharp serrated leaf edges of water soldier can cut swimmers and individuals who handle water solider plants

Parrot's feather

- A major nuisance in irrigation and drainage canals, impedes water flow. Can restrict recreational activities such as angling, swimming and boating

# Pathways of Spread

- Spread as a contaminant in hay (European lake sedge)
- Seeds, turions and rhizomes can be transported by beaver, muskrats or waterfowl
- Seeds, turions and rhizomes can be spread by contaminated equipment (fishing gear, boat motors, etc.)
- Plant materials used in hunting blind construction
- Spread from roadside ditches by road maintenance vehicles
- Sold as an ornamental plants for ponds or water gardens
- Grown for livestock forage (rough manna grass)
- Intentionally planted near or along shorelines
- Discarded into a waterway and/ or carried off by flooding during rain events
- Inappropriate disposal of aquarium contents into waterways

# The Watch List


Water Hyacinth

Photo by: Karen Brown, University of Florida, Budgwood.org

# European Lake Sedge (*Carex acutiformis*)

- AKA: lesser pond sedge
- Cyperaceae family (sedge)
- Large emergent grass-like plant
- Introduced as a contaminant in hay imported from Europe
- High priority invasive plant (Canadian Botanical Association, 2004)
- Ranked 14th overall among invasive plants found in Canada
- Differ from grasses in that they have triangular stems in cross section, as opposed to grasses which have round stems

Photo by: Wikimedia Commons

# European Lake Sedge – Identification

- **Height**: Grows up to 1 m
- **Leaves**: 5.5 mm wide, remain green longer into the fall and after frost (unlike most of our native sedge species)
- **Stem**: Feel triangular at the base (as opposed to grasses)
- **Flowers**: Produces multiple flower spikes per stem (2-4 on staminate/male spikes and 2-5 on pistillate /female spikes) that are serrated, cylindrical and approximately 3-8 cm long and 7 mm wide
- **Female Spikes**: Are densely flowered, erect and attached directly to stem
- **Fruit**: 3 sided, hairless, coarsely veined with 12-18 veins and between 3-4.5 mm in length
- **Fruiting**: Between June and August

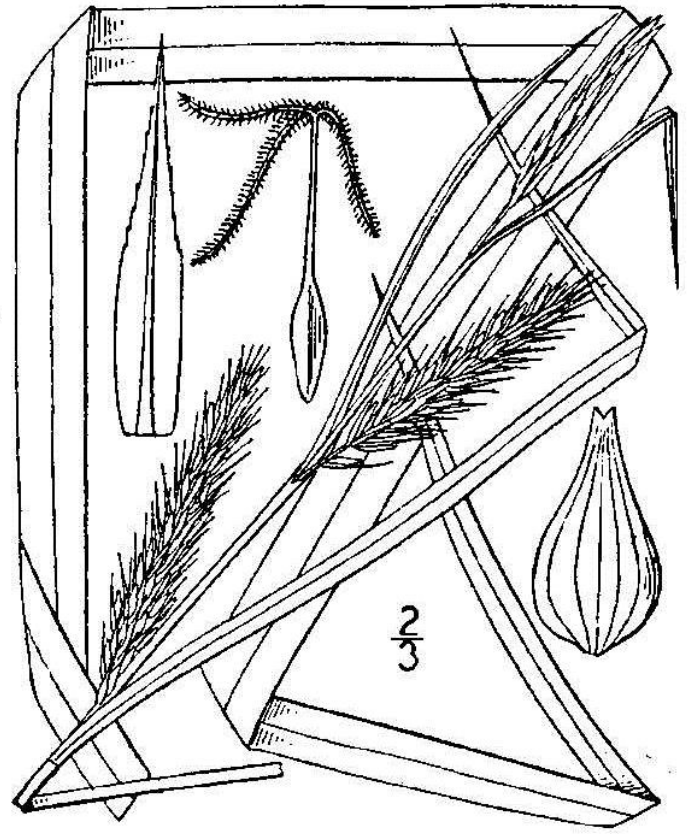
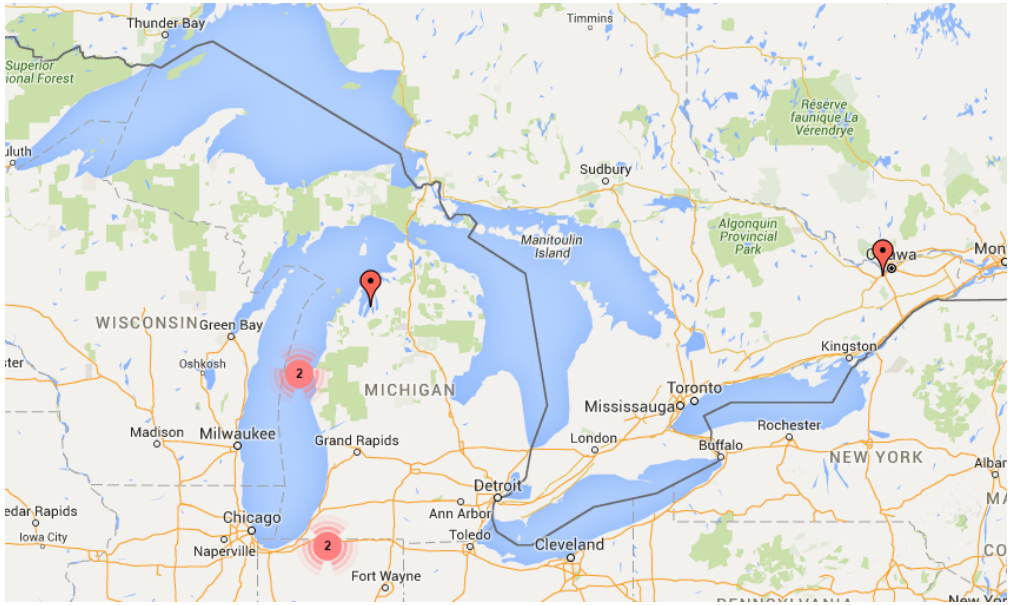



Illustration courtesy of USDA-NRCS PLANTS Database

# European Lake Sedge – Habitat and Distribution

## Habitat

- Often found growing in clumps along the water's edge
- Found in wide range of wetlands including swamps, marshes open thickets and shorelines
- Most often grows around open water, but has also been found growing in dry, semi open areas of old fields in Ontario




Map courtesy of EDDMapS

## Distribution

- **Ontario:** Known to be present at one location in Stony Swamp, near Ottawa, where it dominates an area of six acres
- **U.S.:** Very limited distribution in the eastern US in Maryland, Indiana, New York, Massachusetts and Connecticut

# Rough Mannagrass (*Glyceria maxima)*

- AKA: reed mannagrass, reed meadow grass and reed sweet grass
- Tall, emergent aquatic grass
- Poaceae (grass) family
- Intentionally introduced to North America for use as livestock forage
- First North American record came from Cootes Paradise, near Hamilton at the far west end of Lake Ontario in the mid 1940s
- Found both in its variegated and non-variegated forms

Photo by: Paul Hackney

# Rough Mannagrass – Identification

- **Height**: 1 to 2.5 m
- **Stems**: Unbranched, reddish in colour on the lower portion
- **Leaves**: Flat, pointed and stiff, with prominent midribs; grow up to 40 cm long and 1.2 – 1.9 cm wide; green and creamy white stripes and the margins of the leaf rough with short stiff hairs
- **Flower Stem**: Open and branched, growing up to 30 cm tall
- **Flower Head**: Erect; many yellow, green or purple narrow spikelets
- **Seeds**: Small (1.5 – 2 mm long) smooth and dark brown, with a deep and narrow central furrow (groove in the seed)

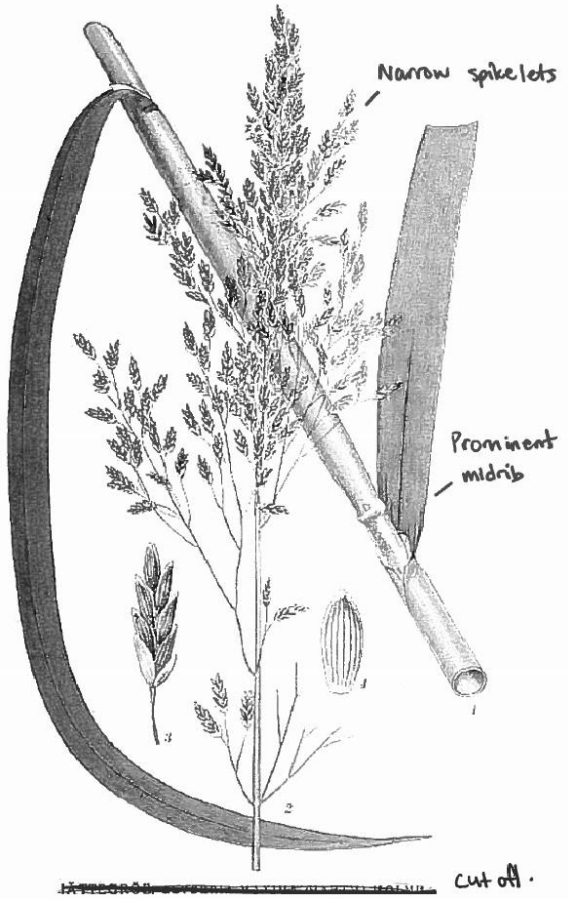
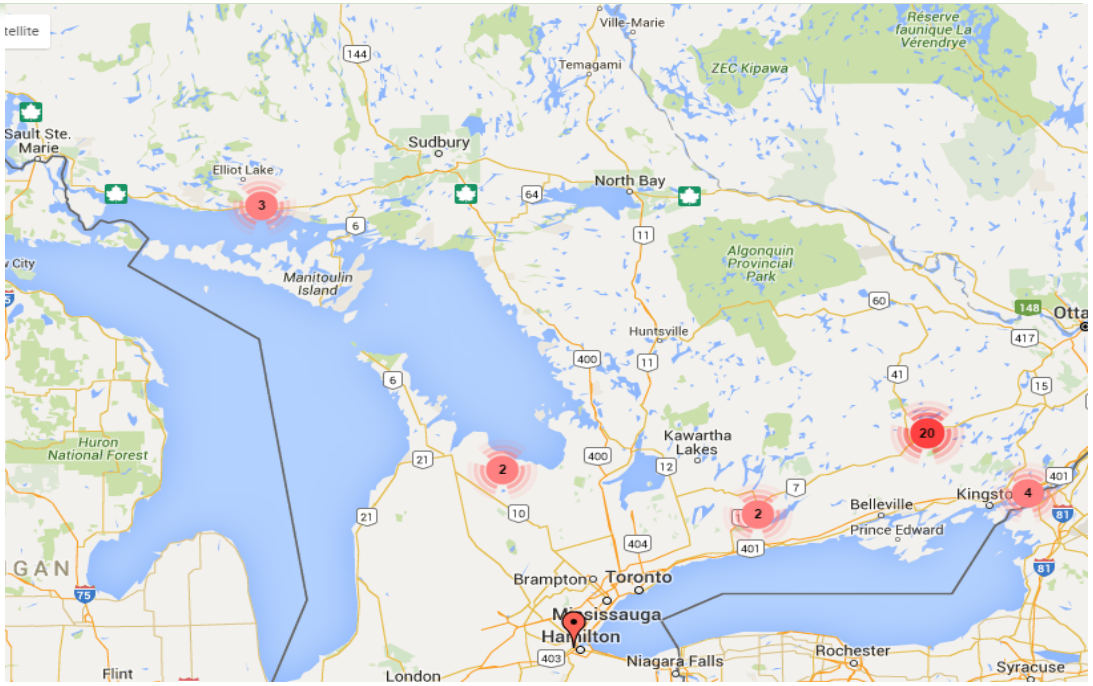



Illustration courtesy of Wikimedia Commons

# Rough Mannagrass – Habitat and Distribution

## Habitat

- Wide variety of wet habitats: shoreline edges, riparian zones, deep water, stream margins, rivers, lakes and wetlands
- Can form thick mats along bank Prefers direct sunlight but tolerates part shade




Distribution Map courtesy of EDDMapS

## Distribution:

- Native to Europe and temperate Asia
- **Ontario**: Widespread and locally abundant in wetlands in SE Ont. (eg. Hamilton to Burlington) & scattered records elsewhere in S. Ont.
- **Canada**: Found in British Columbia and Newfoundland
- **U.S.**: Found in Wisconsin, Massachusetts, Washington and Illinois

# Watermosses (*Salvinia spp.*)

*S. molesta, S. auriculata, S. minima, S. natans*

- Small, floating, aquatic ferns
- Members of the Salvinaceae family
- Native of warm temperate to tropical regions of the world, including Central and South America
- Three species not native to North America; one species native to Mexico (eared watermoss)


Photo by: Barry Rive, sarracenia.com, Bugwood.org

# Watermoss Species

- **Giant salvinia**: (*S. molesta*) aka cariba weed. Native to Brazil, has become established in over 20 countries.
- **Eared watermoss**: (*S. auriculata*) aka African payal and butterfly fern. It is native to Central and South America.
- **Common salvinia**: (*S. minima*) aka water spangles. It is native to Central and South America.
- **Floating fern**: (*S. natans*) aka floating watermoss, floating moss, and water butterfly wings. It is native to Africa, Asia and Europe.
- Available in the water garden and aquarium trade.


Giant Salvinia

Photo by : Robert Videki, Bugwood.org

# Watermosses – Identification

- **Leaves**: Flat; Found in whorls of three but appear paired, with two floating and one that is submerged; floating leaves are green, simple, rounded and up to 4 cm in diameter; either have short petiole or no petiole
- **Hairs**: Upper surface of the leaves have erect forked hairs
- **Submerged Leaves:** Root-like, finely dissected, with a petiole.
- **Stems:** Creeping, branched and bear hairs.
- **Roots**: The plants lack true roots.

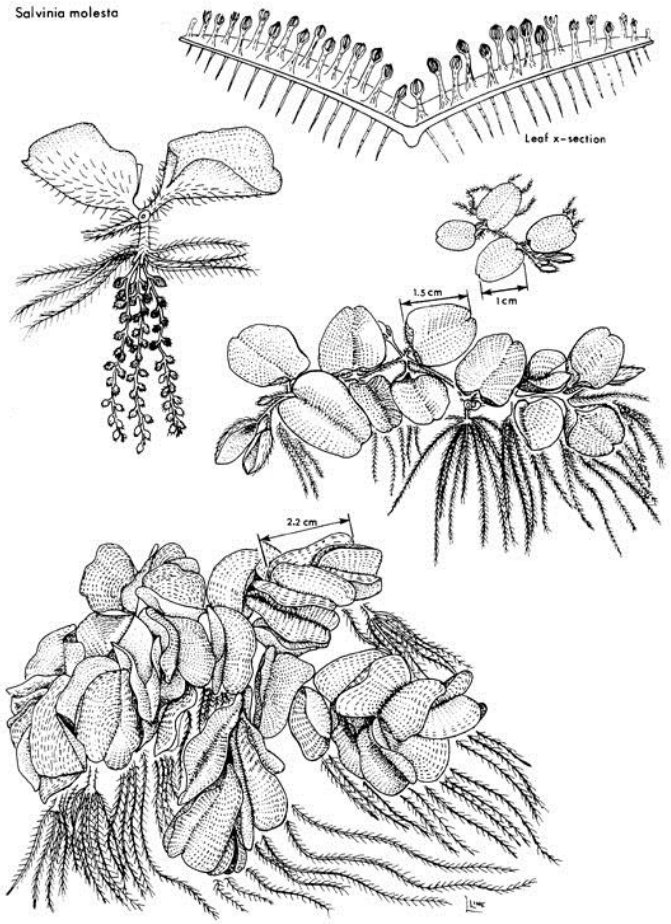



Illustration courtesy of University of Florida/IFAS Center for Aquatic and Invasive Plants

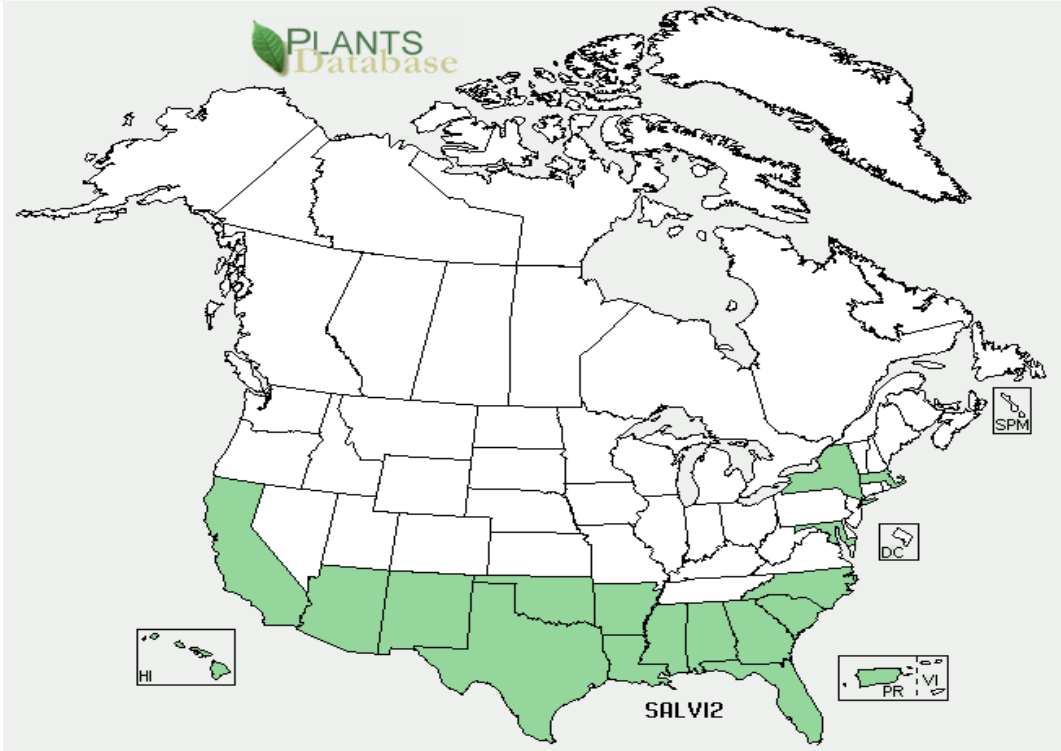
# Watermosses – Habitat and Distribution

## Habitat

- Open and still waters, flood canals, rivers, lakes, reservoirs, and swamps
- Optimal growing conditions include full sunlight and warm (23-29°C) nutrient-rich waters

## Distribution

- **Ontario and Canada**: Not found yet
- **U.S.**: Common salvinia and floating fern reported in New York and Massachusetts; common salvinia and giant salvinia reported in 12 southern states




Distribution Map courtesy of U.S. Department of Agriculture

# Water Lettuce (*Pistia stratiotes*)

- Floating, annual aquatic plant
- Aaceae (arum) family
- First reported in North America in the mid 1700s, likely introduced from the release of ship ballast water in the U.S.


Photo by: Karen Brown, University of Florida, Bugwood.org

# Water Lettuce – Identification

- **Plant**: Resembles an open head of lettuce floating on the water
- **Leaves**: Floating, form tight rosette, no stems; spongy, light green, prominent ridges running parallel to each other; rounded at the top; 2 to 20 cm in length
- **Roots**: Submerged and hang beneath the rosette of the leaves, up to 50 cm in length
- **Flowers**: Small, white to pale green, produce green berries that turn brown as they mature

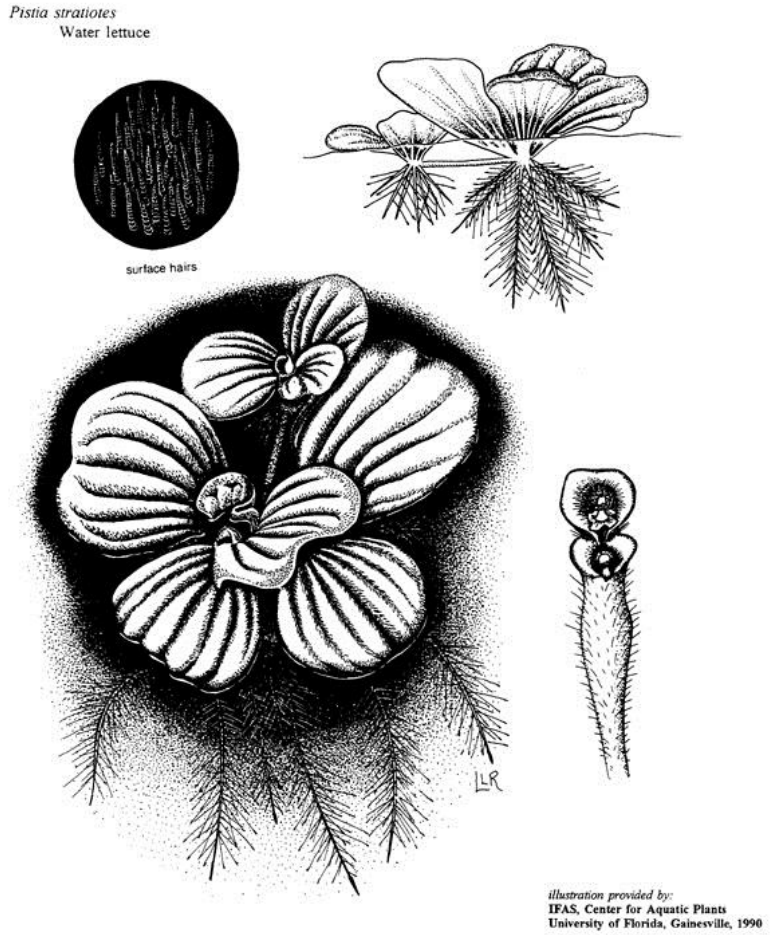
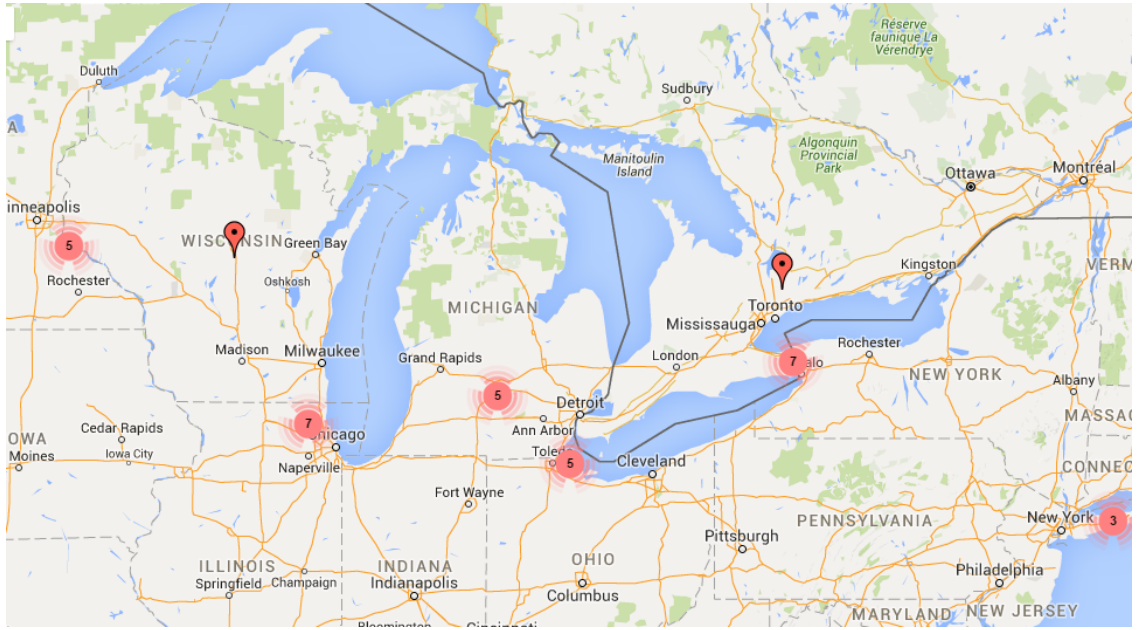



Illustration courtesy of University of Florida/IFAS Center for Aquatic and Invasive Plants

# Water Lettuce – Habitat and Distribution

Distribution Map courtesy of EDDMapS




## Habitat

- Grows in slow moving waters (slow rivers, ditches, lakes, ponds, canals etc.)
- Not winter hardy, limited in temperate regions by long, cool winters
- Minimum growth temperature is 15°C, optimum 22°–30°C

## Distribution

- Native to South America, Africa and Asia
- **Ontario**: Found in the Rideau Canal in Ottawa, along the Welland Canal in the Niagara Region, in the Lake Simcoe watershed, and found co-occurring with Water Hyacinth in Lake St. Clair
- **Canada**: Found in Hubley Lake near Halifax, Nova Scotia
- **U.S.**: Found in more than 18 States

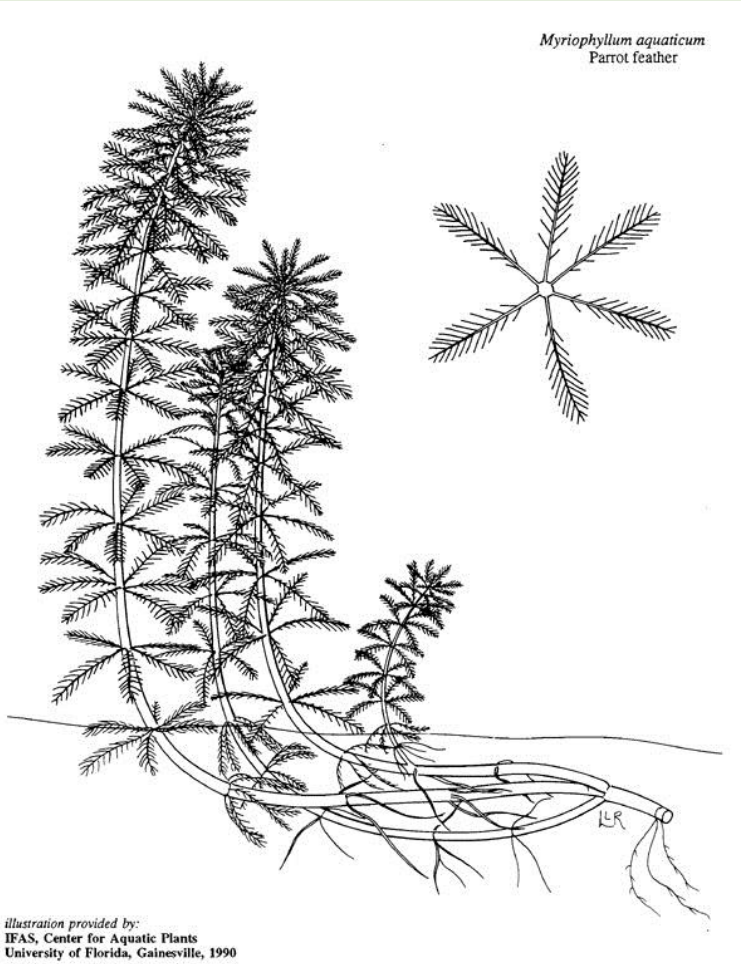
# Parrot's Feather (*Myriophyllum aquaticum)*

- AKA: water-milfoil, brazilian water-milfoil and water-feather
- Submergent/emergent, perennial
- Haloragaceae (water-milfoil) family
- Continues to be a popular plant for use maintaining oxygen in home aquariums and water gardens


Photo by: Graves Lovell, Alabama Department of Conservation and Natural Resources, Bugwood.org

# Parrot's Feather – Identification

- **Emersed Leaves**: Feathery lime-green "waxy''; grow above water in whorls of 4-6 leaves (2.5 to 5 cm long, with 10-18 leaflet pairs); whorls largely spaced at the base of the stem
- **Submersed Leaves**: Limp, brownish in colour, often appear to be decaying
- **Plant**: Long unbranched stems that arise from roots and rhizomes
- **Rhizomes**: Can either root in the sediment (if the water is shallow) or remain unburied and float just under the water's surface.
- **Emergent Stems**: Can grow up to 30 cm above the water surface, with tiny white flowers (female plants only) whorled on a terminal spike.




Illustrations courtesy of University of Florida/IFAS Center for Aquatic and Invasive Plants.

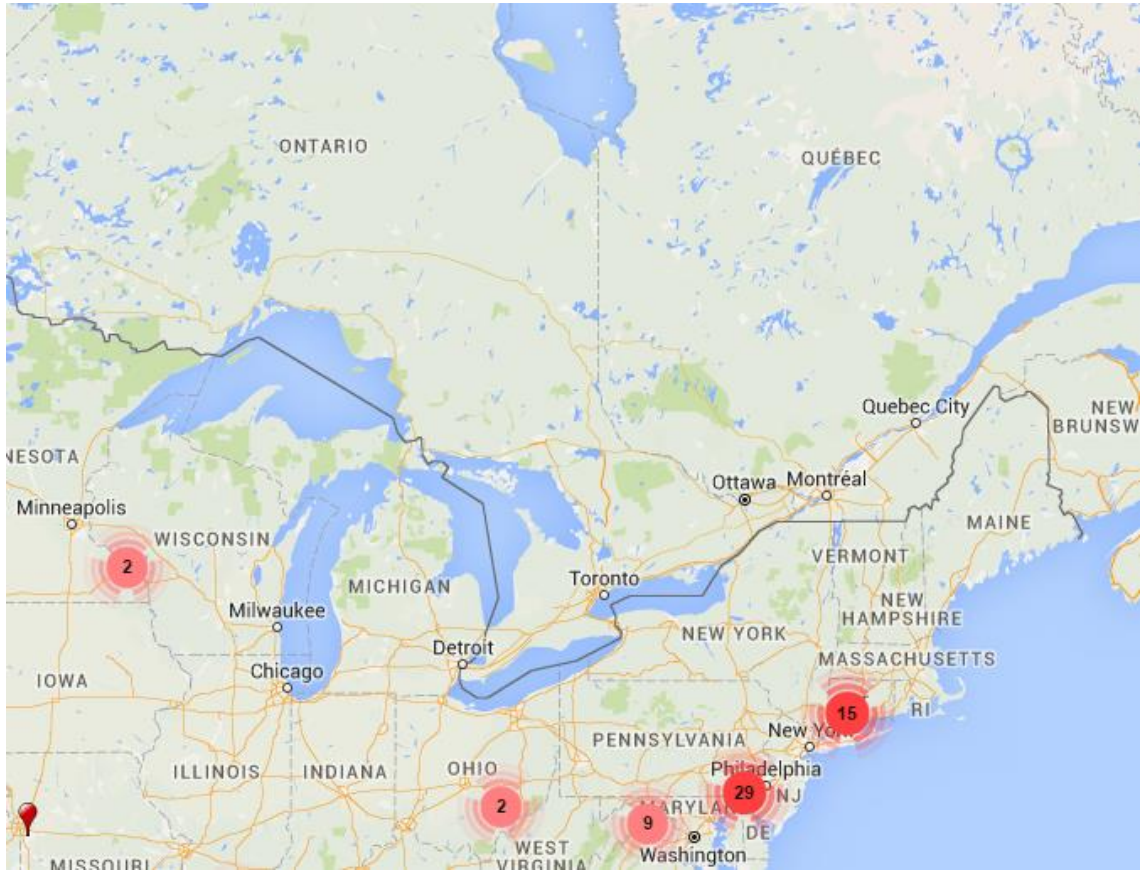
# Parrot's Feather – Habitat

- Typically grows rooted in shallow water, in ponds, lakes, streams and ditches
- Can be found floating in deep high-nutrient waters
- Prefers slow moving or still water
- Can survive during seasonal drought when it may be "stranded" on riverbanks or lake shores with no water.

Photo by: Maryland Department of Natural Resources

# Parrot's Feather – Distribution

- Native to South America, introduced to North America via the aquarium trade in the late 1800s
  - Can now be found on every continent except Antarctica
- **Ontario**: Small population found in a public pond in the Midhurst area. This population was eradicated by filling the pond in 2006
- **Canada**: Present in B.C.'s Fraser River Valley
- **U.S.**: Found in Connecticut, Delaware, New York, Michigan, Ohio, Pennsylvania; prevalent in the southern US and some west coast states




Distribution Map courtesy of EDDMapS

# Hydrilla (*Hydrilla verticillata)*

- AKA: water thyme, water weed and Florida elodea
- Considered one of the world's **worst** invasive aquatic plants
- Submerged, perennial, rooted plant
- Hydrocharitaceae (frog-bit) family
- Grows under low light conditions allowing plant to colonize deep water where native vegetation cannot survive
- Can also propagate readily from broken stem or root fragments

# Hydrilla – Identification

- **Leaves**: Small, bright green, whorles (8 to 20 mm long) attached directly to the stem
- **Whorl**: 3 to 8 leaves in one whorl and each leaf pointed with saw-toothed margins; undersides have sharp teeth along the midrib
- **Forms**: Two forms; one where male and female flowers appear on separate plants (dioecious) and one where male and female flowers appear on the same plants (monoecious)
- **Flowers**: Each has 3 petals and 3 sepals; males are short stalked, found as a single flower or in pairs in the leaf axils; appear during the summer and fall
- **Petals**: 2-3 mm long, whitish to reddish in colour; female flower petals and sepals are up to 4 mm long, and whitish with light green with red streaks, extend on slender stalks up to 10 cm in length
- **Turions**: Formed from rhizomes & are brownish with a smooth surface and those formed from erect stems are green with scales

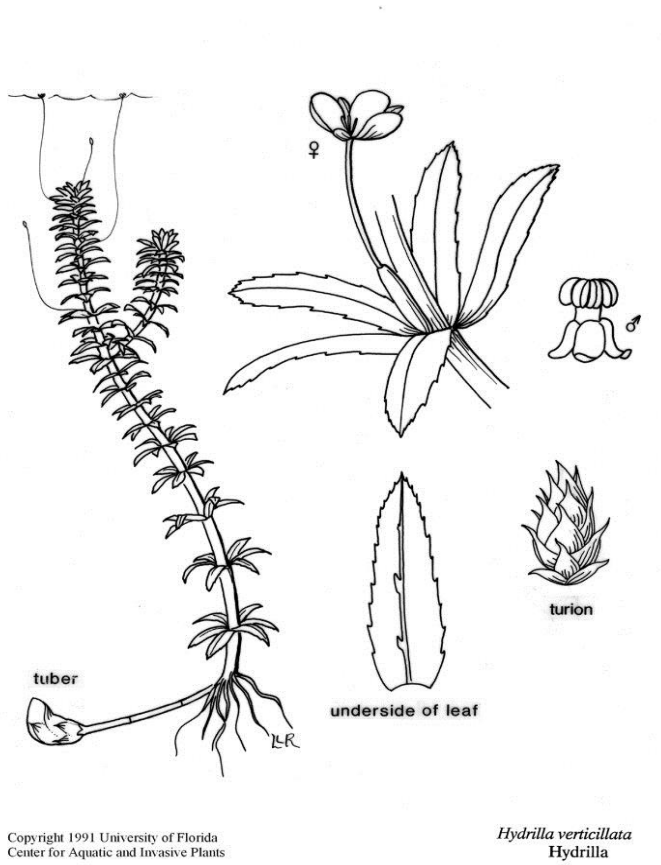



Illustration courtesy of University of Florida/IFAS Center for Aquatic and Invasive Plants

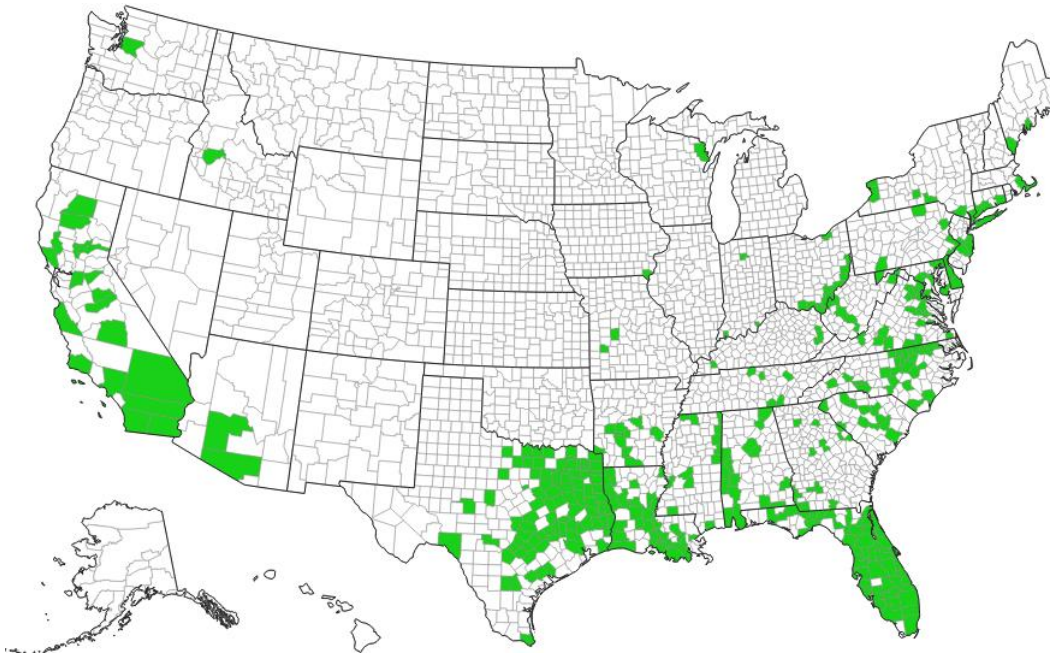
# Hydrilla – Habitat and Distribution

## Habitat

- Introduced in 1950s to Florida through aquarium/nursery trade and spread rapidly through intentional plantings
- Lakes, rivers, ponds, streams and wet ditches
- Can withstand low light conditions and grow in shallow (as little as 50 cm) as well as deep (up to 7 m) water

## Distribution

- Native to Asia
- **Ontario and Canada**: Not yet reported
- **U.S.**: Reported in approximately 30 states; recently found in New York



# Brazillian Waterweed (*Egeria densa)*

- AKA: Brazilian elodea, common waterweed, dense waterweed, egeria, leafy elodea, South American waterweed
- Commonly sold as an aquarium plant as Anacharis
- Submerged, perennial, aquatic plant
- Hydrocharitaceae (frog-bit) family


Photo by: William T. Haller, University of Florida, Bugwood.org

# Brazilian Waterweed – Identification

- **Submerged Leaves**: Opposite or in whorls of three, smaller in size than the middle and upper leaves, which are in whorls of 4-6 and are between 12-40 mm long
- **Upper Leaves**: bright green, found in regular increments becoming more dense towards the tip of the stem; attached directly to the stem without a petiole
- **Leaf Margins**: Fine serration which can only be seen under magnification; Brazilian Waterweed has areas along the stem called double nodes which produce roots and branches that help establish a new plant from fragment
- **Dioecious:** In the U.S., only male plants have been observed (do not produce seed); female plants have not been found outside of South America

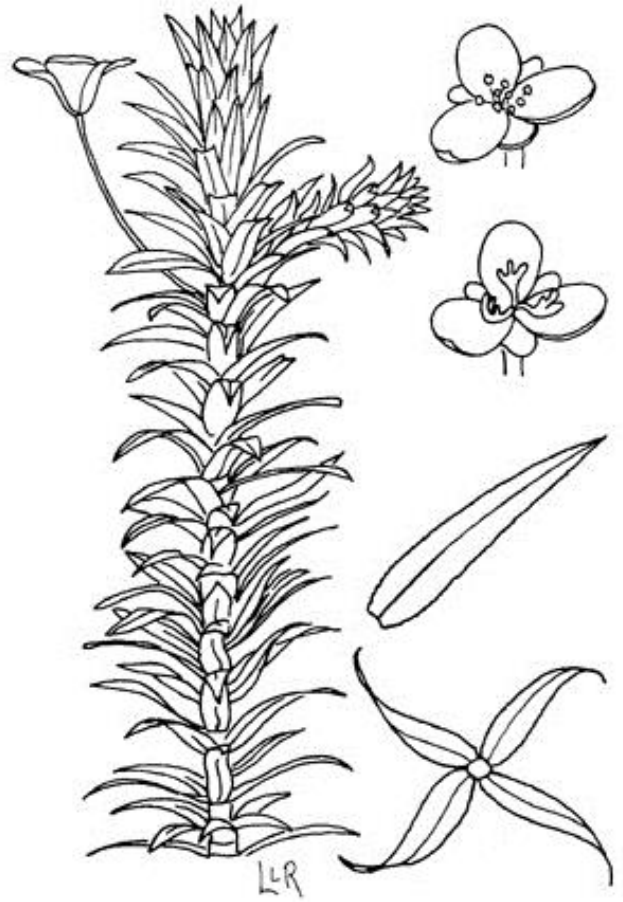


Illustration courtesy of University of Florida/IFAS Center for Aquatic and Invasive Plants

# Brazilian Waterweed – Habitat

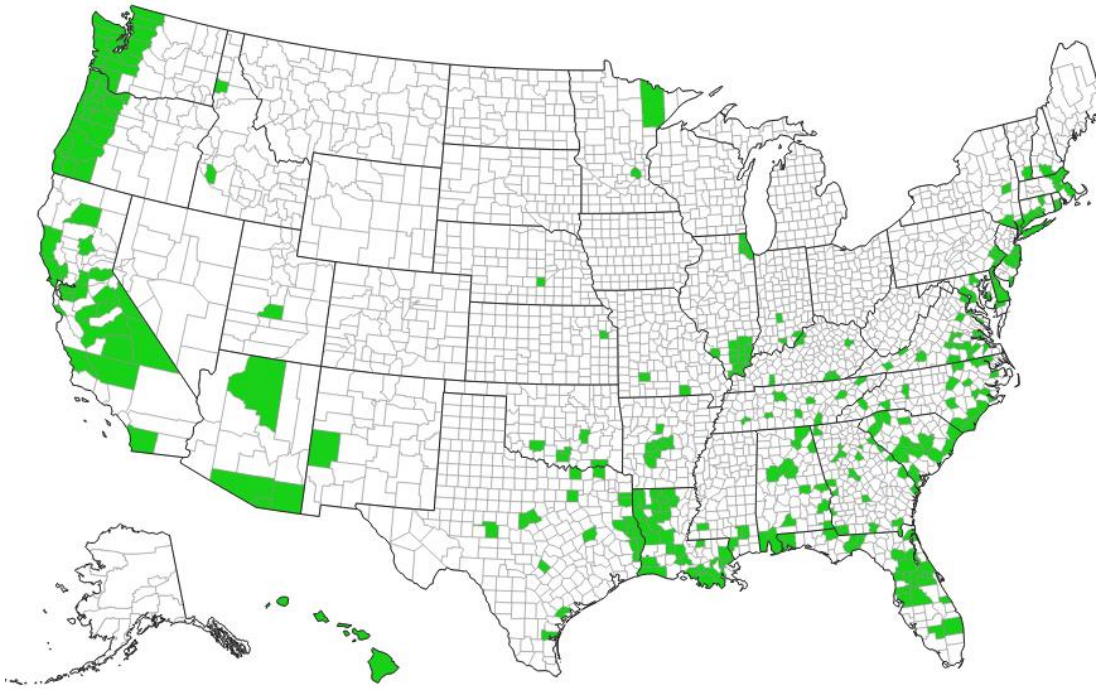
- Shallow lakes, streams ponds and ditches
- More common in warm climates, but is capable of surviving winter
- Tolerates a wide range of environmental conditions, including low light and low temperatures, and often grows in habitats similar to that of Eurasian watermilfoil


Photo courtesy of Robert Videki, Doronicum Kft, Bugwood.org

# Brazilian Waterweed – Distribution

## Distribution

- Introduced to North America in late 19th century; first record in Canada from Vancouver Island in 1974
- Native to South America
- **Ontario**: Not currently known in Ontario
- **Canada**: Found in SW British Columbia
- **U.S.**: Found in 37 states, including two within the Great Lakes Basin
- **International**: Found on every continent except Antarctica



Distribution Map courtesy of EDDMapS

# Water Hyacinth (*Eichhornia crassipes*)

- AKA: Common water hyacinth
- Floating, annual, aquatic plant
- Pontederiaceae (pickerel-weed) family
- First introduced to North America in New Orleans in 1884 where it was initially cultivated as an ornamental plant
- Still popular in horticulture trade


Photo by: Karen Brown, University of Florida, Budgwood.org

# Water Hyacinth – Identification

- **Leaves**: Floating or emergent; form a rosette.
- **Leaf Blades**: Thick with a waterproof coating that gives them a glossy look; unusually shaped with curved top and rounded, cylindrical base
- **Petioles**: Spongy and inflated with an air bladder that helps the plants to float
- **Flowers**: Emergent, violet-blue in colour, with three sepals (part of the flower found below the petals) and three petals; one petal having a darkened middle area and a yellow spot
- **Flowering**: Each plant can have 4 to 15 flowers per flower cluster, appear between early spring and late fall
- **Roots**: Long and dark purple to black, float freely in the water column, but may root in very shallow or soft sediments


Illustration courtesy of University of Florida/IFAS Center for Aquatic and Invasive Plants

# Water Hyacinth – Habitat and Distribution

## Habitat

- Grows in almost any aquatic habitat, provided it is rich in nutrients (ponds, rivers, canals, wet ditches)
- Able to survive fluctuating water levels

## Distribution

- Native to Amazon River
- **Ontario**: Isolated populations found throughout southern Ontario.
- **U.S.**: Large populations found in warmer southern parts of the US including areas surrounding the Gulf of Mexico and California


Distribution Map courtesy of EDDMapS

# Water Soldier (*Stratiotes aloides)*

- Perennial
- Submergent but becomes buoyant (emergent) during the summer months
- As the leaves mature and begin to die, they become waterlogged and the plant sinks below the surface
- Hydrocharitaceae (frog-bit) family
- Sharp serrated leaf edges can cut swimmers and individuals who handle water solider plants
- Sold as an ornamental plant for water gardens

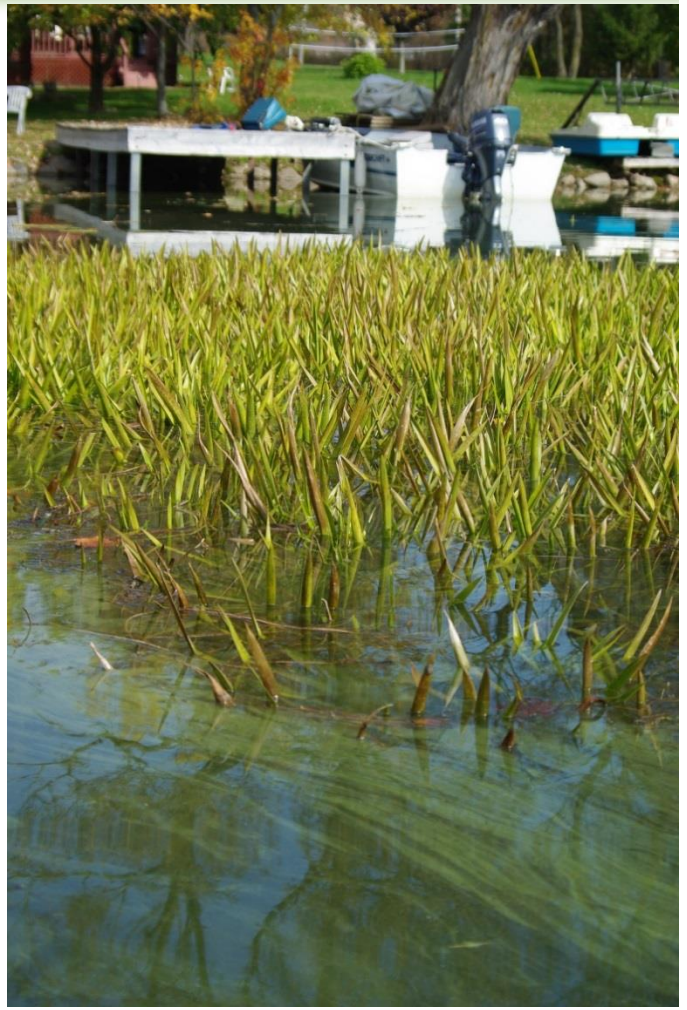


Photo by: Francine MacDonald

# Water Soldier – Identification

- Looks similar to an aloe plant, spider plant or top of a pineapple, and has leaves with sharp serrated edges
- **Leaves**: Stalkless and form a large rosette, long and thin, sword shaped, light to dark green in colour. Submerged leaves are thin and brittle, emergent leaves are thick and rigid
- **Flowers**: Emergent with three white petals and a vibrant yellow centre, but are infrequently seen in Ontario.
- Mature plants produce **offsets** which look like a smaller versions of the adult plant
- **Roots**: Long, white and thin and loosely hold the plant in the sediment

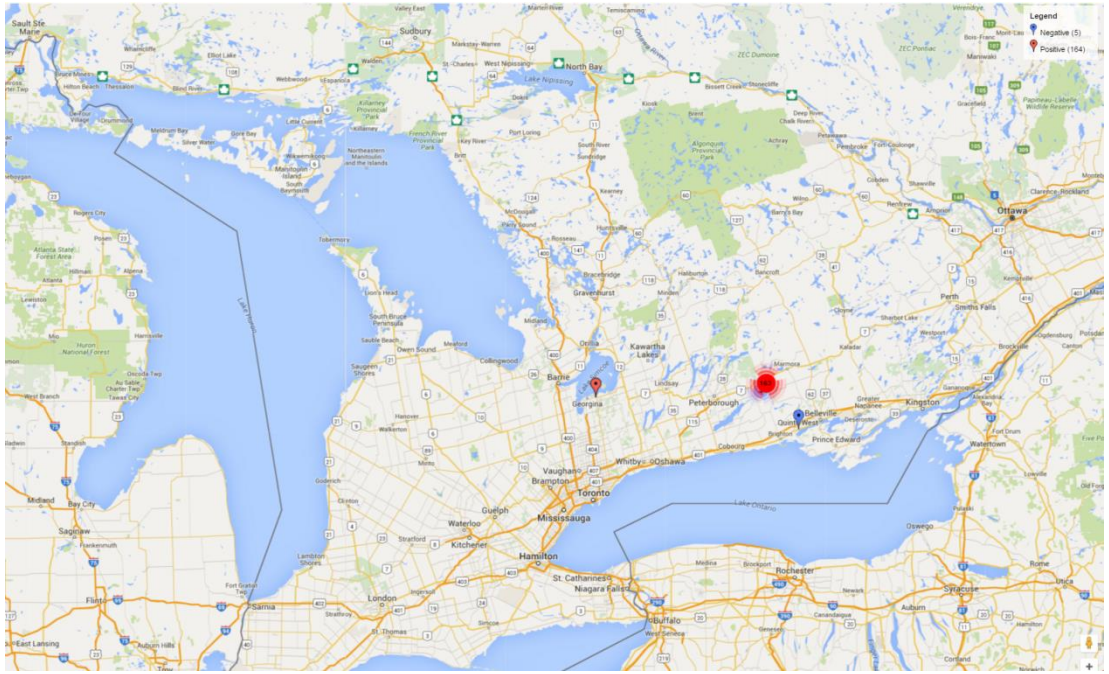
Photo by: Francine MacDonald

# Water Soldier – Habitat and Distribution

## Habitat

- Occurs in waters up to 5 m deep, slow moving rivers, lakes ponds and canals
- Prefers nutrient rich waters and soft, muddy sediments

Distribution Map courtesy of EDDMapS




## Distribution

- Native to Europe and Northwest Asia
- **Ontario**
  - First reported in Ontario in 2008 in the Trent River, near the town of Havelock (then the only population reported in North America)
  - Since found in the Trent Severn Waterway near Sutton, as well as in private, landlocked ponds near Blackstock, Bayfield and Campbellford.
- Eradication efforts are underway in TSW, led by MNRF, OFAH & partners.

# Water Chestnut *(Trapa natans)*

- AKA: Jesuit's nut, water caltrops, devil's nut and death flower
- Trapaceae (water chestnut) family
- Roots in sediment or floats freely in water
- Annual
- Seeds have sharp, barbed spines which may cause injuries to swimmers and others recreationists
- Commonly confused with Chinese water chestnut used in Asian cuisine (but unrelated)
- Likely introduced to the U.S. as a water garden plant in the late 1800's

Photo by: Isabelle Simard

# Water Chestnut – Identification

- **Plant**: Comprised of alternate floating leaves attached to a central stem
- **Leaves**: Form densely crowded rosette up to 30 cm in diameter; triangular and sharply toothed; 2 to 5 cm wide; petioles have a spongy and swollen section which enables the rosettes of leaves to float
- **Submerged Leaves**: Opposite on the stem and feather-like
- **Flowers**: Emergent and white with 4 petals; produced on a short flower stalk amongst the rosette of leaves
- **Seeds**: Very distinct; nut-like; 3 to 4 cm wide with sharp barbed spines and a hard shell when mature
- **Stem**: The submerged portion of the stem grows up to 5 m but is usually only 1 m long; emergent portion is short and bears the rosette of leaves

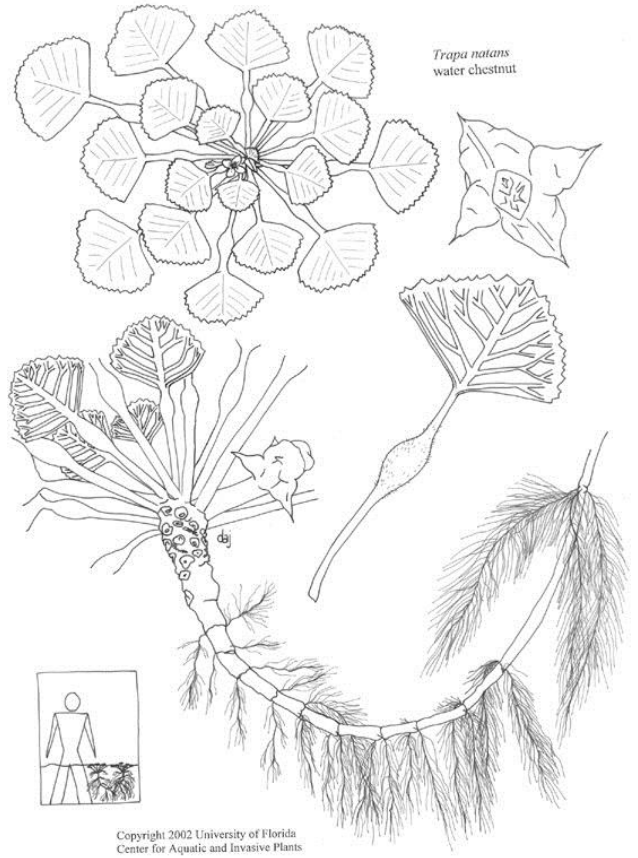



Illustration courtesy of University of Florida/IFAS Center for Aquatic and Invasive Plants

# Water Chestnut – Habitat

## Habitat

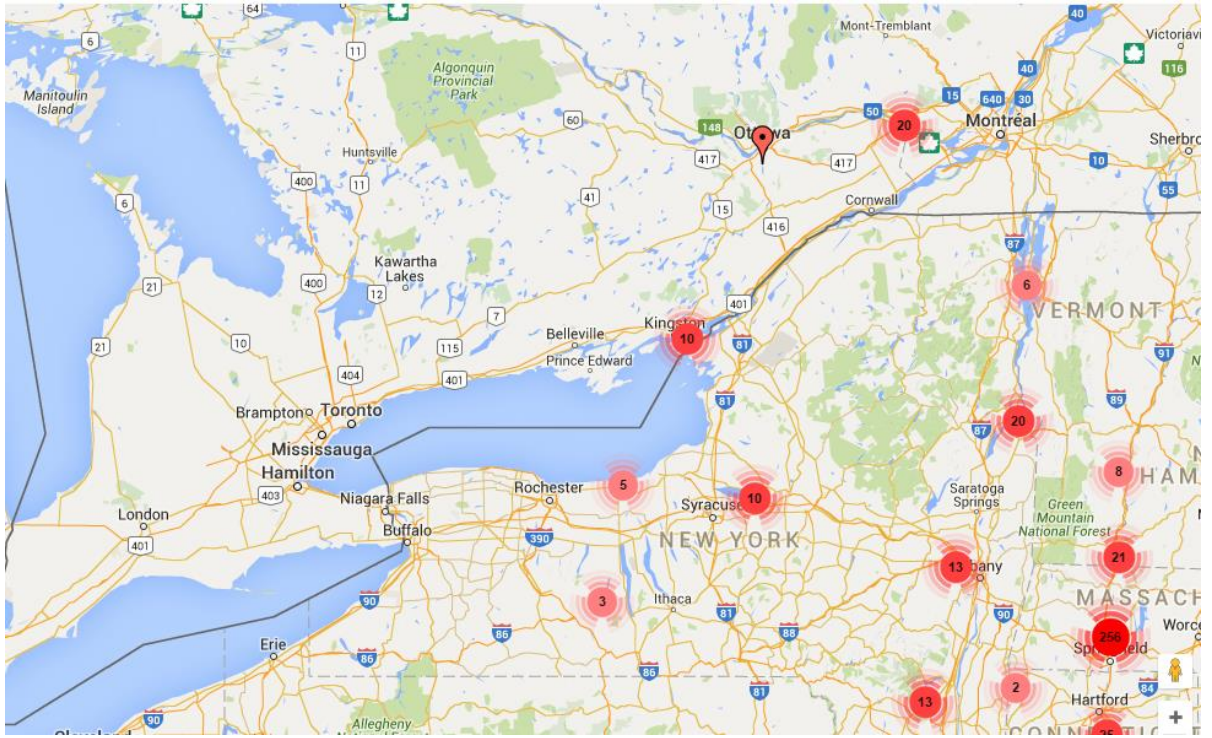
- Grows most often in quiet, nutrient-rich, slow moving waters
- Prefers muddy shorelines of lakes, slow rivers and ponds, full sun and soft substrate
- Occurs in waters up to 2 m deep, but can be found in water up to 4 m deep.

Photo by: Matt Smith

# Water Chestnut – Distribution

## Distribution

- **Ontario**: Found in the Ottawa River at Voyageur Provincial Park (2008) and Lake Ontario's Bayfield bay (2013) near Wolfe Island and Rideau Canal (2014).
- **Canada**: First recorded in Canada in Quebec in 1998 and in Ontario in 2005; occurs in southwestern Quebec
- **U.S.**: found in northeastern U.S. (Lake Champlain watershed) in New York and Vermont, as well as in Lake Ontario on the New York side.




Distribution Map of EDDMapS

# Preventing the Spread

✓ **Report it.**

If you think you see an aquatic invasive plant take a picture, record the location and report it using either www.eddmaps.org/Ontario or the Invading Species Hotline 1-800-563-7711.

✓ **Watch for it**

Learn what aquatic invasive plants look like and monitor rivers, lakes, streams and other water bodies. Early detection of invasive plants can increase the success of control and removal efforts.

✓ **Stop the spread**

Inspect your boat, motor, trailer and boating equipment such as anchors and fishing gear, centerboards, rollers and axles. Remove any plants that are visible before leaving any waterbody. Wash or dry your boat, tackle, downriggers, trailer and other boating equipment to kill harmful species not visible at the boat launch.

✓ **Use native species**

Use local native species in your water garden. Don't plant any aquatic invasive plants. Don't transplant aquatic invasive plants. Encourage your local garden centre to sell non-invasive or native plants. Check out the Grow Me Instead guides for a list of alternatives to plant instead of aquatic invasive plants.

# Help Track the Spread of These Plants!

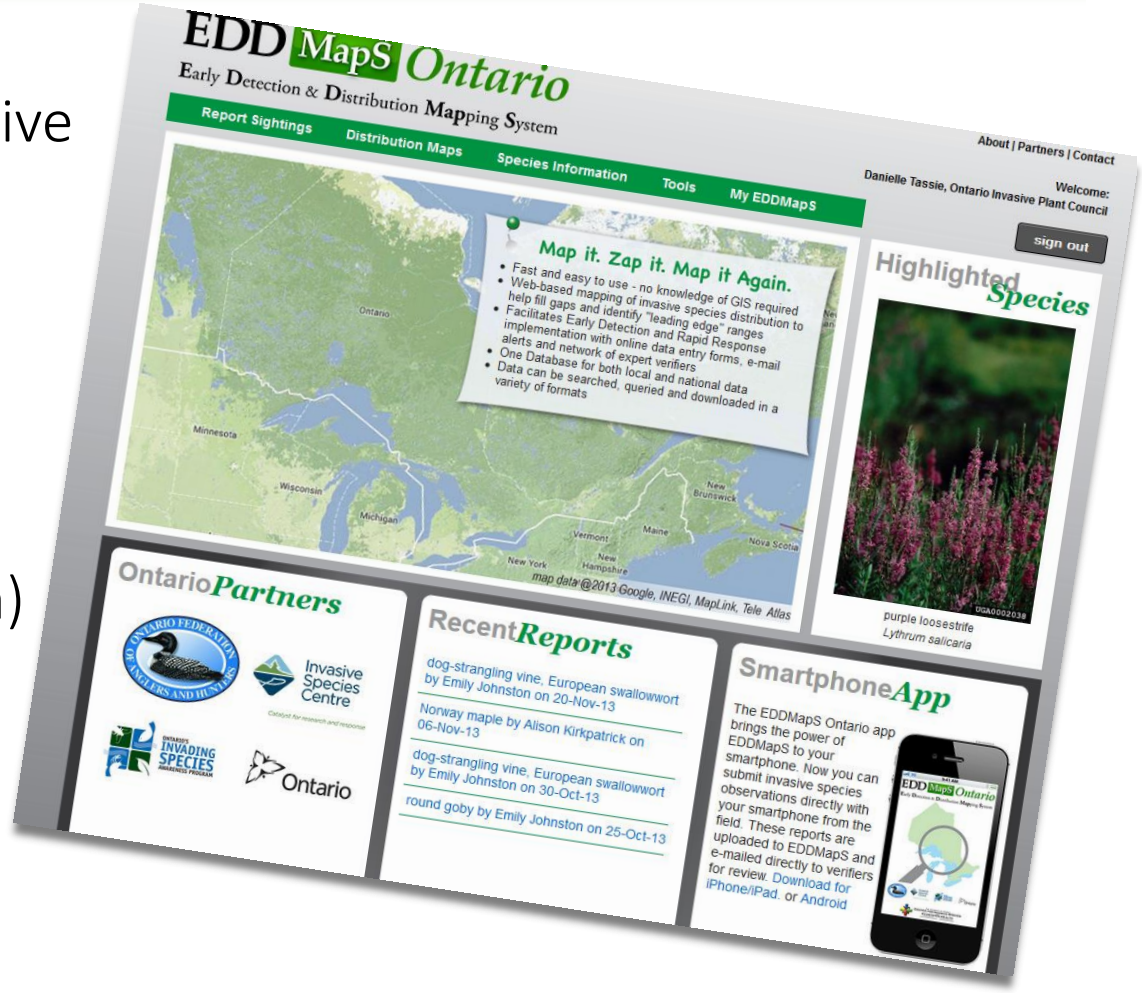
You can help track the spread of theses invasive species in a couple of ways:

You can call the Invading Species Hotline:

1-800-563-7711

Or report sightings online to Ontario's new mapping system (requires a photo & location)

www.eddmaps.org/ontario



# We Gratefully Acknowledge the Contributions of:

**Mhairi McFarlane,** *Nature Conservancy of Canada*

**Freyja Whitten,** *Credit Valley Conservation Authority*

**Eric Sager**, *Fleming College*

**Iola Price,** *Ontario Invasive Plant Council*

**Francine MacDonald**, *Ontario Ministry of Natural Resources and Forestry*

**Darryl Mitchell**, *Ontario Ministry of Natural Resources and Forestry*

**Heather Pankhurst**, *Central Lake Ontario Conservation Authority*

**Diana Shermet**, *Central Lake Ontario Conservation Authority*

**Janice Gilbert**, *Ph. D. Wetland Ecologist*

**Chet Neufeld**, *Native Plant Society of Saskatchewan*

**Eric Snyder**, *Ontario Ministry of Natural Resources and Forestry*

**Michael Irvine**, *Ontario Ministry of Natural Resources and Forestry*

**Scott Olan**, *Ontario Ministry of the Environment*

**Ryan Thum**, *Grand Valley State University*

**Syndell Parks**, *Grand Valley State University*

**Robert Canning**, *Trent University*

**Sarah Higginson**, *Ontario Ministry of Natural Resources and Forestry*

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# For More Information

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# Questions


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# Early Infestation – Water Chestnut

# Early Infestation – Water Soldier