INVASIVE AQUATIC

PLANT

SPECIES

A QUICK REFERENCE GUIDE

Acknowledgements

Support for the development of this guide was provided by the Ontario Ministry of Natural Resources and Forestry

TEXT COMPILED AND WRITTEN BY:

Ontario Federation of Anglers and Hunters
Invading Species Awareness Program

GRAPHIC DESIGN AND PRODUCTION BY:

Adam Connor
www.adamconnor.ca

COVER PHOTO(S):

Kyle Borrowman
Troy Evans, Great Smoky Mountains National Park, Bugwood.org
Leslie J. Mehrhoff, University of Connecticut, Bugwood.org

TABLE OF CONTENTS

Introduction 6
What makes an aquatic plant invasive? 7
Invasive Species Act, 2015 7
The invasive aquatic plant species regulated as prohibited 8
What can I do? 9
How to report invasive species 9

Brazilian Elodea *Egeria densa* **12**
Curly-Leaved Pondweed *Potamogeton crispus* **14**
Eurasian Water-Milfoil *Myriophyllum spicatum* **16**
European Frog-Bit *Hydrocharis morsus-ranae* **18**
European Water Chestnut *Trapa natans* **20**
Fanwort *Cabomba caroliniana* **22**
Hydrilla *Hydrilla verticillata* **24**
Parrot Feather *Myriophyllum aquaticum* **26**
Water Hyacinth *Eichhornia crassipes* **28**
Water lettuce *Pistia stratiotes* **30**
Water soldier *Stratiotes aloides* **32**
Yellow Floating Heart *Nymphoides peltata* **34**
Yellow Iris *Iris pseudacorus* **36**

Glossary of plant terms 38
References used 40
Photo credits 41

INTRODUCTION

Invasive species are plants, animals, and micro-organisms that, when introduced outside of their natural environment, out-compete native species (Government of Canada, 2016). Invasive species can have harmful consequences for the natural environment, economy, and society, including human health. However, not all introduced species are invasive. Some, like the introduced Chinook salmon (*Oncorhynchus tshawytscha*), produce economic incentives for society, while also not posing a significant threat to native fish and their ecosystems.

Invasive aquatic plants, by contrast, displace native vegetation, slow down water flow, alter oxygen levels, and can affect recreational activities (e.g. boating, fishing, and swimming).

HOW DO AQUATIC INVASIVE PLANTS ARRIVE AND SPREAD?

Aquatic plants are introduced and continue to spread by shipping vessels, recreational and commercial boating, and the aquarium and water garden trade.

INVASIVE SPECIES ACT, 2015

The Ontario Invasive Species Act (ISA) came into force on November 3rd, 2016. The goal of the Invasive Species Act is to support the prevention, early detection, response to and eradication of invasive species in Ontario. Preventing invasive species from arriving and becoming established in Ontario is critical in the fight against this growing threat. Some key elements of the Invasive Species Act include:

- Giving Ontario the tools to regulate invasive species as either prohibited or restricted and banning activities such as buying, selling, possessing and transporting certain invasive species;
- Enabling response actions to address urgent threats; and
- Helping to promote compliance through modernized inspection and enforcement measures.

INVASIVE AQUATIC PLANT SPECIES REGULATED AS PROHIBITED UNDER THE INVASIVE SPECIES ACT, 2015 AS OF JANUARY 1ST, 2018

In Ontario,
it's **illegal** to import, possess, deposit, release, transport, breed/grow, buy, sell, lease or trade these species:

Brazilian Elodea (Brazilian Waterweed)
(Egeria densa) page 12

European Water Chestnut
(Trapa natans) page 20

Hydrilla *(Hydrilla verticillata) page 24*

Parrot Feather *(Myriophyllum aquaticum) page 26*

Water Soldier *(Stratiotes aloides) page 32*

WHAT CAN I DO?

- Learn to identify invasive aquatic plant species that are a threat to Ontario and how to prevent the spread of these unwanted species.
- Never buy or keep invasive aquatic plants. If you have any information about the illegal importation, distribution, or sale of invasive plants, report it immediately to the Ministry of Natural Resources and Forestry TIPS line at **1-877-TIPS-MNR** (**847-7667**) toll-free any time.
- Don't release any aquatic plants into Ontario lakes, rivers, or streams. Properly dispose of unwanted aquatic plants.
- Clean, Drain, and Dry your boat, trailer, and equipment—remove all plants, animals, and mud, and dispose of them on dry land or in the garbage.
- If you see an invasive aquatic plant in the wild, please contact the toll-free Invading Species Hotline at 1-800-563-7711 or report a sighting online at EDDMapS.org/Ontario

HOW TO REPORT INVASIVE SPECIES

- **Call:** 1-800-563-7711
- **Email:** info@invadingspecies.com
- **Create a profile:** on EDDMapS.org/Ontario and submit your reports digitally.

When submitting a report through the Invading Species Hotline or online at EDDMapS.org/Ontario, it is best to have the following information on hand to submit a complete report:

What?

What species do you suspect you encountered? Are there native look-alikes that you may not have considered?

Picture?

In order to confirm reports, a picture is required. However, with some high-priority species (e.g. Prohibited Species), it is best to always report if you suspect you have encountered one!

When and where?

Be sure to note the date and geographical location where you encountered the invasive plant (e.g. latitude and longitude).

Specimen?

Do you have the plant on hand? If so, call **1-800-563-7711** and ISAP staff will direct you on your next steps.

Species Profiles

PROHIBITED INVASIVE SPECIES (ISA)

BRAZILIAN ELODEA

Egeria densa

PLANT TYPE: SUBMERGED

ORIGIN (NOT CURRENTLY KNOWN IN ONTARIO)

- Native to South America.

LEAVES

- Submerged, bright green, found in whorls of 4 - 8.

FLOWERS

- Emergent, small flowers with three white petals, and three smaller green sepals.

HABITAT

- Slow-moving water like wetlands, lakes, ponds, and slow-moving streams – rooted at depths of 1-2 m, up to 6 m; can also drift freely.

IMPACTS

- Rapidly form dense mats on the surface that may restrict water movement, increase sedimentation, affect water quality, and crowd out native species.
- Changes to water quality may include lowered temperature, reduced oxygen concentrations, reduced nutrient availability, and eutrophication.
- Ecosystem impacts may include smothering of native plant seeds through sedimentation and changes to native fish populations through reduced habitat quality.
- Thick mats may impede recreational activities and clog infrastructure and water supply intakes.

LOOKALIKE SPECIES

- Native waterweed's leaves are shorter, and opposite or 3 in a whorl, and petals are the same size as sepals.
- Canadian elodea, (native) Hydrilla (invasive)

CURLY-LEAVED PONDWEED

Potamogeton crispus

PLANT TYPE: SUBMERGED

ORIGIN

- Native to Eurasia.

LEAVES

- Submersed, alternate, oblong, distinct margins that are wavy, finely and sharply toothed.

FLOWERS

- Emergent, small, red-brown colour.

HABITAT

- Lakes, rivers, streams, ponds, ditches, and canals. Rooted in silt, clay, gravel, or sand.

IMPACTS

- Forms dense stands which crowd out other species and potentially decrease oxygen levels.
- Restrict water flow.
- Dense stands hinder recreational activities.

LOOKALIKE SPECIES

- Richardson's pondweed (native) and large-leaf pondweed (native)

EURASIAN WATER-MILFOIL

Myriophyllum spicatum

PLANT TYPE: SUBMERGED

ORIGIN

- Native to Eurasia and North Africa.

LEAVES

- Whorled, green, feather-like, pinnately divided with 12 or more thread-like segments.

FLOWERS

- Emergent, grow on terminal spikes above the water, reddish colour. Usually seen late summer in Ontario.

STEMS

- Leafy shoot, branching at water surface, tip is usually reddish and thin, getting thicker below the flowers.

HABITAT

- Most common in 1 - 3 m deep water of lakes, rivers, and ponds.
- Forms dense underwater mats.

IMPACTS

- Reduces biodiversity by competing aggressively with native plants.
- Reduced oxygen levels in the water caused by decomposing plants can kill fish.
- Thick mats can impede recreational activities.

LOOKALIKE SPECIES

- Native northern water-milfoil has leaves with 11 or fewer leaf segments on each side of axis. Native coontails have leaves that fork in pairs.

EUROPEAN FROG-BIT

Hydrocharis morsus-ranae

PLANT TYPE: FREE-FLOATING

ORIGIN

- Native to Eurasia.

LEAVES

- Round to heart-shaped, 2.5-5 cm, forming a rosette. Green top, purple-red bottom with spongy coating along the middle vein of the leaf.

FLOWERS

- Single emergent white flower, three rounded petals, yellow centre.

HABITAT

- Slow-moving water such as sheltered inlets, shorelines, ponds, slow-running rivers, and ditches.

IMPACTS

- Forms thick mats that reduce biodiversity by crowding out native plants and preventing sunlight from reaching submerged plants.
- Decomposition removes oxygen from the water, which can affect fish communities and other aquatic life.
- Dense mats impede recreational activities and clog drainage and streams.

LOOKALIKE SPECIES

- North American frog-bit (*Limnobium spongia*) leaves have a spongy coating covering the entire bottom of the leaf. Watershield (*Brasenia schreberi*) leaves do not form a rosette and the leaves and stems under water have a slimy coating. White water lily (*Nymphaea odorata*) leaves are round and larger (15 - 30 cm wide).

PROHIBITED INVASIVE SPECIES (ISA)

EUROPEAN WATER CHESTNUT

Trapa natans

PLANT TYPE: FLOATING (ROOTED OR FREE-FLOATING)

ORIGIN

- Native to Eurasia and Africa.

LEAVES

- Floating leaves are alternate, forming a densely crowded rosette. Bright green, leathery, diamond / fan-shaped with sharp toothed edges. Submersed leaves are opposite, finely dissected, and feather-like.

FLOWERS

- Emergent, four white petals.

STEMS

- Has a spongy swollen section that helps the plant float.

HABITAT

- Lakes, rivers, streams, and ponds with soft substrate.
- Found commonly at 2 m depth and creates dense floating mats.

IMPACTS

- Forms extremely dense floating mats of vegetation that shades out native vegetation, which reduces plant biodiversity.
- Dense mats impede recreational activities, also the hard nuts with sharp, barbed spines can accumulate on shore and cause injury when stepped on.
- Reduced light penetration combined with decomposing vegetation can lead to lowered levels of dissolved oxygen, which affects native species and can kill fish.

FANWORT

Cabomba caroliniana

PLANT TYPE: SUBMERGED

ORIGIN

- Native to the sub-tropic and temperate regions of South America.

LEAVES

- Small oblong floating leaves. Submersed leaves are finely divided and fan-shaped; they grow in pairs on opposite sides of the stem, creating a feathery effect.

FLOWERS

- Emergent, three white to pale yellow petals.

STEM

- Green-reddish colour, white or reddish-brown hairs.

HABITAT

- Rooted in silty substrate of stagnant to slow-moving waters e.g. streams, small rivers, ponds, lakes, and ditches.
- Creates thick mats in <3 m deep water.

IMPACTS

- Fast growing, forms thick mats that crowd out native plants, block sunlight to submerged plants, disrupt fish communities, and clog drainage canals and streams.
- Dense stands can hinder recreational activities.

LOOKALIKE SPECIES

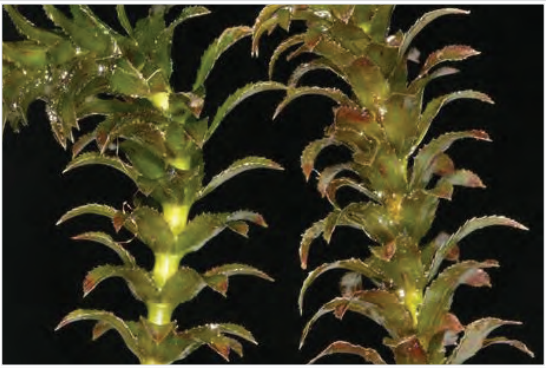
- Bladderwort (*Utricularia vulgaris*), white-water crowfoot (*Ranunculus aquatilis*), northern water-milfoil (*Myriophyllum sibiricum*), water marigold (*Megalodonta beckii*) and coontail (*Ceratophyllum demersum*). Only fanwort has opposite, finely divided, fan-shaped leaves on distinct stems.

PROHIBITED INVASIVE SPECIES (ISA)

HYDRILLA

Hydrilla verticillata

PLANT TYPE: SUBMERGED



ORIGIN (NOT CURRENTLY KNOWN IN ONTARIO)

- Native to Asia.

LEAVES

- Green, arranged in whorls of 3-8 on the stem. Saw-toothed edges, and sometimes prickles on underside.

FLOWERS

- Emergent, small, three white to reddish, or white to light green petals, with red stripes.

HABITAT

- Still or flowing water of rivers, lakes, ponds, wetlands, streams and, wet ditches.

IMPACTS

- Aggressive growth, may outcompete native plants.
- May form dense mats that block sunlight from reaching other submerged plants, including native species.
- Decreases oxygen levels, increases water temperature and degrades water quality by raising pH levels.
- May hinder water flow and impede recreational activities.

LOOKALIKE SPECIES

- Canada waterweed (*Elodea canadensis*) has three leaves per whorl and no visible toothed leaf edges or prickly hairs on the leaf underside.

PROHIBITED INVASIVE SPECIES (ISA)

PARROT FEATHER

Myriophyllum aquaticum

PLANT TYPE: SUBMERGED

ORIGIN (NOT CURRENTLY KNOWN IN ONTARIO)

- Native to south America.

LEAVES

- Submerged leaves are whorled, bright green, feather-like with 20-30 segments per leaf. Emergent leaves are longer and much greener than submergent leaves.

FLOWERS

- White, occur on axils of emergent leaves and form a terminal spike above the water.

HABITAT

- Shallow waters of ponds, lakes, streams, and ditches.

IMPACTS

- May clog waterways.
- Potential to displace native vegetation.
- May impede recreational activities.

LOOKALIKE SPECIES

- Northern water-milfoil (*M. sibiricum* = *exalbescens*) has leaves with <11 segments on each axis. Native Coontails (*Ceratophyllum demersum, C. echinatum*) have dichotomously divided leaves.

WATER HYACINTH

Eichhornia crassipes

PLANT TYPE: FREE-FLOATING

ORIGIN (NOT CURRENTLY KNOWN IN ONTARIO)

- Native to south America.

LEAVES

- Floating or emergent; forming a rosette. Leaf blades are bright green, thick and glossy, egg-shaped to round, and appear on an inflated leafstalk filled with spongy tissue.

FLOWERS

- Emergent, showy, six violet-blue petals, loosely clustered with 4-15 flowers on a spike above the rosette. One petal is deeper violet with a yellow spot.

HABITAT

- Ponds, rivers, canals, and wet ditches in warm climates.

IMPACTS

- Outcompete and/or displaces native species for space, light, and nutrients.
- Thick mats reduce oxygen levels and can alter the composition of invertebrate and fish communities.
- Slows water flow, blocks irrigation canals, delays hydroelectric and water treatment plants.
- Hinders recreational activities.

LOOKALIKE SPECIES

- Common arrowhead (*Sagittaria latifolia*)
- Pickerelweed (*Pontederia cordata*).

WATER LETTUCE

Pistia Stratiotes

PLANT TYPE: FREE-FLOATING

ORIGIN (NOT CURRENTLY KNOWN IN ONTARIO)

- Native to Australia and Pacific Islands, Africa, Asia, south and central America, West Indies and Mexico.

LEAVES

- Ridged leaves are light green, with short white hairs, rounded edges and no stem. Leaves form a rosette that resembles a head of lettuce.

FLOWERS

- Small, white to pale green, on stalk from centre of rosette, produces a green berry that turns brown when mature.

HABITAT

- Slow-moving waters e.g. streams, rivers, lakes, ponds, and wet ditches.

IMPACTS

- Thick mats block sunlight and slow or prevent the growth of native aquatic plants.
- Plant decomposition reduces oxygen in the water.
- Dense mats hinder many recreational activities, restrict water flow in irrigation and flood control canals.

PROHIBITED INVASIVE SPECIES (ISA)

WATER SOLDIER

Stratiotes aloides

PLANT TYPE: SUBMERGED BUT OFTEN BECOMES SEMI-EMERGENT DURING SUMMER MONTHS.

ORIGIN

- Europe and northwest Asia.

LEAVES

- Sword-shaped, bright green with sharp spines, forming a large rosette.

FLOWERS

- Emergent, three white petals.

HABITAT

- Slow / still water e.g. ponds, ditches, fens, oxbows, and inlets of lakes.
- Occurs in water <5 m deep.

IMPACTS

- Forms dense mats of floating vegetation, which crowds out native aquatic plants resulting in decreased biodiversity.
- Potential to alter surrounding water chemistry, which may harm phytoplankton and other aquatic organisms.
- Dense floating mats hinder recreational activities.
- Sharp serrated leaf edges can cut swimmers and individuals who handle this plant.

LOOKALIKE SPECIES

- Flowering plants are distinctive. Non-flowering plants could resemble Native bur-reeds (*Sparganium* spp.), arrowheads (*Sagittaria* spp.), and eel-grass (*Vallisneria americana*). None of these plants have serrated leaf edges.

YELLOW FLOATING HEART

Nymphoides peltata

PLANT TYPE: BOTTOM ROOTED, FLOATING

ORIGIN

- Native to southern Europe and Asia.

LEAVES

- Circular or heart-shaped.

FLOWERS

- Emergent, five bright yellow petals with fringed edges.

HABITAT

- Slow-moving water of lakes, ponds, canals, and slow-moving rivers.
- Can grow in damp mud and water up to 4 m deep.

IMPACTS

- Creates dense mats of floating vegetation.
- Shades out native aquatic plants.
- Degrades fish and wildlife habitats.
- Affect water quality by decreasing the level of oxygen.
- Make it difficult to enjoy recreational activities.

LOOKALIKE SPECIES

- Native yellow pond and bullhead lilies (*Nuphar variegatum, N. advena*) have yellow flowers, but not fringed petals.

YELLOW IRIS

Iris pseudacorus

PLANT TYPE: EMERGENT

ORIGIN

- Native to Eurasia.

LEAVES

- Linear and sword-shaped.

FLOWERS

- Three bright yellow drooping sepals with purple-brown markings, surrounding three smaller upright petals.

HABITAT

- Wetlands and shallow water along streams, rivers, ponds, and lakes.

IMPACTS

- Forms dense stands with thick mats of rhizomes and dead leaves that can displace native plants and change wetlands from a wet to a drier environment.
- Reduces habitat available for wildlife, including native fish and bird nesting and rearing sites.
- Dense mats block water flow in irrigation and flood control ditches.
- Poisonous to both humans and animals if eaten and its sap can cause dermatitis.

LOOKALIKE SPECIES

- Yellow iris is the only iris in North America with yellow petals. Without flowers, it resembles native blue flag (*I. versicolor*), which has shorter stems and is often purplish around the leaf base.

GLOSSARY OF PLANT TERMS

Annual
a plant that completes its life cycle in one year-germinating from seed, flowering, setting seed, and dying in one growing season.

Dichotomous(ly)
forking in pairs.

Elongate
considerably longer than wide.

Emergent
partly submersed in water, partly above water surface.

Midvein
the central vein of a leaf.

Node
the place where a leaf or branch is attached to a stem.

Oblong
shaped like a geometrical rectangle (other than a square).

Perennial
a plant that lives for more than two years.

Rhizome
an underground stem, usually elongate.

Rosette
a cluster of leaves or other organs radiating from a centre point.

Submerged
under water.

Sepal
small leaves located directly under a flower-
they are the outermost part of a flower.

Terminal
at the end, or tip of.

Turion
a winter bud; sometimes a scaly, bulb-like growth from
a bud on a rhizome or other vegetative organ.

Whorl
a ring of three or more similar structures (e.g.,
Leaves) radiating from a node or common point.

REFERENCES USED

Invaders of the Great lakes. Adventure Publications, 2013.

An Identification Guide to Prohibited Aquatic Invasive Species in British Columbia. Invasive Species Council of British Columbia.

Ontario Federation of Anglers and Hunters. 2014. *The Lake Superior Aquatic Invasive Species Guide*. Prepared in Collaboration with the Lake Superior Binational Program and the Great Lakes Panel on Aquatic Nuisance Species. Available at www.Invadingspecies.com

Field Guide to Aquatic Invasive Species. 3rd ed., Ministry of Natural Resources and Forestry, 2010.

Jesse Anderson, Doug Jensen, Jeff Gunderson, and Marie Zhuikov.2007. A Field Guide to *Fish Invaders of the Great Lakes Region*. University of Minnesota Sea Grant Program, Duluth, MN. USA.

"Invaders." *Ontario's Invading Species Awareness Program*, Ontario Federation of Anglers and Hunters, www.invadingspecies.com/.

Lui, Keiko. *Field guide to aquatic invasive species: identification, collection and reporting of aquatic invasive species in Ontario waters*. 3rd ed., Ministry of Natural Resources, 2008.

PHOTO CREDITS

Brazilian Elodea
William T. Haller, University of Florida, Bugwood.org

Robert Videki, Doronium Kft, Bugwood.org

Eurasian Water-Milfoil
Chris Evans, University of Illinois, Bugwood.org

Dave Britton

European Frogbit
Michigan Sea Grant

OFAH

European Water Chestnut
Kyle Borrowman

Fanwort
Robert Videki, Doronium Kft, Bugwood.org

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

Hydrilla
Robert Videki, Doronium Kft, Bugwood.org

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

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

Water Hyacinth
Ted D. Center, USDA Agricultural Research, Bugwood.org

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

Water Lettuce
Graves Lovell, Alabama Department of Conservation and Natural Resources, Bugwood.org

Troy Evans, Great Smoky Mountains National Park, Bugwood.org

Yellow Floating Heart
Leslie J. Mehrhoff, University of Connecticut, Bugwood.org

Yellow Iris
Dawn Sucee

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

Curly Leaf Pondweed
Leslie J. Mehrhoff, University of Connecticut, Bugwood.org

Chris Evans, Illinois Wildlife Action Plan, Bugwood.org

Water Soldier
Matt Smith, Ministry of Natural Resources and Forestry

NOTES

NOTES

ONTARIO'S
INVADING
SPECIES
AWARENESS PROGRAM

ONTARIO FEDERATION OF ANGLERS AND HUNTERS