The Lake Simcoe Aquatic Invasive Species Guide

Prepared by:
Ontario Federation of Anglers and Hunters
March 2021

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

This guide was patterned after the *Lake Superior Aquatic Invasive Species Guide*, developed and distributed by the Ontario Federation of Anglers and Hunters, with support from the Lake Champlain Basin Program Aquatic Nuisance Species Subcommittee - Spread Prevention Workgroup.

Suggested Citation:
Ontario Federation of Anglers and Hunters. 2021. *The Lake Simcoe Aquatic Invasive Species Guide*. Available at www.invadingspecies.com.

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Cover photo of Rusty Crayfish by USGS, US Geological Survey, Bugwood.org

Lake Simcoe Watershed

Map courtesy of Lake Simcoe Region Conservation Authority

The Lake Simcoe Aquatic Invasive Species Guide

Introduction

Invasive species are defined as harmful alien species whose introduction or spread threatens the environment, the economy, or society, including human health. They thrive in the absence of their native predators and have the potential to drastically alter habitat, rendering it inhospitable for native species. Aquatic invasive species (AIS) reach our waters through a variety of means, sometimes intentionally. Some were introduced for specific purposes, such as controlling aquatic plants, while others were planted as ornamentals, such as garden plants which then escaped. A few were released by aquarists while some "unwanted" live study specimens were released by teachers and students. However, most species were unintentionally introduced through ballast water from ships, when dumping bait buckets, or by moving watercraft and gear between waterbodies. The Lake Simcoe Protection Plan outlines the Ontario government's strategy to prevent, monitor, control, and adapt to the spread of invasive species in Lake Simcoe (https://www.ontario.ca/page/lake-simcoe-protection-plan).

With an area of 722 km^2 and inflow from 35 major rivers and streams, Lake Simcoe is an important source of biodiversity for the southern Ontario region. The lake and surrounding watershed, which span across 20 municipalities, are home to a wide variety of aquatic and non-aquatic life, including 75 species of warm and coldwater fish, and many provincially rare species-at-risk.

Increased urban and rural development has resulted in a high degree of human influence on Lake Simcoe and the surrounding watershed, including the introduction of invasive species. In addition to its natural diversity of species, Lake Simcoe has become home to a variety of invasive organisms with wide-ranging effects on the local ecology, economy, and society. This guide illustrates invasive species that are already present or threatening establishment; however, it is not an exhaustive list. Impacts of many non-native species are still unknown, and this guide profiles 14 species that have yet to reach the Lake Simcoe watershed. The actions that you can take (page 4) will help stop the introduction of species like fishhook waterflea, hydrilla, water lettuce, and many more.

The Lake Simcoe Aquatic Invasive Species Guide is designed for recreational users of the lake and its surrounding watershed. Descriptions and photos provided will help you identify these invaders and report sightings. Knowing the distribution of invasive species and detecting any new arrivals is critical for managing and protecting the lake – do your part to help keep Lake Simcoe healthy!

How to Use the Guide

This AIS guide is divided into three sections: Fishes and Invertebrates, Aquatic Plants and Algae, and Invasive Disease. Fish and plant anatomical keys are located at the front of each section. For each AIS, the common and scientific names are provided at the top of the page. A description with the key features used to identify the species is provided, along with photographs showing specimens or features of the species. This guide also provides information on the habitat, known distribution within the Lake Simcoe watershed, and the environmental and human impacts of the invasive species.

AIS listed in this guide are categorized as follows:

ESTABLISHED: Species which have already reached the watershed, have a significant presence throughout, and are reproducing within its waters;

PRESENT: Species which have reached the watershed but exist only in select, isolated locations without evidence of additional spread; and

THREAT: Species which have not yet reached the watershed.

The status of each species in the guide is shown at the top of the page. It is important to report all AIS, regardless of status, because knowing current ranges helps with lake management of AIS. Importantly, if you suspect you have found a threat species, report it immediately as early detection is especially critical.

You can report any potential AIS using the EDDMapS webpage or mobile app (Android & iPhone).

- Visit **www.EDDMapS.org** to register and report your sighting.
- You can also report invasive species using the following resources:
  - **Invading Species Hotline** at **1-800-563-7711** or by email: **info@invadingspecies.com**.
  - iNaturalist app or website at **https://www.iNaturalist.ca/**

Help Prevent the Spread of Aquatic Invasive Species!

Aquatic invasive species – plants, fishes, crustaceans, molluscs, amphibians, diseases, or pathogens – can spread from bilge water, bait buckets, and livewells and can attach to boats, trailers, motors, paddles, waders, footware, and fishing tackle. Some species can survive for several days or weeks out of water. Small plant fragments, fish eggs, or microscopic organisms may hitch a ride unbeknownst to you.

Outdoor Recreationists: What you can do:

- ❏ **Clean** the boat and all related equipment before leaving the waterbody, and ensure it is clean before entering a new one. Look for any mud, vegetation, mussels, or other debris stuck in or on the vessel and its equipment;
- ❏ **Drain** before leaving a waterbody. Drain all standing water by pulling the transom plug, empty your livewell, lower the motor, and drain all other water-containing devices on the vessel. Draining helps to eliminate small organisms like zebra mussel larvae from the vessel;
- ❏ **Dry or disinfect**. Some AIS can survive up to two weeks out of water and not every invader can be seen with the naked eye. To remove undetected AIS, you can dry the vessel for at least five days in sunlight or clean it from top to bottom with hot water over 50°C or by using pressurized water between 2,500 and 3,000 psi; and
- ❏ For anglers, **Dispose** of unwanted bait and fish parts at least 30 metres away from the water's edge, and dispose of unwanted worms in the trash. When keeping live bait, drain bait container at least 30 metres away from the water's edge and replace with spring or dechlorinated tap water. Never dump live or dead fishes, bait, or other organisms from one waterbody into another.

Home Aquarists, Water Gardeners, Teachers, and Students: What you can do:

Alternatives to release:

- ❏ Contact a retailer for proper handling or for possible returns;
- ❏ Give or trade with another aquarist, pond owner, or water gardener;
- ❏ Donate to a local aquarium society, school, or aquatic business; and/or
- ❏ Contact a veterinarian or pet retailer for humane disposal guidance.

What about those plants?

- ❏ Build water gardens away from other waters;
- ❏ Inspect plant orders and remove seeds, other plant fragments, snails, and fishes;
- ❏ Seal aquatic plants in plastic bags and dispose in the trash;
- ❏ Avoid compost disposal as many seeds can withstand drying and freezing; and
- ❏ Never collect plants or fishes from the wild (in many jurisdictions this practice is illegal).

Guide to Aquatic Invasive Fishes and Invertebrates

Invasive Fishes and Invertebrates in the Lake Simcoe Watershed

Established

Fishes

Invertebrates

Present

Fishes

Threat

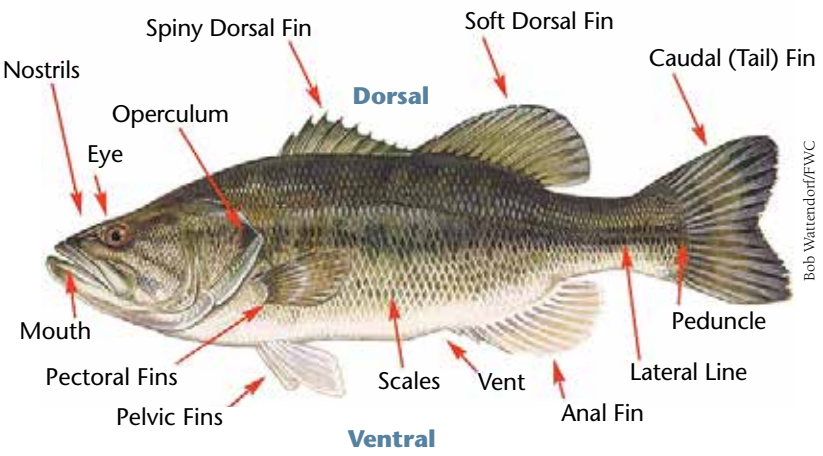
Fishes

Invertebrates

Round Goby

David Copplestone-MNRF

Generalized Fish Anatomy



Definitions

Dorsal: Relating to the upper side or 'back' of a fish.

Lateral: Along or out to the sides of the fish. A 'lateral line' runs along the side of the body from head to tail.

Ventral: Referring to the bottom or underside of a fish.

Photos: John Lyons, Wisconsin Department of Natural Resources

Rainbow Smelt

(Osmerus mordax)

Size: 18-22 cm long (7-9 inches)

Characteristics:

- Long, slim body type
- Bodies are olive green dorsally, with purple, pink, and blue iridescence ventrally and a silvery belly
- Large teeth on both jaws, roof of the mouth, and tongue
- Large mouth, protruding lower jaw, upper jaw extends laterally to middle of eye or beyond
- Single dorsal fin in the middle of the back and a small fleshy (adipose) fin near the tail
- Scales are small and easily detached

Similar Species: Pygmy Whitefish (*Prosopium coulterii*), Lake Herring (*Coregonus artedi*), and other members of the subfamilly *Coregoninae*. Fish in the minnow family (*Cyprinidae spp.*).

Habitat: In the spring, large schools move from lakes into streams and along shorelines to spawn.

Distribution: Throughout Lake Simcoe.

Impacts: Competes with forage fishes for food resources, which disrupts the food web. Declines in Lake Herring, Whitefish, and Lake Trout populations in Lake Simcoe have been connected to the introduction of Rainbow Smelt. In other waterbodies, declines in Yellow Perch and Walleye populations have also been observed.

D. Jude, CLGAS, Univ. of Mich., 1998.

Round Goby

(Neogobius melanostomus)

J. Ellen Marsden

Round Goby (top) and native sculpin (bottom). Note: "fused" pelvic fins appearing as one disc-shaped fin on the ventral side of Round Goby.

Size: 6-18 cm long (2.5-7 inches)

Characteristics:

- Typically grey with brown or black spots on back and sides; cream to white belly; young gobies lack spots
- Cylindrical body shape
- Front dorsal fin has a large black spot
- Pelvic fins are fused together to form one round suction-cup disk
- Distinct nostrils with short tubes that do not reach the upper lip

Similar Species: Native sculpins (family *Cottidae*), Tubenose Goby (*Proterorhinus semilunaris*).

Habitat: Prefers riprap cobble and rock bottoms; shallow to deep water in lakes and slow-moving rivers.

Distribution: Throughout Lake Simcoe and surrounding watershed.

Impacts: Aggressive feeding and reproduction, driving out other bottom-dwelling fishes into poor habitat. Egg predation affects game fish recruitment. Believed to be linked to outbreaks of botulism type-E in Great Lakes' fishes and fish-eating birds.

Banded Mysterysnail

(Viviparus georgianus)


USGS

Size: Up to 3.5 cm long (1.4 inches)

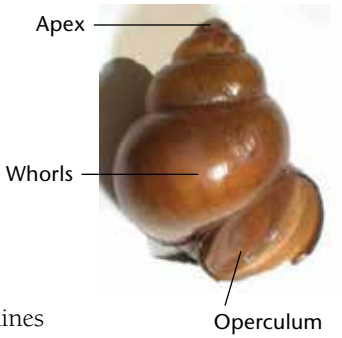
Characteristics:

- Large freshwater snail with dark spiral bands
- Spherical, inflated shell with 4-5 whorls; whorls separated by deep indents
- Yellow to greenish brown with 3-4 dark reddish-brown spiral bands
- Operculum (thin, plate-like cover on the shell opening) is ear-shaped with concentric growth lines

Similar Species: Native snails including mammoth lymnaea (*Bulimnaea megasoma*), great pond snail (*Lymnaea stagnalis*), white and brown lipped garden snails (*Cepaea hortensis* and *Cepaea nemoralis*), and various types of native mysterysnails such as pointed campeloma (*Campeloma decisum*).

Chinese Mysterysnail

(Cipangopaludina chinensis)



USGS

Size: Up to 6.5 cm long (2.5 inches)

Characteristics:

- Large freshwater snail
- Spherical, inflated shell with up to 7 whorls; whorls separated by deep indents
- Brownish to olive-green
- Operculum is oblong with concentric growth lines

Similar Species: *See Banded Mysterysnail.*

Habitat: Slow-moving freshwater rivers, streams, and lakes with soft, muddy, or silty bottoms; Chinese mysterysnail often found in proximity to flowing water and river mouths.

Distribution: Chinese mysterysnails are present in several Lake Simcoe tributaries, including the Black and Talbot rivers, as well as in the main lake. Banded mysterysnails have been identified at the mouth of the Black River flowing into Lake Simcoe, as well as in nearby Bass Lake.

Impacts: Competes with native snails; may also decrease available phosphorus near shore. Both mysterysnails are intermediate hosts for parasitic worms and can transmit trematodes that kill waterfowl. They both often litter shorelines and clog water intake screens. Banded mysterysnails also prey on fish embryos.


Colin van Overdijk, Bugwood.org

Eurasian Amphipod

(Echinogammarus ischnus)

Size: Up to 11 mm

Characteristics:

- Laterally compressed invertebrate
- Curved body shape
- Semi-transparent
- Small, triangular rostrum (part of shell in front of eyes)
- Seven pairs of walking legs
- Two sets of small antennae
- Males are significantly longer than females

Similar Species: Native species of freshwater shrimp such as *Gammarus fasciatus.*

Habitat: Generally, inhabit shallow sections of water with rock or gravel bottoms, rocky shorelines, and often coincide with collections of zebra and quagga mussels. Adaptable and able to exist in all manner of environments, including tidal and brackish conditions.

Distribution: Throughout Lake Simcoe.

Impacts: This AIS has been connected to the decline of native amphipod populations across the Great Lakes and St. Lawrence River.


Ellen Marsden, UVM


Bill Tate

Quagga Mussel

(Dreissena bugensis)

Size: Adults are 2-3 cm long (0.75-1.25 inches); larvae (known as veligers) are barely visible to naked eye

Characteristics:

- Small freshwater mussel, sometimes with a striped pattern on shells
- Mussels are pale coloured, from cream to white, and may have darker stripes, bars, or rings
- Rounded triangular shell without a flat surface on hinge area
- Left and right shell sides are asymmetrical

Similar Species: Zebra mussel – has the "D" shaped shell with one flat side.

Habitat: Lakes, reservoirs, ponds, slow-moving rivers, and quarries. Can occur in both shallow, warm waters and deeper, cool waters; overlaps with and extends below depths preferred by zebra mussels.

Distribution: Throughout Lake Simcoe and surrounding watershed.

Impacts: Form dense colonies that attach to all available substrates, including rocks, plants, boats, and docks. Quagga mussels filter large amounts of plankton from the water, which increases water clarity and alters the growth pattern of algae and aquatic plants. Native mussels are impacted through food competition and by smothering from attached quagga mussels. Linked to botulism type-E and wildlife die-offs. Quagga mussels are able to colonize at deeper depths than zebra mussels and are increasing the scope of impacts on these waters.

Rusty Crayfish

(Faxonius rusticus)

University of Minnesota Sea Grant Program

Size: Up to 15 cm long (6 inches)

Characteristics:

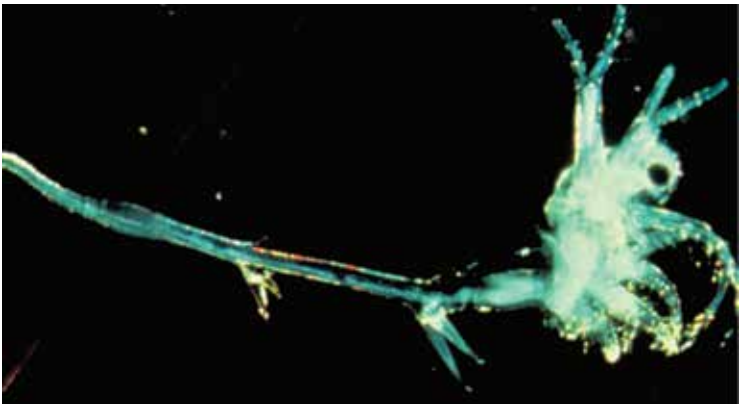
- Covered by a hard exoskeleton (outer covering); 5 pairs of legs attached to the body, front pair end in large claws
- Variable body colour with dark reddish spot on both sides of the body
- Strong, smooth claws are larger than most crayfish species; brownish olive or reddish brown colour, with black bands and orange claw tips

Similar Species: Native virile crayfish (*F. virilis*), native northern clearwater crayfish (*F. propinquus*), and other species in genus *Faxonius*.

Habitat: Very hardy; can live in both fast and slow-moving waters; prefers clay, silt, or gravel bottoms with rocks, logs, and debris for cover.

Distribution: Throughout Lake Simcoe and surrounding watershed.

Impacts: Very aggressively competes with native crayfish for food and habitat. Feeds on invertebrates, vegetation, and native fish eggs. Clear-cuts aquatic vegetation taking away habitat for fish. Loss of vegetation can result in enhanced shoreline erosion. Hybridizes with native crayfish, reducing biodiversity.



US EPA

Spiny Waterflea

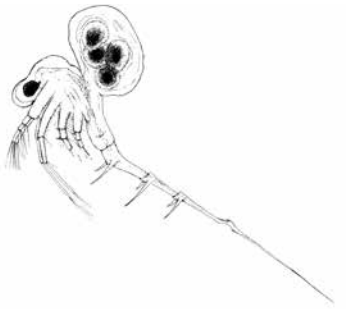
(Bythotrephes longimanus)

Jeff Gunderson, Minnesota Sea Grant

Size: 1 cm long (0.4 inches); about 60% is tail length

Characteristics:

- Tiny aquatic crustacean, just visible to the naked eye; often collects in jelly-like clumps on fishing lines, cables, and commercial fishing nets
- Clear body with orange, blue, or green colouring
- Long, barbed tail filament; 1-4 pairs of barbs; straight needle-like tip
- Head has a single, large, dark eye



Michigan Sea Grant Program

Similar Species: Fishhook waterflea (*Cercopagis pengoi*) and native zooplankton.

Habitat: Prefers large, deep, clear lakes, but is also found in more productive lakes; migrates to the deeper waters during the day and up to the surface at night.

Distribution: Throughout Lake Simcoe.

Impacts: Preys on native zooplankton, which reduces food for small fishes and juvenile sport fishes; fouls fishing equipment.

U.S. Geological Survey Archives, U.S. Geological Survey, www.forestryimages.org

Zebra Mussel

(Dreissena polymorpha)

USGS

Size: Adults are 2-4 cm long (0.75-1.5 inches); larvae barely visible to the naked eye

Characteristics:

- Small, freshwater mussel with a striped pattern on shells
- Shells are zigzagged or striped but number of stripes varies; colour patterns can be from light to dark
- "D" shaped shell: flat on hinge side
- Usually attached to objects, surfaces, or other zebra mussels using silky threads (known as byssal threads) excreted near hinge

Similar Species: Quagga mussel – does not have the "D" shaped shell with one flat side.

Habitat: Lakes, rivers, reservoirs, ponds, and quarries; requires slow-moving water for the veligers to attach to plant and substrate surfaces.

Distribution: Throughout Lake Simcoe.

Impacts: Form dense colonies that attach to all available substrates, including rocks, plants, boats, and docks. Zebra mussels filter large amounts of plankton from the water, which increases water clarity and alters the growth pattern of algae and aquatic plants. Native mussels are impacted through food competition and by smothering from attached zebra mussels. Linked to botulism type-E and wildlife die-offs.

Photos: John Lyons, Wisconsin Department of Natural Resources

Goldfish

(Carassius auratus)

Size: up to 40 cm long (16 inches)

Characteristics:

- Deep-bodied, averaging 12-22 cm long
- Their colour can vary from the typical bright orange to olive green or creamy white. Wild populations are typically olive to grey
- Head and eyes are large, relative to the rest of the fish
- The dorsal fin is long and has a single stout spine with a serrated trailing edge, similar in shape to that of the Common Carp's dorsal fin. The anal fin is short and has a single stout serrated spine, as well. The tail is deeply forked
- The mouth is small and has no trailing whiskers (barbels), not to be confused with the Common Carp, which does have barbels

Similar Species: Common Carp or Koi (*Cyprinus carpio*), Rudd (*Scardinius erythrophthalmus*), and Golden Shiner (*Notemigonus crysoleucas*).

Habitat: In Ontario, Goldfish are usually found in the wild in quiet areas of populated urban or suburban vegetated ponds, streams, and pools. This AIS is highly adaptable and resilient.

Distribution: In and around the east branch of the Holland River.

Impacts: Although there is some uncertainty surrounding their impacts on North American ecosystems, the behaviour that Goldfish populations in Ontario exhibit suggests that they may reduce the province's biodiversity through their effects on native species. In addition to competing with and even predating on native fish, Goldfish increase water turbidity while feeding, which effects the growth of vegetation. Additionally, Goldfish can carry diseases, such as the Koi herpesvirus, that can harm local fish populations.

NYSDEC, Bureau of Habitat

Rudd

(Scardinius erythrophthalmus)

Size: 10-35 cm long (4-14 inches)

Characteristics:

- Brown-green back; silver, gold, or rosy sides; silvery-white belly
- Large, deep-bodied minnow
- Dorsal fin is set far back on the body, beginning behind the start of the pelvic fin
- Pectoral, pelvic, and anal fins are a vivid red or orange colour
- Mouth is small and upturned
- Eyes are red or have a red spot dorsally

Similar Species: Golden Shiner, Redfin Shiner (*Lythrurus umbratilis*), and Goldfish.

Habitat: Variety of habitats: slow-moving streams, rivers, and vegetated areas of lakes and ponds.

Distribution: Rudd/Golden Shiner hybrids have been detected in Yonge's Harbour of Lake Simcoe, indicating the presence of Rudd within the system. Rudd have also been detected in nearby Wilcox Lake. Scattered occurrences in the St. Lawrence River, Lake Ontario, and Lake Erie.

Impacts: May compete with native fishes for invertebrate prey; may alter nursery sites by feeding on vegetation. Impacts biodiversity through hybridization with the native Golden Shiner.

Asian Carps

Asian carps were brought from Asia to North America in the 1960s and 70s. Since then, they have migrated north through U.S. waterways towards the Great Lakes. Asian carps prefer cool to moderate water temperatures, like those found near the shores of the Great Lakes and within Lake Simcoe. The term "Asian carps" includes four species: Bighead Carp, Silver Carp, Grass Carp, and Black Carp.

Similar Species: Common Carp*, Goldfish, Rudd, suckers (Family *Catostomidae*), Golden Shiner, Fallfish (*Semotilus corporalis*) *(*Note: Barbels – whiskerlike tactile organs near the mouth – can help differentiate Asian carps from Common Carp.)*

Habitat: Prefer large rivers and embayments but can live in ponds and lakes; often near the surface; Black Carp can be found in deeper water than the other Asian carps.

Distribution: Not yet present in the Lake Simcoe watershed. Several species of Asian carps have established populations throughout the Mississippi River Basin and the Illinois Waterway, reaching as far north as the Chicago Sanitary and Ship Canal in the State of Illinois. Grass Carp have also been detected in small numbers in Lake Michigan, Lake Ontario, Lake Erie, Lake Huron, and the St. Lawrence River, but do not currently have any reproducing populations in these waterbodies.


Ted Lawrence

Impacts: If Asian carps become established in Ontario waterways such as Lake Simcoe, they could potentially eat the food supply that our native fish depend on and displace them from their habitat. Grass Carp are the most imminent threat to Ontario's waters at this time. If allowed to establish, they will consume approximately 40% of their body weight every day in aquatic vegetation. This consumption will lead to altered aquatic habitats and increased likelihoods of algal blooms as the Grass Carp expel undigested plant material. Black Carp feed exclusively on molluscs and so pose a considerable threat to native snails and mussels. Bighead and Silver Carp are both planktivorous and would fundamentally alter the food web, if ever introduced and allowed to establish in our waters. Silver Carp are hazardous to boaters as they will leap up to 3 metres out of the water due to vibrations from boat propellers and other similar disturbances.

David Riecks, University of Illinois, IN Sea Grant

Bighead Carp

(Hypophthalmichthys nobilis)

Size: Up to 120 cm long (47 inches)

Characteristics:

- Dark grey back; fades to off-white on sides and belly; irregular dark blotches
- Large, deep bodied, laterally compressed fish; grows up to 45 kg (100 lbs)
- Short dorsal fin, stiff but not serrated; dorsal spine followed by 8 soft rays
- Smooth keel (raised line running along the belly) only between pelvic and anal fins
- Large mouth with a lower jaw that extends past upper jaw; no barbels
- Eyes forward, sit below mouth, and project downward; scaleless head

Black Carp

(Mylopharyngodon piceus)

Matthew R. Thomas, KY Dept. of Fish & Wildlife Resources

Size: Up to 150 cm long (60 inches)

Characteristics:

- Dark brown to black on back and sides; some white on belly; dark-edged scales give a cross-hatched effect
- Cylindrical, slightly compressed body; no keel (raised line running along the belly); up to 35 kg (80 lbs)
- Short, soft, and pointed dorsal fin with 8-10 rays; all fins are dark
- Small to moderately sized mouth; slightly downturned; no barbels
- Eyes sit in line with the mouth

Jeff Hill, University of Florida

Grass Carp

(Ctenopharyngodon idella)

Size: Up to 100 cm long (40 inches)

Characteristics:

- Olive-brown back; blending to white from sides to belly; dark-edged scales give a cross-hatched effect
- Moderately compressed, more slender body than Bighead and Silver carps; up to 35 kg (80 lbs)
- Short, soft, and pointed dorsal fin with 8-10 rays
- Moderately sized mouth; slightly downturned; no barbels
- Eyes sit in line with the mouth

Silver Carp

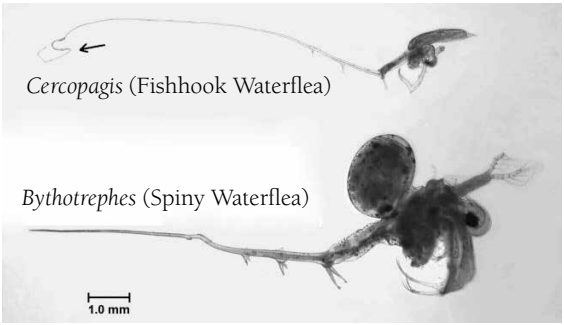
(Hypophthalmichthys molitrix)

David Riecks, University of Illinois, IN Sea Grant

Size: Up to 90 cm long (35 inches)

Characteristics:

- Olive to greyish black back; silvery sides; fading to white belly
- Large, deep-bodied, laterally compressed fish; up to 40 kg (90 lbs)
- Short dorsal fin, stiff but not serrated
- Smooth keel (raised line running along the belly) from the base of gills to anal fin
- Large mouth with a lower jaw that extends past upper jaw; no barbels
- Eyes forward, sit below the mouth, and project downward; scaleless head



NOAA, Great Lakes Environmental Research Laboratory

Fishhook Waterflea

(Cercopagis pengoi)

Size: 1 cm long (0.4 inches); about 80% is tail length

Characteristics:

- Tiny aquatic crustacean, just visible to the naked eye; may collect in cotton-like clumps on fishing lines, downrigger cables, and commercial fishing nets
- Transparent body
- Long, barbed tail filament; 1-3 pairs of barbs; unique loop or hook at the tip
- Head has a single, large, dark eye

Similar Species: Invasive spiny waterflea and native zooplankton species.

Habitat: Prefers the warmer surface water of deep, open waterbodies.

Distribution: Not yet present in the Lake Simcoe watershed. Established in Lake Ontario, Lake Erie, Lake Michigan, and the St. Lawrence River.

Impacts: Preys on native zooplankton, which reduces food for small fishes and juvenile sport fishes; fouls fishing equipment.

Ontario Federation of Anglers and Hunters

D.L. Gustafson

USGS

New Zealand Mudsnail

(Potamopyrgus antipodarum)

Size: 0.5-0.8 cm long (0.2-0.3 inches)

Characteristics:

- Small, slender freshwater snail
- Cone-shaped, with slender, pointed apex. Whorls on body contains raised pointed sections
- Colour is variable, ranging from light to dark brown
- Operculum (thin, plate like cover on the shell opening) is ear-shaped

Similar Species: Members of the pond snail family (*Lymnaeidae*).

Habitat: Lakes, rivers, and estuaries with silty and sandy substrates; does not tolerate freezing temperatures.

Distribution: Not yet present in the Lake Simcoe watershed. Established in the Welland Canal and the Great Lakes, including Lake Ontario, Lake Erie, Lake Superior, and Lake Michigan.

Impacts: Reproduces and spreads rapidly, with up to 300,000 individuals per square metre of lake bottom; can dominate an area and alter the food web of a waterbody; may compete with native invertebrates for resources.

Guide to Aquatic Invasive Plants and Algae

Invasive Plants and Algae in the Lake Simcoe Watershed

Established

Plants

Algae

Present

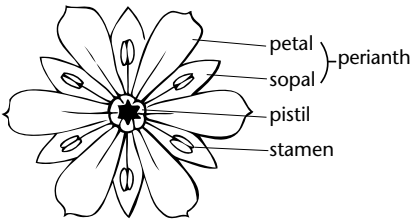
Plants

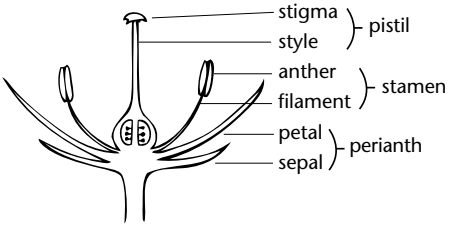
Threat

Phragmites Rita Shaw

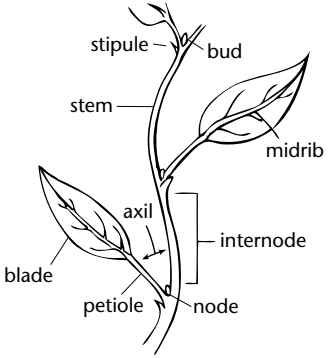
Plant Parts

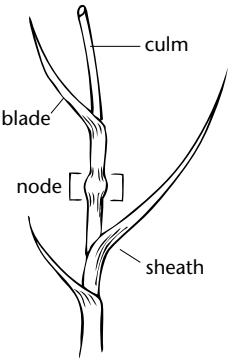
Flower Parts

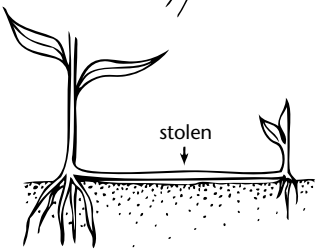


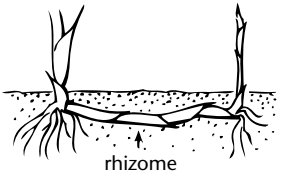


Stems

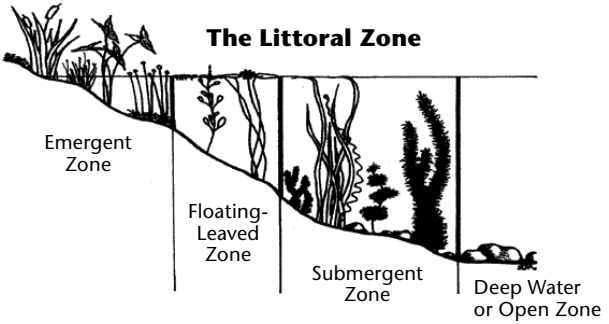








The Littoral Zone



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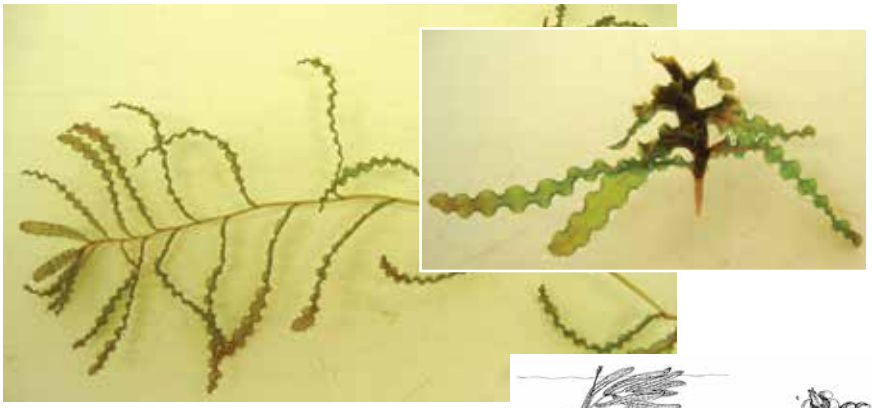
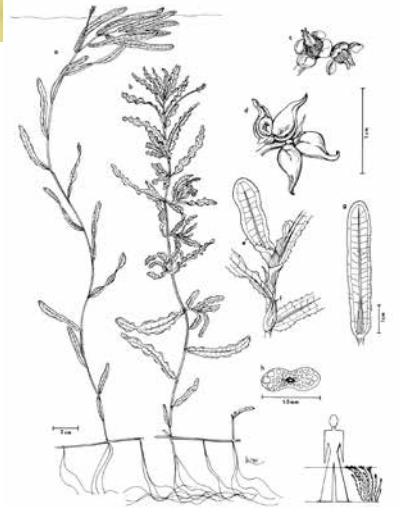


Both photos: Karen Hahnel, MEDEP



Curly-Leaved Pondweed

(Potamogeton crispus)

Size: up to 2 m long (6 feet)

Characteristics:

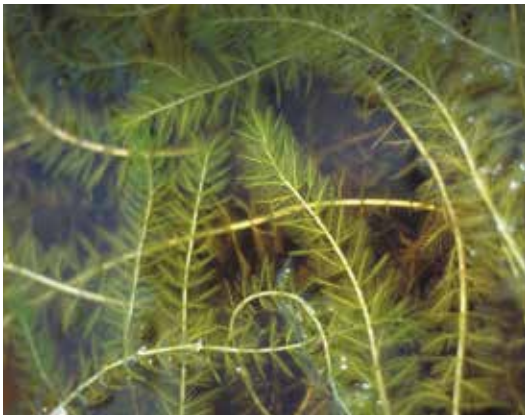
- A submerged, rooted, aquatic perennial plant
- Oblong leaves, 4-10 cm long (1.5-4 inches) and 0.5-1 cm wide (0.2-0.4 inches), with a midvein, wavy edges, and finely-toothed margins; arranged along the stem in alternating pattern; reddish-green coloured
- Flattened, branching stems
- Flowers are tiny and extend above the water in small spikes; blooms in May and June
- Spreads from rhizomes and turions (vegetative overwintering buds) in late fall and early winter, giving it a competitive advantage over native plants

Similar Species: Native pondweed species, such as large-leaved pondweed (*P. amplifolius*) and Richardson's pondweed (*P. richardsonii*).

Habitat: Freshwater lakes, rivers, streams, ponds, ditches, and canals.

Distribution: Throughout Lake Simcoe and the surrounding watershed.

Impacts: Forms large, dense stands; outcompetes native plants; impedes boating, fishing, and swimming; plant decay can deplete oxygen levels leading to fish die-offs.



Alison Fox, University of Florida

VTDEC

Eurasian Water-Milfoil

(Myriophyllum spicatum)

Size: 50-70 cm long (20-28 inches)

Characteristics:

- A submerged, rooted, aquatic perennial plant;
- Feather-like leaves, with a mid-vein and 12-20 paired leaflets (native water-milfoil has 11 or fewer leaflet pairs); arranged along the stem in whorls of 4-5
- Stem is a leafy shoot, branching repeatedly, especially at the water's surface; shoots have reddish brown tips
- Flowers are small and red; extend above the water on 5-20 cm terminal spikes (2-8 inches); bloom in July and August
- Spreads primarily by fragmentation; can spread by seeds as well

Similar Species: Native northern water-milfoil (*M. sibiricum*) and invasive parrot feather (*M. aquaticum*).

Habitat: Generally in 1-3 m (3-10 feet) deep water of lakes, ponds, and slow-moving streams, but can occur at depths up to 10 m (32 feet).

Distribution: Throughout Lake Simcoe and the surrounding watershed.

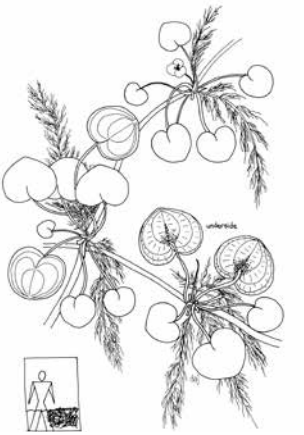
Impacts: Forms large, dense stands; outcompetes native plants; impedes boating, fishing, and swimming; hybridizes with northern water-milfoil that creates a more vigorous and aggressive form of invader.

Ann Bove, VTDEC

Mark Malchoff, Lake Champlain Sea Grant

European Frog-Bit

(Hydrocharis morsus-ranae)



Size: leaves are 1-6 cm wide (0.4-2.4 inches)

Characteristics:

- Free-floating, perennial aquatic plant; forms a rosette on the water's surface
- Rounded, heart-shaped, floating leaves 1-6 cm wide (0.4-2.4 inches), with a petiole (leaf stem)
- Small, white flowers with three petals open just above the water's surface
- Well-developed root system, up to 50 cm long (20 inches), which tangles around other plants to form dense mats
- Spreads by turions or by offsets that detach and form new plants

Similar Species: American frogbit (*Limnobium spongia*), yellow pond-lily (*Nuphar variegata*), and white water-lily (*Nymphaea odorata*). Native frogbit has a convex layer of spongy, gelatinous, red-tinged tissue beneath the leaf.

Habitat: Areas with limited wave action and slow-moving water; sheltered inlets, ponds, rivers, and ditches.

Distribution: Lake Simcoe tributaries, including Uxbridge Brook and the Talbot River. Has also been positively identified along the shores of the main lake around Georgina Island, Moons beach, and Victoria Point.

Impacts: Forms large, dense floating mats; outcompetes native plants; impedes water flow, boating, fishing, and swimming.

Ann Murray, University of Florida

European Common Reed

(Phragmites australis subsp. australis)

Size: 1-4 m tall (3-13 feet)

Characteristics:

- Extremely tall, erect, emergent (above water) perennial grass
- Long, sharp, bluish-green leaves with a pointed tip; 15-40 cm long (6-16 inches) and 2-4 cm wide (0.8-1.6 inches)
- Stem is hollow and 0.5-1.5 cm thick (0.2-0.6 inches)
- Feathery, plume-like flower heads with individual clusters of small purple-brown flowers that change to tan or grey at the end of the season
- Spreads mainly by fragmentation and creeping of rhizomes (underground stems); establishment of new populations may occur from seed

Similar Species: Native phragmites (*P. americanus*) and several species of cattail (*Typha spp.*). Native phragmites usually has a more reddish stem and smaller seedheads.

Habitat: Marshes, floodplains, river and stream margins, lake edges, wet ditches, and fields. Deep roots also enable growth in relatively dry areas.

Distribution: Across the shores and wetlands of Lake Simcoe and the surrounding watershed.

Impacts: Forms large, dense stands; outcompetes native plants; reduces wetland plant and animal species diversity.

Meg Modley, Lake Champlain Basin Program

Carol Treadwell

Purple Loosestrife

(Lythrum salicaria)

Characteristics:

- Erect, emergent perennial plant
- Leaves are lance-shaped; 3-10 cm long (1.2-4 inches); arranged along the stem in an opposite arrangement or in whorls of three
- Stem is square or angular; may have small hairs
- Pink-purple flowers blossom in spikes 10-40 cm long (4-16 inches) from July to September
- Spreads primarily by seeds, can re-sprout from broken roots; multiple stems can grow from one root

Similar Species: Native pickerelweed (*Pontederia cordata*) and various members of the fireweed and *Liatris* families.

Habitat: Marshes, floodplains, river and stream margins, lake edges, wet ditches, and fields.

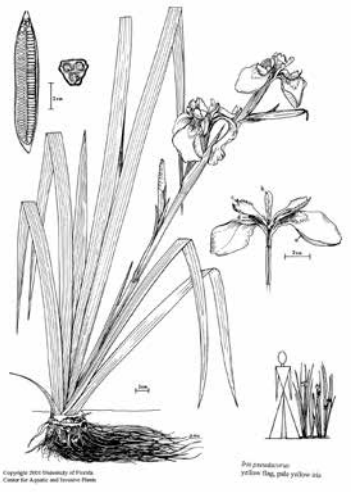
Distribution: Across the shores and wetlands of Lake Simcoe and the surrounding watershed.

Impacts: Forms dense stands over very large areas, threatening wetland habitat and communities, potentially reducing or displacing native species of plants, birds, and invertebrates. In 1992, the Canadian and American governments approved the release of two European leaf-eating beetle species, which are natural enemies of purple loosestrife and feed exclusively on the plant. This biological control of purple loosestrife can reduce populations by up to 90 per cent and allow native plants to re-establish.

Photos: Dawn Sucee, OFAH

Yellow Iris

(Iris pseudacorus)



Size: 70-150 cm tall (25-60 inches)

Characteristics:

- Erect, emergent perennial plant
- Leaves are linear, sword-shaped, 40-100 cm long (16-40 inches) and 2-3 cm wide (0.8-1.2 inches); all leaves originate from underground rhizomes
- Flowers are showy, bright yellow, and have three spread out sepals with brown markings
- Spreads by rhizome fragments, fruit, and/or seed

Similar Species: Blue flag iris (*Iris versicolor*), cattails (*Typha spp.*), and sweet flags (*Acoraceae spp.*).

Habitat: Marshes, floodplains, river and stream margins, lake edges, wet ditches, and fields.

Distribution: Shorelines around Sibbald Point Provincial Park, Georgina Island, Orillia, and along several Lake Simcoe tributaries.

Impacts: Forms dense stands; may outcompete native plants and convert habitat from a wetland to a drier environment; poisonous to animals and humans if ingested; contact with human skin can cause dermatitis.

Marcus Rosten

Minnesota Department of Natural Resources

Starry Stonewort

(Nitellopsis obtusa)

Size: Up to 83 cm (33 inches)

Characteristics:

- Thin stems and branchlets similar to thick fishing line
- Whorls of 4-6 branchlets coming off the main shoots, with blunt tips
- White, star-shaped bulbils (fruit-like structures), which give the species its name, are produced at the nodes, generally 3-6 mm wide
- Dense collections of vegetation can resemble underwater hills or mounds and are often called “pillows”

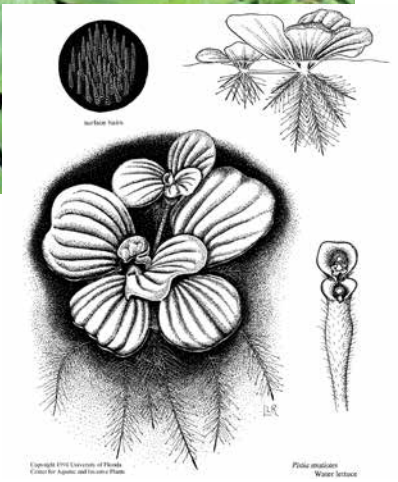
Similar Species: Chara or muskgrass (*Chara vulgaris*).

Habitat: Inhabits all manner of fresh or brackish water, including lakes, ponds, and slow-moving rivers.

Distribution: Throughout Lake Simcoe and surrounding watershed.

Impacts: Starry stonewort reduces biodiversity by forming dense mats and competes aggressively with native plants. These mats can impede movement of fish, spawning activity, water flow, and recreational activities such as swimming, boating, and fishing. Once introduced to a new area, starry stonewort can establish and spread very quickly.

Heather Smith, OFAH



Water Lettuce

(Pistia stratiotes)

Size: leaves are 2-20 cm long (1-8 inches)

Characteristics:

- Free-floating perennial or annual aquatic plant; forms rosettes at the water's surface
- Leaves are floating or nearly erect; spongy, light-green with short white hairs; rounded above and narrow at the base with prominent and nearly parallel ridges
- Small flowers, white to pale-green on a small stalk growing from the rosette
- Roots are submerged and numerous, hanging beneath the rosette of leaves, up to 50 cm long (20 inches)
- Spreads by seed, plant fragmentation, and strong water currents

Similar Species: None; this species is distinct.

Habitat: Slow-moving streams, rivers, lakes, ponds, canals, and wet ditches.

Distribution: Identified in Island Lake, Ballantrae. It is found in ponds connected to the Rideau Canal in the Ottawa Valley, and Welland River in the Niagara Region, Ontario, as well as in the Erie Canal in New York, and Lake Erie in Ohio.

Impacts: Forms large, dense floating mats; clogs irrigation and flood control canals; impedes boating, fishing, and swimming; alters oxygen levels.

Graves Lovell

Leslie J. Mehrhoff

Brazilian Elodea

(Egeria densa)

Size: 3-5 metres

Characteristics:

- Grows to the surface of the water
- Thin upright stems, 1 to 3 mm in diameter
- Leaves are 1 to 3 cm long, up to 5 mm broad, and found in whorls of 4 to 8
- Bright-green leaves and stem with short internodes
- Small, emergent flowers with three white petals

Similar Species: Native Canada waterweed (*Elodea canadensis*), invasive hydrilla (*Hydrilla verticillata*).

Habitat: Slow-moving or still water with a variety of substrate types.

Distribution: Not yet present in the Lake Simcoe watershed or in Ontario, but has established populations on the U.S.-side of the Great Lakes Basin.

Impacts: Brazilian elodea (or Brazilian waterweed) can restrict water movement, increase sedimentation, affect water quality, and displace native plant species, changing important habitat for fish species. Its dense mats can also impede recreational activities and even clog infrastructure and water intakes.

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European Water Chestnut

(Trapa natans)

VTDEC

Size: Rosette up to 30 cm wide (12 inches)

Characteristics:

- Annual aquatic plant that can be rooted or free-floating; appearing as a rosette up on the water's surface
- Surface leaves are waxy and triangular, 2-5 cm wide (0.8-2 inches), with toothed edges, located at the end of petioles up to 15 cm long (6 inches); additional submerged leaves are feather-like
- Petioles have swollen sections that help the plant float
- Small, white flowers with four petals; bloom from July until first frost
- Spreads by fragmentation and by its nut-like fruit that has four sharp, barbed points

Similar Species: None; this species is distinct.

Habitat: Lakes, rivers, streams, and ponds; soft substrates and nutrient-rich waters; in water 2-4 m (6-13 feet) deep.

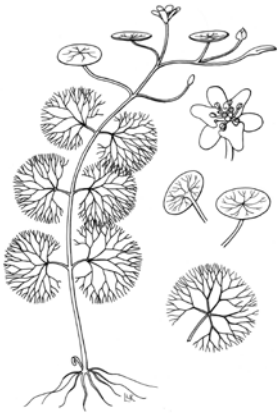
Distribution: Not yet present in the Lake Simcoe watershed. The only known populations of water chestnut in Ontario exist in the Ottawa River and within Voyageur Provincial Park.

Impacts: Forms large, dense floating mats; outcompetes native plants; impedes boating, fishing, and swimming.

Photos: NHDES

Fanwort

(Cabomba caroliniana)



Size: 2-9 m long (6-30 feet)

Characteristics:

- Rooted, submerged, perennial aquatic plant;
- Leaves are finely divided, fan-like, and about 6 cm wide (2.5 inches); petioles up to 1.5 cm long (0.6 inches). The native lookalike, water marigold (*Megalodonta beckii*) has leaves without a petiole; arranged oppositely along the stem
- Inconspicuous, oblong-shaped, floating leaves
- Stems are tubular, long, and multi-branched
- Single white or yellow flowers, 0.6-1.5 cm wide (0.2-0.6 inches); on a long stem, usually emergent
- Spreads primarily by stem fragments or rhizomes

Similar Species: Bladderwort (*Utricularia vulgaris*), white-water crowfoot (*Ranunculus aquatilis*), northern water-milfoil, water marigold, and coontail (*Ceratophyllum demersum*).

Habitat: Rooted in silty substrate of stagnant to slow-moving waters in streams, small rivers, ponds, lakes, and ditches; usually in water less than 3 m deep (10 feet), but up to 5 m (16 feet).

Distribution: Not yet present in the Lake Simcoe watershed. In Ontario, the Crowe River watershed northeast of Peterborough is the only known occurrence.

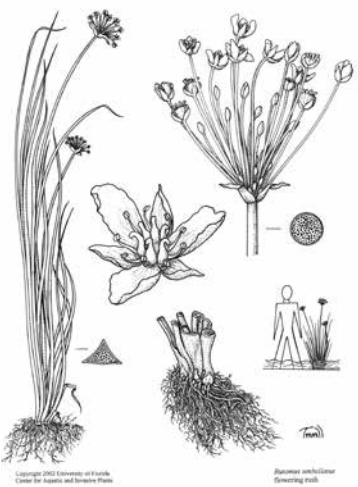
Impacts: Extremely persistent; forms dense stands; outcompetes native plants; impedes water flow, boating, fishing, and swimming. Can significantly reduce water storage capacity and taint drinking water supplies.

Ann Bove, VTDEC

Les Merhoff, University of CT

Flowering Rush

(Butomus umbellatus)



Size: up to 2.7 m tall (9 feet)

Characteristics:

- Erect, emergent perennial plant, which can also be submerged or have leaves floating on the water's surface
- Leaves all originate from underground rhizomes; linear shape 0.5-1.0 cm wide (0.2-0.4 inches); leaf tips are usually spiraling
- Green stems are triangular in cross section
- Flowers grow in umbrella-shaped clusters; each flower has three pinkish-white petals
- Fragmentation of each part of the plant can lead to its spread; it also spreads by seeds

Nick Proulx, MNDNR

Similar Species: Native sedges (*Cyperaceae spp.*), rushes (*Juncaceae spp.*), burr-reeds (*Sparganium spp.*), and sweetflag (*Acorus americanus*).

Habitat: Shallow water up to 2 m (6.5 feet) deep in lakes, rivers, marshes, ponds, and wet ditches.

Distribution: Has been detected in multiple locations throughout the Holland River, including areas near Bradford and Newmarket. Throughout the drainages of Lake Erie, Lake St. Clair, Lake Ontario, in the western St. Lawrence River, in central Ontario in the Trent-Severn Waterway (including nearby Balsam Lake), and northern Ontario in the Rainy-Lake of the Woods watershed.

Impacts: Displaces native riparian vegetation; impedes boating, fishing, and swimming.

Caleb Slemmons, National Ecological Observatory Network

David Fenwick

Hydrilla

(Hydrilla verticillata)

Size: up to 7.5 m long.

Characteristics:

- This plant is an emergent perennial
- Stems are rooted, erect, either branched or unbranched
- Leaves are green, attached to the stem and arranged in whorls of 3 to 8. They have visibly saw-toothed edges, and sometimes have prickles on the underside
- Flowers are small, with petals 2 to 4 mm wide, and are white to reddish or white to light-green with red stripes. When open, they float on the surface of the water

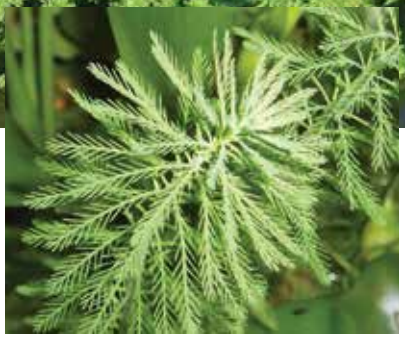
Similar Species: Native Canada waterweed and invasive Brazilian elodea.

Habitat: Lakes, ponds, wetlands, streams, rivers, and ditches.

Distribution: Not yet present in the Lake Simcoe watershed. Hydrilla has not been detected in Canada, but it has been found in neighbouring U.S. states, including Pennsylvania and New York. Hydrilla populations can now be found on every continent except Antarctica.

Impacts: Once established, hydrilla is able to grow aggressively, outcompeting native plants. It forms dense mats that block sunlight from reaching other submerged plants, including native species. Degrades water quality by raising pH levels, decreasing oxygen, and increasing water temperature. By causing stagnant water, hydrilla may also provide habitat that allows mosquitoes to breed.

Richard Old_XID Services Inc



Leslie J. Mehrhoff

Parrot Feather

(Myriophyllum aquaticum)

Size: 2 - 5m

Characteristics:

- Herbaceous, submerged aquatic plant reaching 2 to 5 m
- Leaves are whorled and feather-like with 20 to 30 segments per leaf
- Submerged leaves are 1.5 to 3.5 cm long and emergent leaves are 2 to 5 cm long and much greener
- Flowers in axils of emergent leaves, forming an emergent terminal spike
- Only female white flowers are known to occur in North America

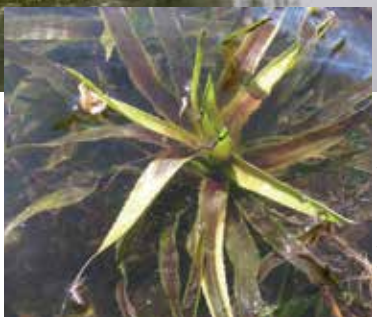
Similar Species: Native northern water-milfoil, and coontail, invasive Eurasian water-milfoil.

Habitat: Non-tidal waters, including lakes, ponds, and slow-moving streams.

Distribution: Not yet present in the Lake Simcoe watershed. In Ontario, parrot feather populations have been detected in Midhurst, Mallorytown, and northwest of Hamilton. The populations in Midhurst and Mallorytown have been successfully eradicated. Parrot feather is also known to occur in British Columbia and in at least 26 states throughout the U.S.

Impacts: Parrot feather outcompetes and displaces native vegetation, as well as clogging waterways and impeding recreational activities, such as boating, swimming, and fishing. It also creates stagnant waters, increasing breeding grounds for mosquitoes.

David Copplestone, OFAH



Stratiotes aloides Eric Snyder, OMNR

Water Soldier

(Stratiotes aloides)

Size: leaves up to 40 cm long (16 inches)

Characteristics:

- Perennial, aquatic plant, submerged during the winter and early spring, but becomes buoyant and rises to the water's surface, becoming emergent during the summer
- Leaves are sword-shaped, bright green, with sharp spines on the margins; form rosettes
- Flowers are white with three petals; however, flowering plants are rare in Ontario
- Similar to the runners of household spider plants; water soldier can also spread via turions

Similar Species: Native tape grass (*Vallisneria americana*), American burr-reed (*Sparganium americanum*).

Habitat: Prefers quiet waters, slow-moving rivers, lakes, ponds, and canals; in water up to 5 m deep.

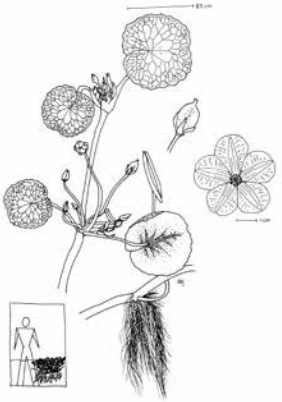
Distribution: Although a small population of water soldier was detected within the Black River in 2015, control measures have been taken and no sightings have occurred there since. The only known wild populations in North America are currently in the Trent-Severn Waterway, near the hamlet of Trent River, Ontario, and in Red Horse Lake, southeast of Lyndhurst.

Impacts: Forms large, dense stands; outcompetes native plants; impedes boating, fishing, and swimming; inhibits phytoplankton growth; depending on population size, can alter surrounding water chemistry..

Mark Malchoff, Lake Champlain Sea Grant

Yellow Floating Heart

(Nymphoides peltata)



Size: leaves are 3-10 cm wide (1-4 inches)

Characteristics:

- Rooted, perennial, aquatic plant
- Heart-shaped, almost circular, floating leaves 3-10 cm wide (1-4 inches)
- Bright yellow flowers, about 2-4 cm wide (0.8-1.6 inches), with five ruffled petals; 2-5 flowers from each leaf stalk; blooms from June to October
- Reproduces by seed and vegetatively by broken stems

Ann Bove, VTDEC

Similar Species: European frog-bit and yellow pond-lily.

David Cappaert, Michigan State University, Bugwood.org

Habitat: Prefers quiet waters, slow-moving rivers, lakes, ponds, and canals; grows on damp mud and in water up to 4 m deep (13 feet).

Distribution: Not yet present in the Lake Simcoe watershed. In Ontario, it was found in a pond that is connected to the Rideau River, in the Royal Botanical Gardens Nature Sanctuaries near Burlington, and areas near Georgetown and Erin.

Impacts: Forms large, dense floating mats; outcompetes native plants; impedes water flow, boating, fishing, and swimming.

Dr. P. R. Bowser, Cornell University

Viral Hemorrhagic Septicemia
(VHS)

VHS is a multi-strain infectious disease that effects both fresh and saltwater fish. To reduce the spread of this disease, the Ministry of Natural Resources and Forestry has created two distinct VHS management zones for Ontario, one of which applies exclusively to Lake Simcoe.

Characteristics:
Fish with VHS may, but will not always display the following symptoms:

- Pale gills/organs
- Bulging eyes
- Bloated abdomen
- Hemorrhaging (bleeding) on body and organs
- Abnormally dark body colour

Distribution: VHS has been detected in several Lake Simcoe fish species, including Pumpkinseed, Brown Bullhead, Rock Bass, and Round Goby.

Impacts: VHS has caused significant sport fish die-off events throughout the Great Lakes. VHS can affect a variety of sport and baitfish species, resulting in wide ranging effects to the larger ecosystem.

Aquatic Invasive Species Index

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