Ontario

ONTARIO FEDERATION OF ANGLERS AND HUNTERS

Aquatic Invasive Species Training Workshop – Bracebridge - July 25th, 2014

ONTARIO'S INVADING SPECIES AWARENESS PROGRAM

About the OFAH?

- Founded in 1928
- Ontario's largest conservation organisation
- Over 100,000 members, subscribers, and supporters, and 720 member clubs
- Fish and Wildlife conservation programs i.e. Invading Species Awareness Program

Invading Species Awareness Program

- Partnership between OFAH/OMNR among others
- Promote public awareness to prevent the spread of invasive species
- Focus on pathways such as recreational watercraft, angling, aquarium and horticultural industries
- Track and monitor the spread of aquatic invasive species in Ontario
- Contribute to research and control measures of invasive species

ONTARIO'S INVADING SPECIES AWARENESS PROGRAM

Introduction

This workshop will outline how invasive species have been introduced, spread, and how they are being managed in Ontario. We will also focus on reporting procedures.

Overview

- AIS Pathways & Management
- Identification & Reporting

Hands-On

- Reporting Procedures
- Know your AIS

Terms and Definitions

Based on definitions from the Conference of the Parties to the United Nations Convention on Biological Diversity

Alien Species (introduced species, non-native species)

- are species of plants, animals, and micro-organisms introduced by human action outside their natural past or present distribution. (e.g. Chinook Salmon)

Invasive Alien Species

- are those harmful alien species whose introduction or spread threatens the environment, the economy, or society, including human health.

Aquatic Invasive Species (AIS)

- Fish, animal, and plant species that have been introduced into a new aquatic ecosystem and are having harmful consequences for the natural resources in the native aquatic ecosystem and/or the human use of the resource.*

*Definitions taken from *The Canadian Aquatic Invasive Species Action Plan*

What are Aquatic Invasive Species?

Invasive species share several common characteristics

- Over 185 non-indigenous species in the Great Lakes basin
- Until ballast water regulations began in 2006, one new non-native species entered the Great Lakes every eight months

Pathways of Introduction and Spread

Aquatic invasive species are introduced and spread to Ontario waters via seven key pathways.

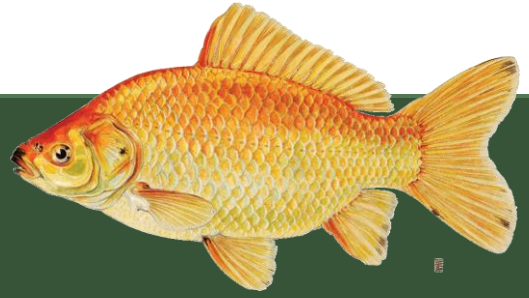
1. **Shipping**
   - Hull and ballast water introductions are the primary source of AIS in the Great Lakes

2. **Recreational and Commercial Boating**
   - e.g. Eurasian water milfoil

3. **Movement of Live Bait**
   - E.g. Rudd

Pathways of Introduction and Spread

New aquatic species are introduced to Ontario and spread through out Ontario waters via seven key pathways.



4. **Aquarium & Horticultural Trade**
   - e.g. Koi, Goldfish, Yellow iris

5. **Live Food Fish**
   - e.g. Bighead Carp, Black Carp and Silver Carp

6. **Unauthorized Introductions**
   - e.g. Rock Bass, Smallmouth Bass

7. **Canals and Water Diversions**
   - e.g. Sea Lamprey

Regulations

A variety of regulations exist to control the spread of invasive species within Ontario

Regulations to prevent the introduction and spread of invasive species through the bait pathway:

- a white list of legal baitfish species (OFR Schedule 1, Part 2),
- prohibitions on:
  - the overland transport of crayfish (OFR s 29),
  - commercial harvest and sale of crayfish and frogs (FWCA O. Reg 664/98 s 31.3)
  - possession for or use as bait of invasive fish or live fish that are not a species of baitfish (OFR s 29);
  - possess for or use as bait of rainbow smelt (in Fisheries Management Zones 2, 4 & 5) (OFR s 29)
  - release of live bait or live baitfish, or emptying the contents of a bait bucket into any waters or within 30 m of any waters (OFR s 28)
  - Importation into Ontario of live fish, live leeches, or crayfish or salamanders for use as bait (OFR s 5)

Part 3: Species of Invasive Fish (Subsection 1 (1))

"invasive fish" means a fish of a species set out in Part 3 of Schedule 1.

Additionally, all pathways are addressed by the OFR regulation (s 6) that prohibits the possession of live invasive fish (as defined in Schedule 1, Part 3) except under the authority of a special license.

Item	Column 1 Common Name	Column 2 Scientific Name
1.	Ruffe	*Gymnocephalus cernuus*
2.	Grass Carp	*Ctenopharyngodon idella*
3.	Bighead Carp	*Hypophthalmichthys nobilis*
4.	Silver Carp	*Hypophthalmichthys molitrix*
5.	Black Carp	*Mylopharyngodon piceus*
6.	Snakehead family	*Channidae*
7.	Rudd	*Scardinius erythropthalmus*
8.	Round Goby	*Neogobius melanostomus*
9.	Tubenose Goby	*Proterorhinus marmoratus*

AIS Species Identification

The Field Guide categorizes AIS into the following four categories. Today we will cover species from each of the last three groups.

Algae

Once considered plants but now classified separately; lack true roots, stems, leaves, and embryos

Plants

Can be free-floating, floating and, rooted in sediment, submergent or emergent

Invertebrates

Include arthopods (crayfish), molluscs (snails, mussels, clams), crustaceans (waterfleas, mysid)

Fishes

Include any alien invasive fresh water fish

AIS Species Identification

We will discuss the following species of AIS plants in detail.

Fanwort
Eurasian Water-milfoil
European Frog-bit
European Common Reed
Purple Loosestrife
Yellow Iris

Fanwort-*Cabomba caroliniana*

What is it?

- Submergent perennial plant
- Native to South America
- First detected in Kasshabog Lake (1991)

Pathway of Introduction and Spread

- Aquarium and water garden trade
- Spread by recreational boats

Habitat

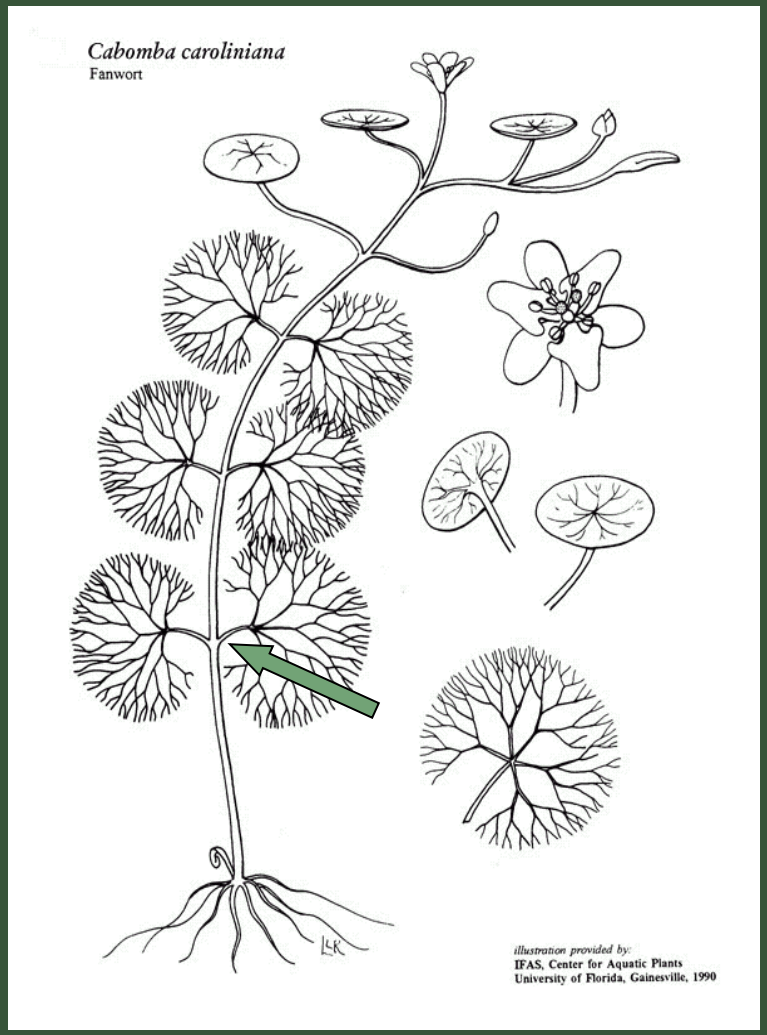
- Slow flowing water: streams, lakes, ponds
- Nutrient rich waters, tolerant of low pH

Fanwort-*Cabomba caroliniana*

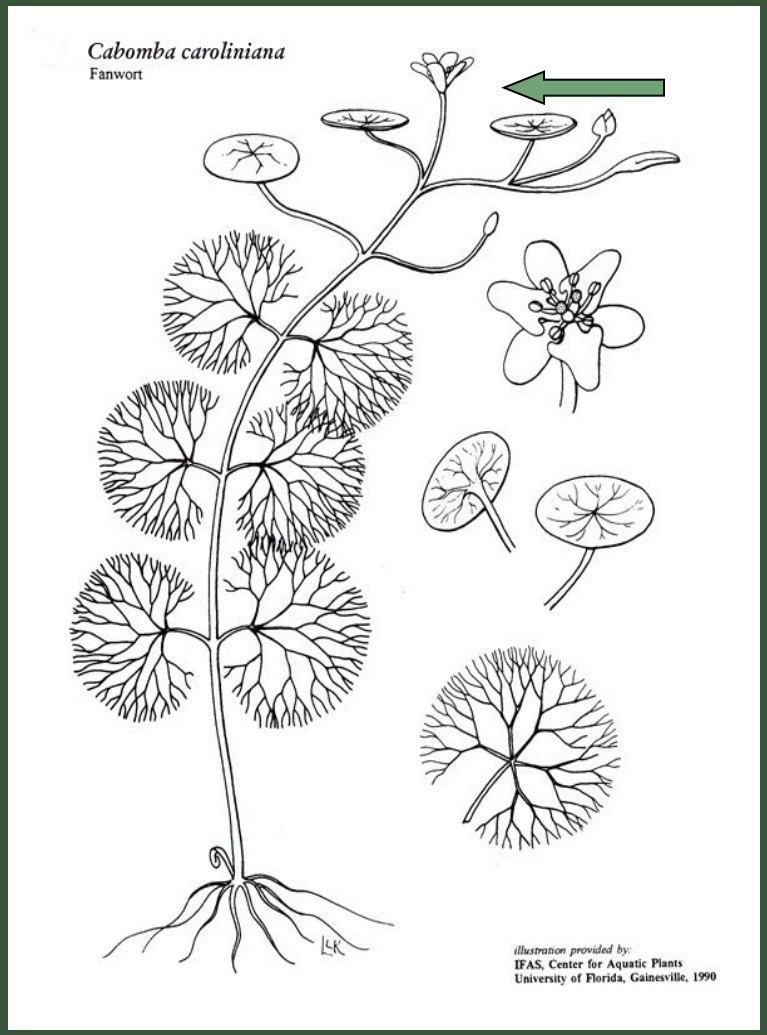
Impacts

- Forms dense monotypic stands
- Out competes native vegetation
- Interferes with recreational water use

Fanwort-*Description*

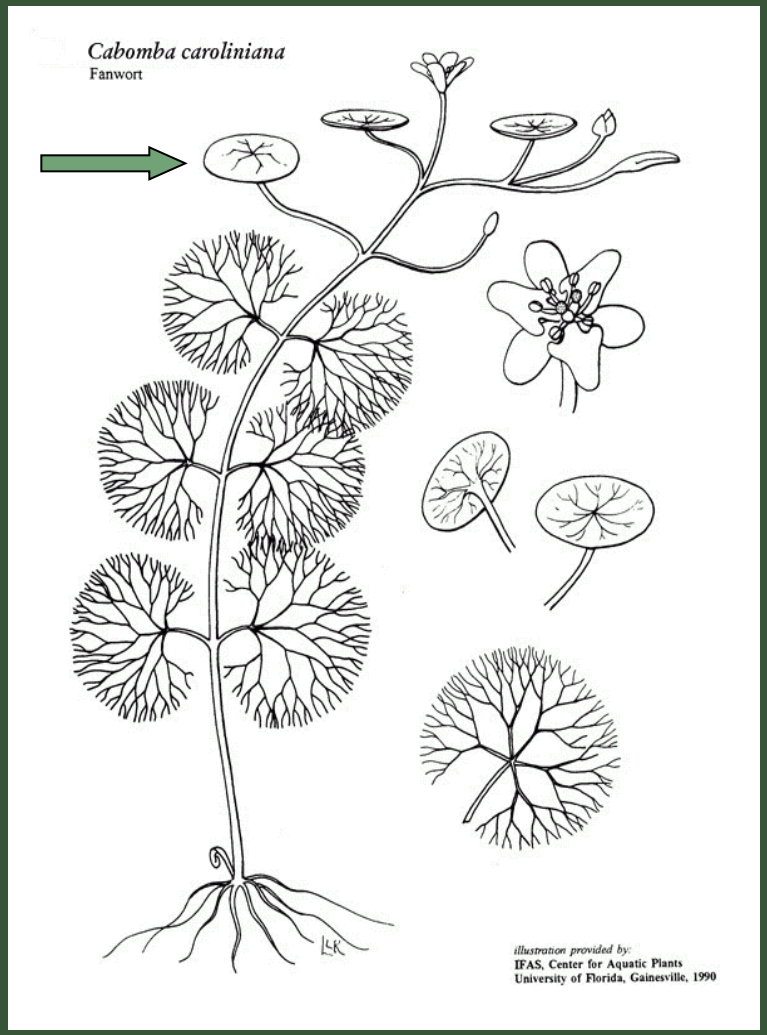


Fanwort-*Description*



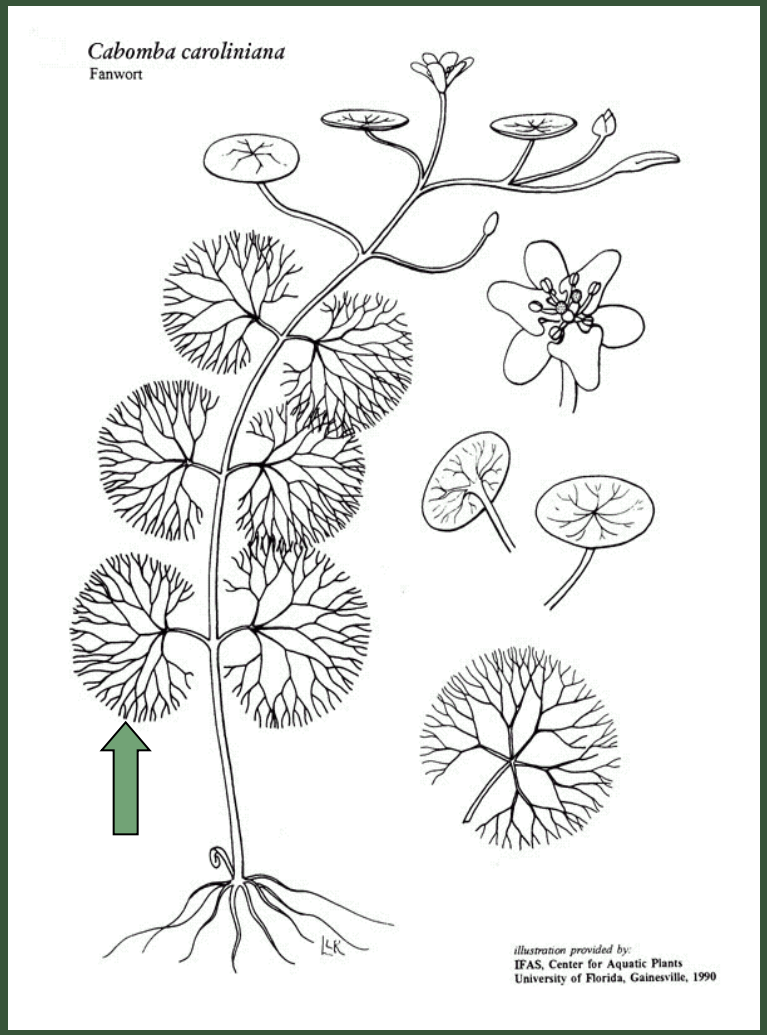
Emergent flowers, small (6-5mm),
White to yellow petals (3) and sepals (3)

Fanwort-*Description*



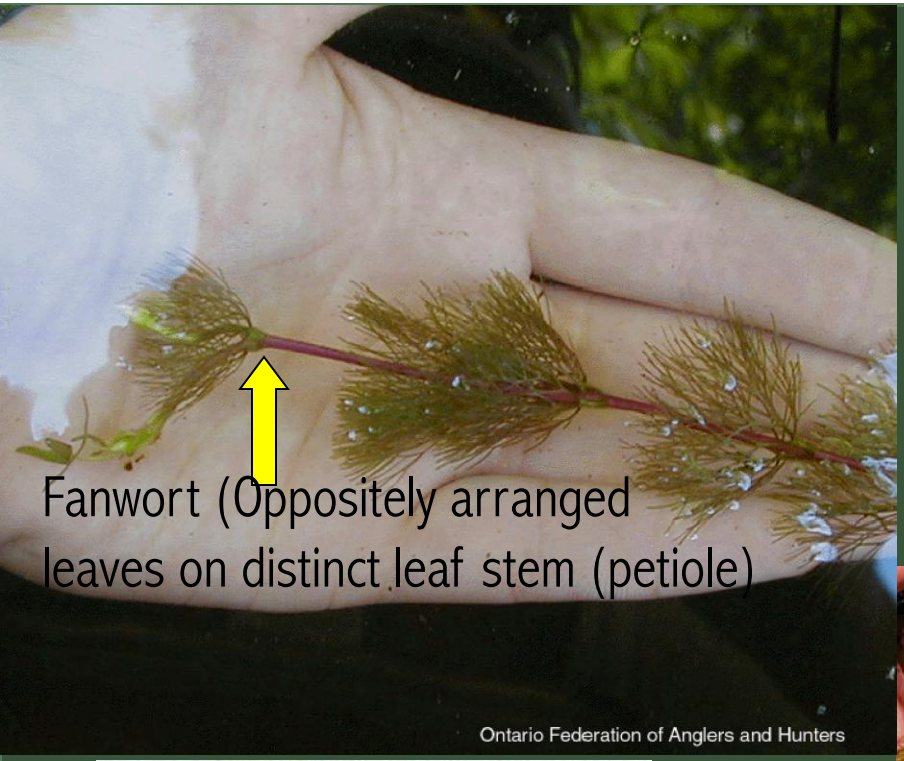
Floating alternate leaves

Fanwort-*Description*

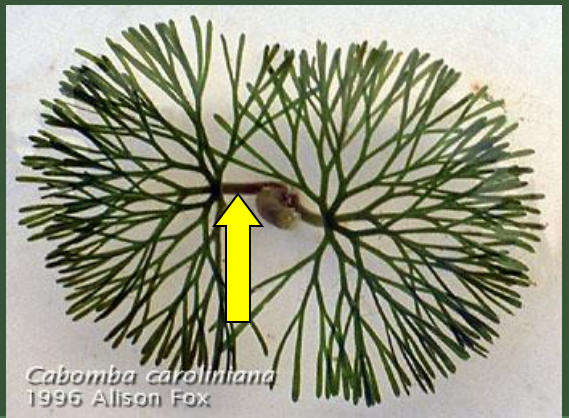


Submerged opposite fan-shaped leaves

Fanwort-Similar Species

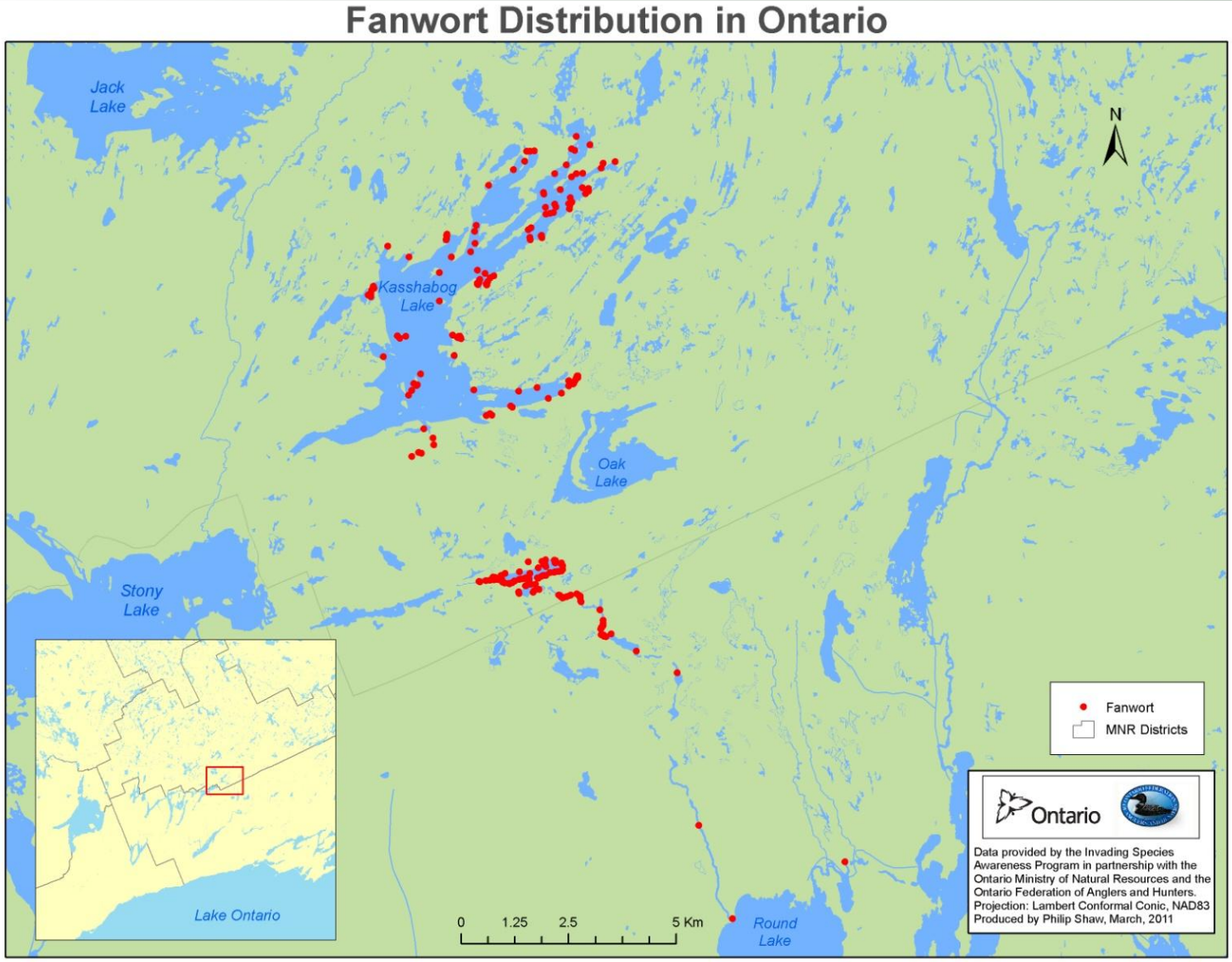


Fanwort (Oppositely arranged leaves on distinct leaf stem (petiole)



White water crowfoot: (alternately arranged leaves, no distinct leaf stem)

Fanwort-Distribution



First detected in Kasshabog Lake in 1991, spreading downstream in Crowe River watershed

Eurasian Water Milfoil -*Myriophyllum spicatum*

What is it?

- Submergent perennial plant
- Native to Eurasia
- First recorded in Canada in Lake Erie (1961)

Photo: Dave Brittion

Pathway of Introduction and Spread

- Shipping
- Recreational Boating (plant fragments)

Habitat

- 1-3 m deep lakes, rivers and (up to 10 m)
- Prefers nutrient rich waters, can be found in nutrient poor waters
- Alkaline or acid waters

Eurasian Water Milfoil -*Myriophyllum spicatum*

Impacts

- Forms dense canopy over large areas, suppressing native vegetation
- Impedes water traffic, recreation
- May hybridize with native milfoil species

Eurasian Water Milfoil -Description

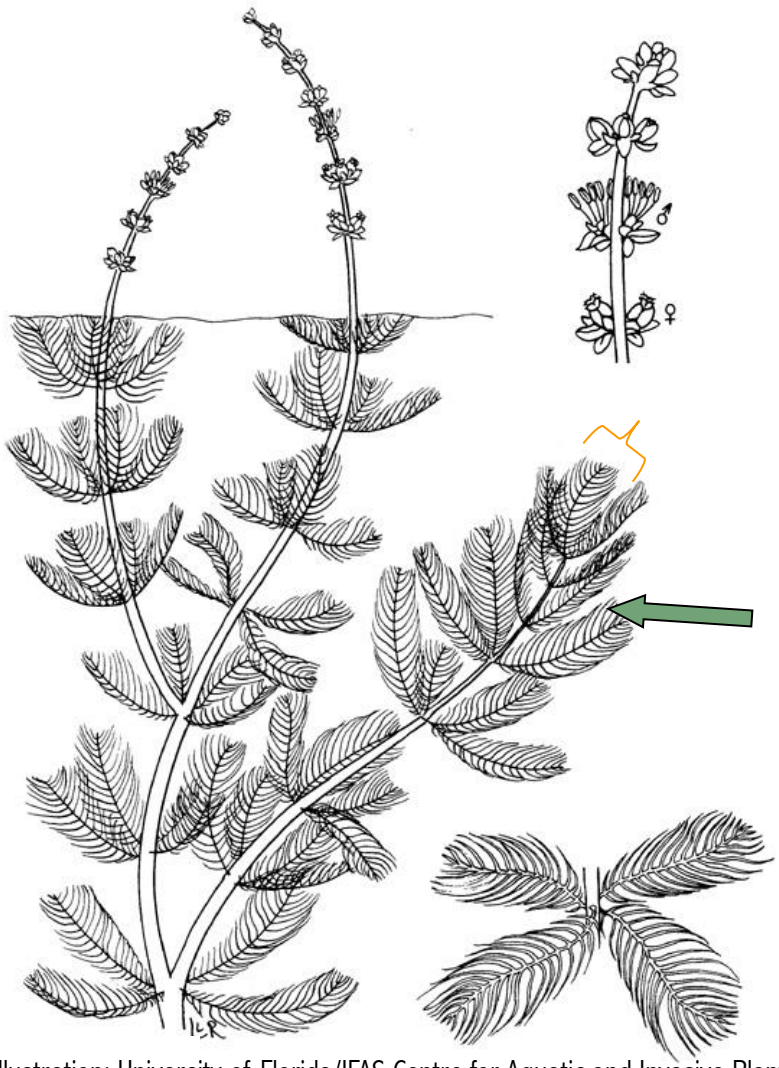


Illustration: University of Florida/IFAS Centre for Aquatic and Invasive Plants

Photo: Dave Britton

Leaves: feather-like with 12 or more segments per side

Eurasian Water Milfoil -Description

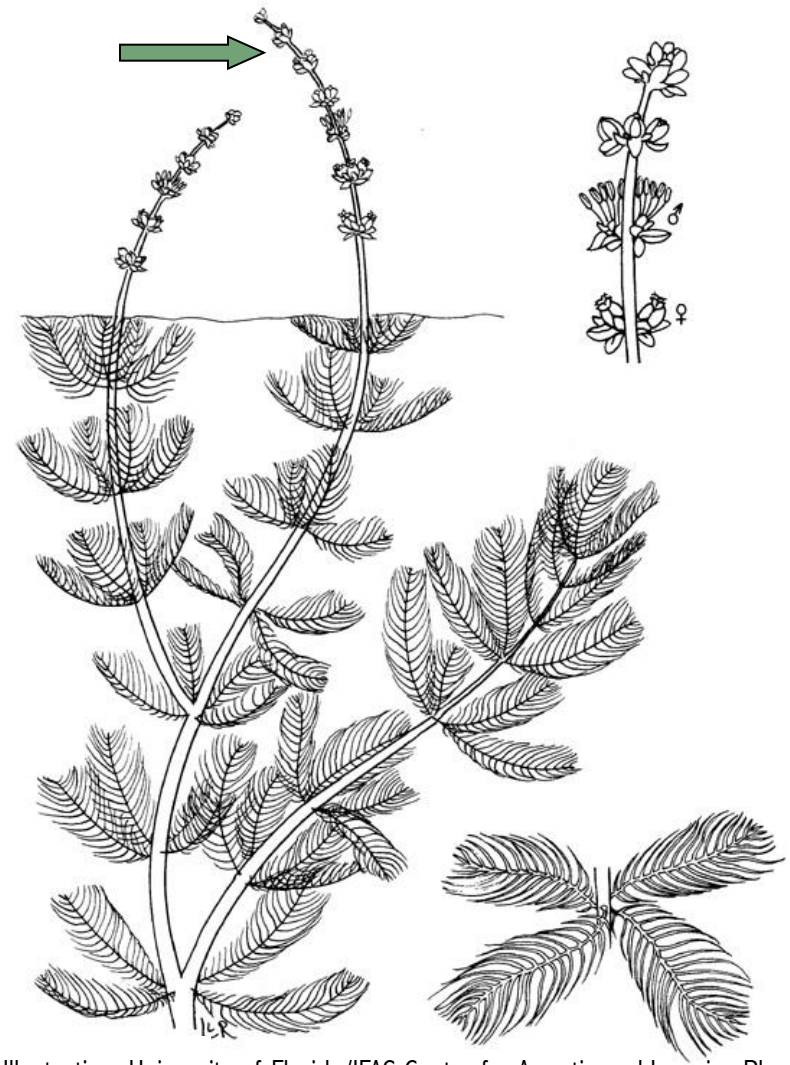


Illustration: University of Florida/IFAS Centre for Aquatic and Invasive Plants

Flowers: emergent, on terminal spike (5-20cm long)

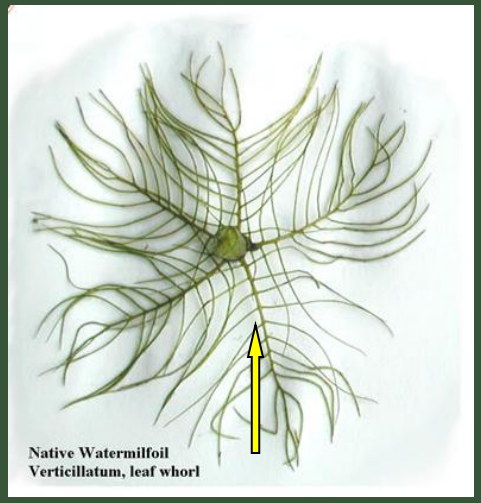
Eurasian Water Milfoil -Similar Species

Photo: Dave Britton

Eurasian water milfoil

Petioles small (<2mm or absent); flowers pink

- Leaves with 12 or more leaflets



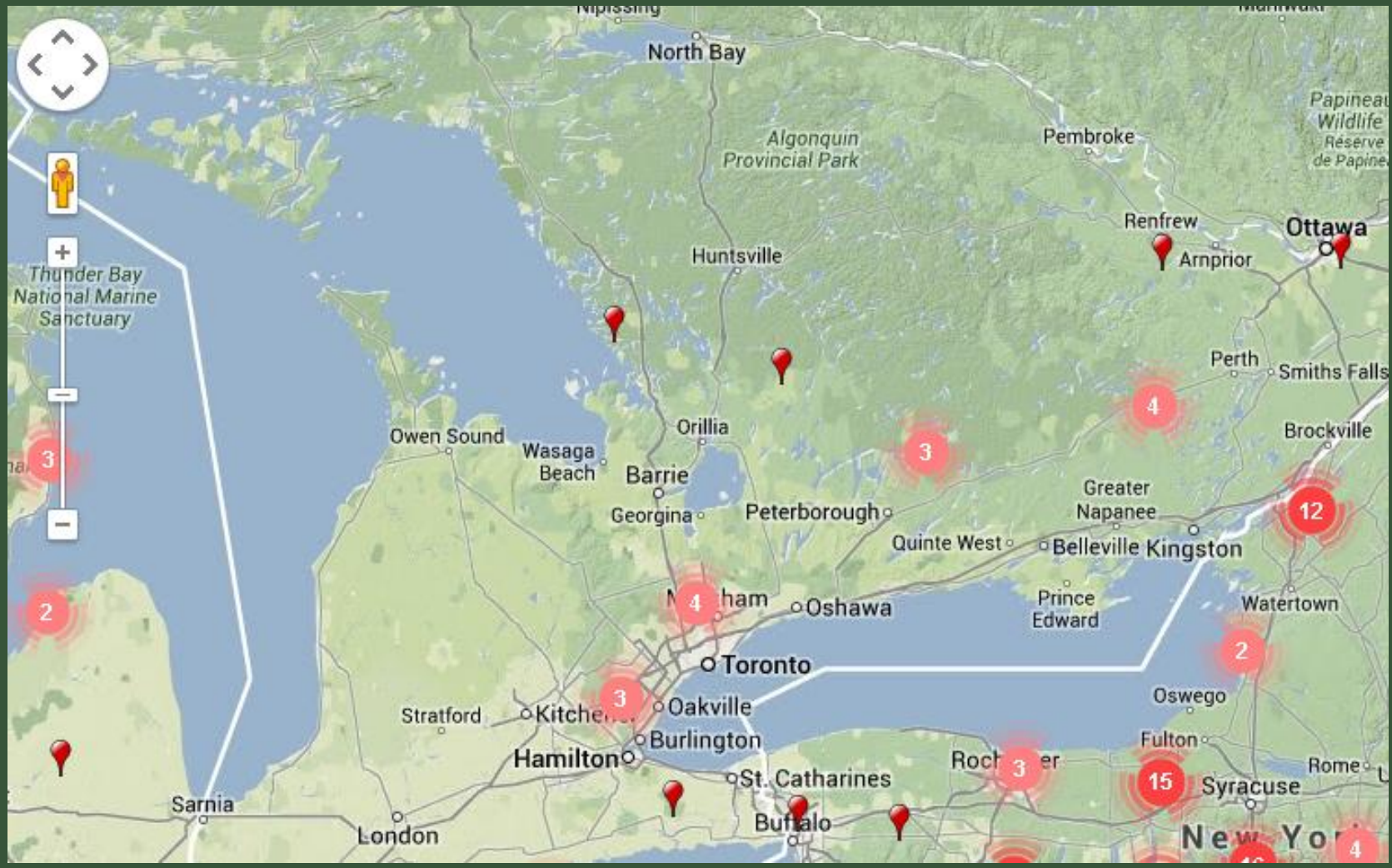
Parrotfeather

Leaves with longer petioles; flowers white

Northern water milfoil

-Leaves with 11 or fewer leaflets

Eurasian Water Milfoil -Distribution



From EDDMapS. March 14th, 2014

European Frog-Bit - *Hydrocharis morsus-ranae*

What is it?

- Free floating (or rooted when on mud) perennial
- Native to Eurasia
- Originally introduced to Central Experimental Farm in Ottawa (1932), later observed in the adjacent Rideau Canal (1939)

Photo: Michigan Sea Grant, www.miseagrant.umich.edu

Pathway of Introduction and Spread

- Recreational Boating

Habitat

- Slow moving water (ponds, rivers, inlets, and ditches)

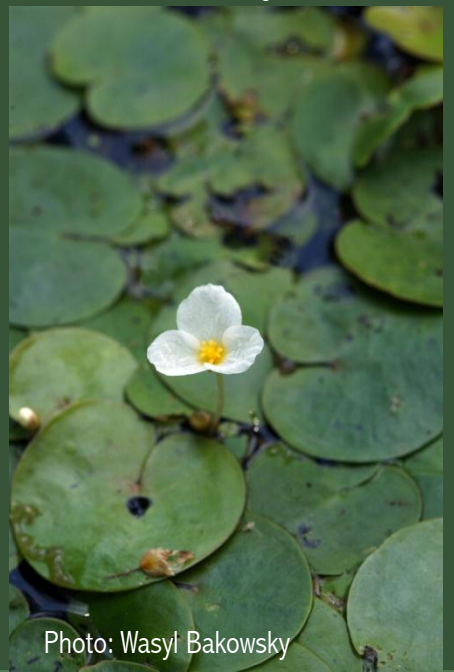


Photo: Wasyl Bakowsky

European Frog-Bit

Photo: Michigan Sea Grant, www.miseagrant.umich.edu

Impacts

- Forms large dense floating mats which can reduce submerged plants by diminishing light and competing for gases and nutrients
- Impedes water flow, boat traffic, recreational activities

European Frog-Bit – Description

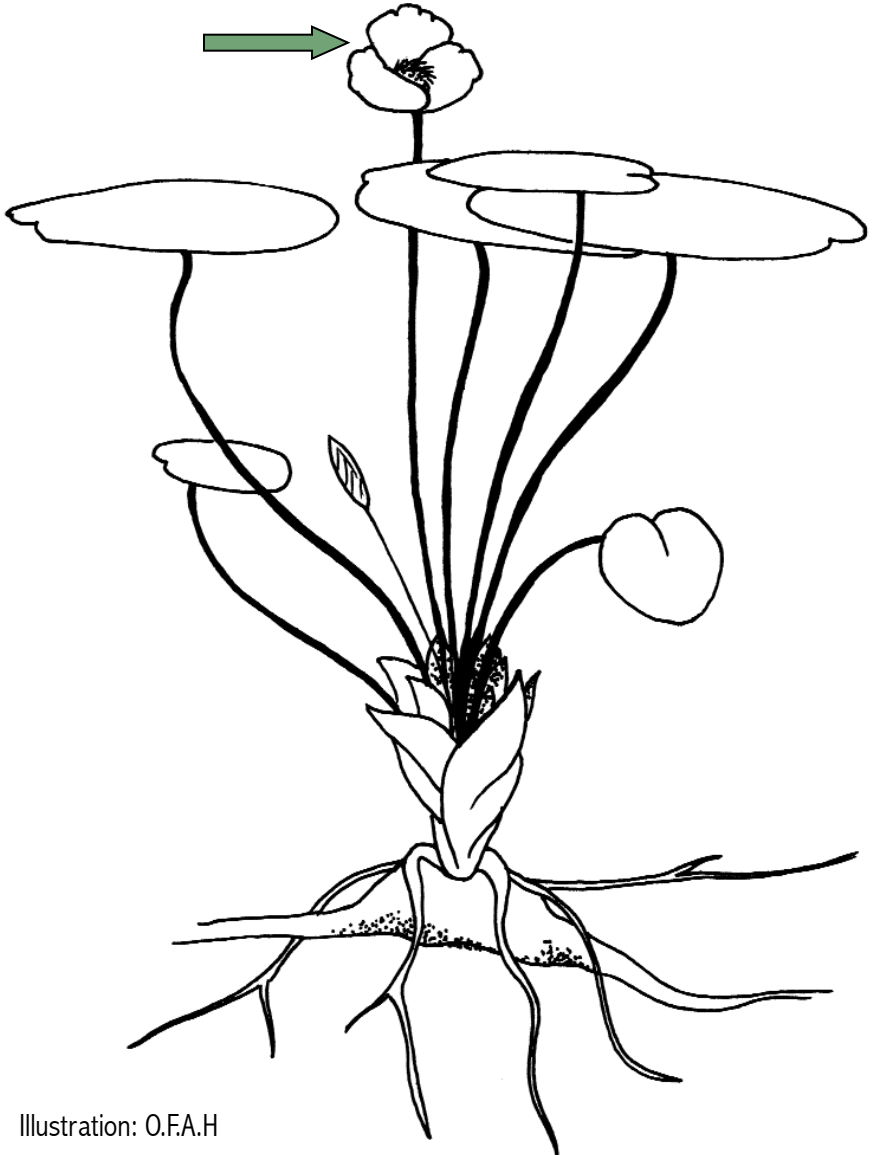


Illustration: O.F.A.H

Photo: Wasyl Bakowsky

Emergent flower:
small, 15 mm in diameter, solitary, three white petals with a yellow centre

European Frog-Bit – Description

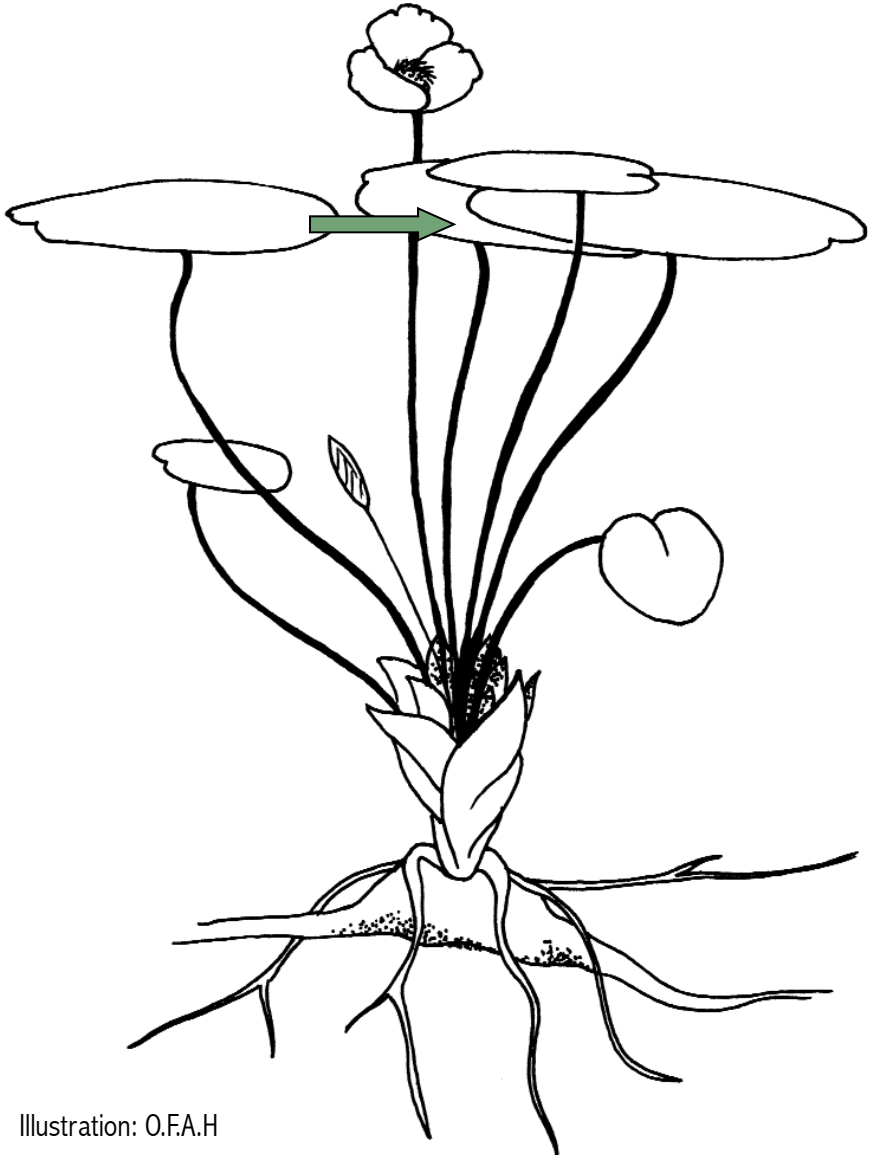


Illustration: O.F.A.H

Photo: Wasyl Bakowsky

Floating leaves: round or heart-shaped, the size of a two dollar coin, spongy underside helps the plant float

European Frog-Bit – Description

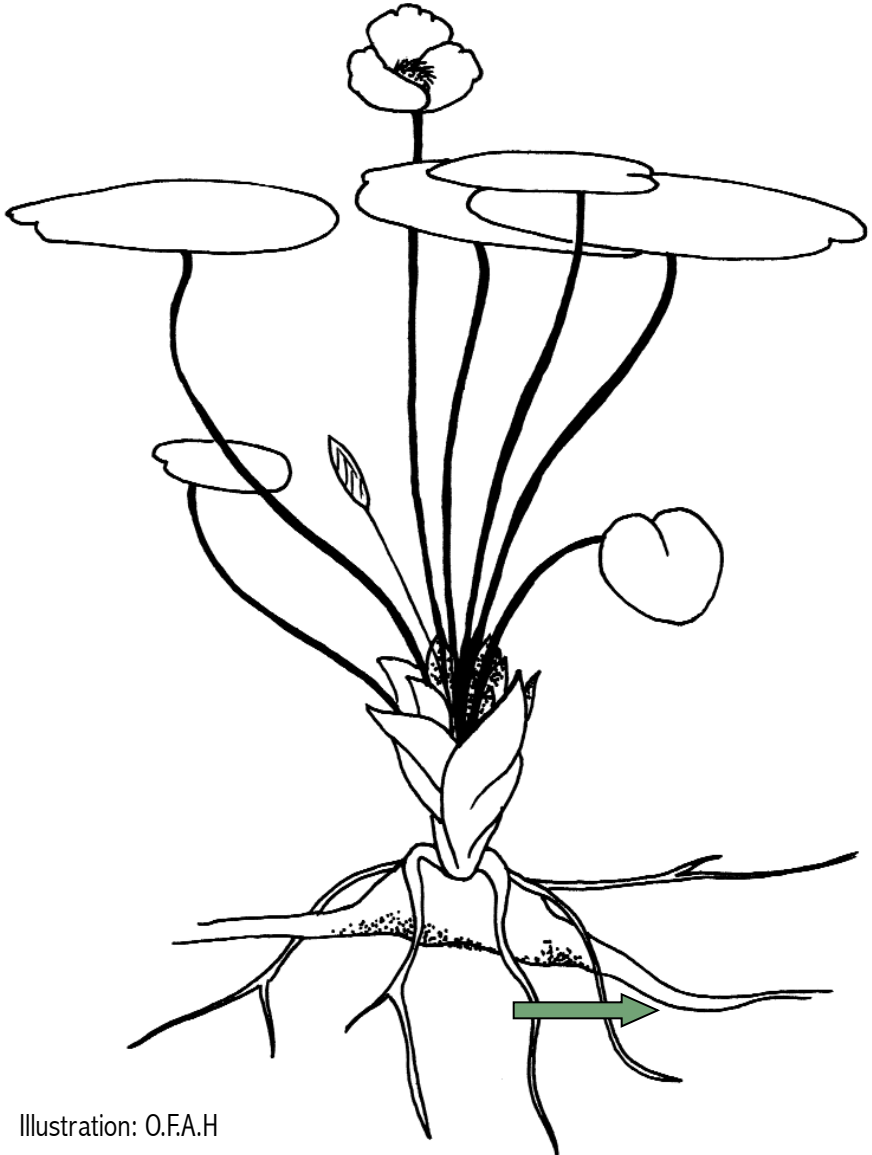


Illustration: O.F.A.H

Photo: Wasyl Bakowsky

Stolons (runners): extend from centre of plant outward to form new plants

European Frog-Bit – Similar Species

Photo: A. Murray, University of Florida, Center for Aquatic and Invasive Plants

North American frog-bit

- Spongy tissue from margin to margin

Photo: Wasyl Bakowsky

European frog-bit

-Spongy tissue confined to the midvein region

-Flowers white to pinkish, leaves up to 6 cm wide

Photo: Kenneth Lawless, Virginia Tech College of Science

Water-Shield

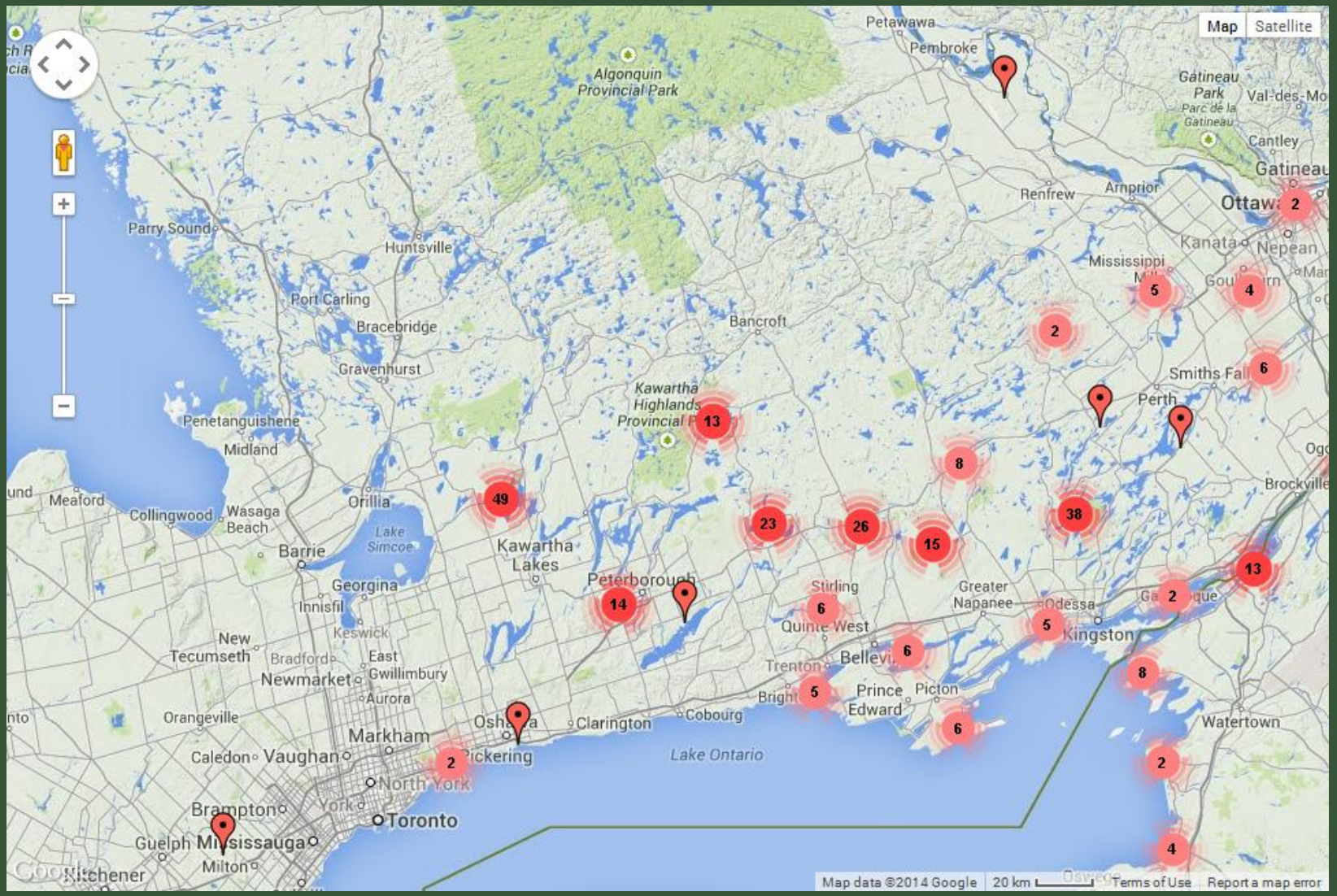
- Purplish flowers; Mucilaginous coating

Photo: Andy Fyon, www.ontariowildflower.com

White Water Lilly

- Leaves 7-30 cm wide; large showy flowers

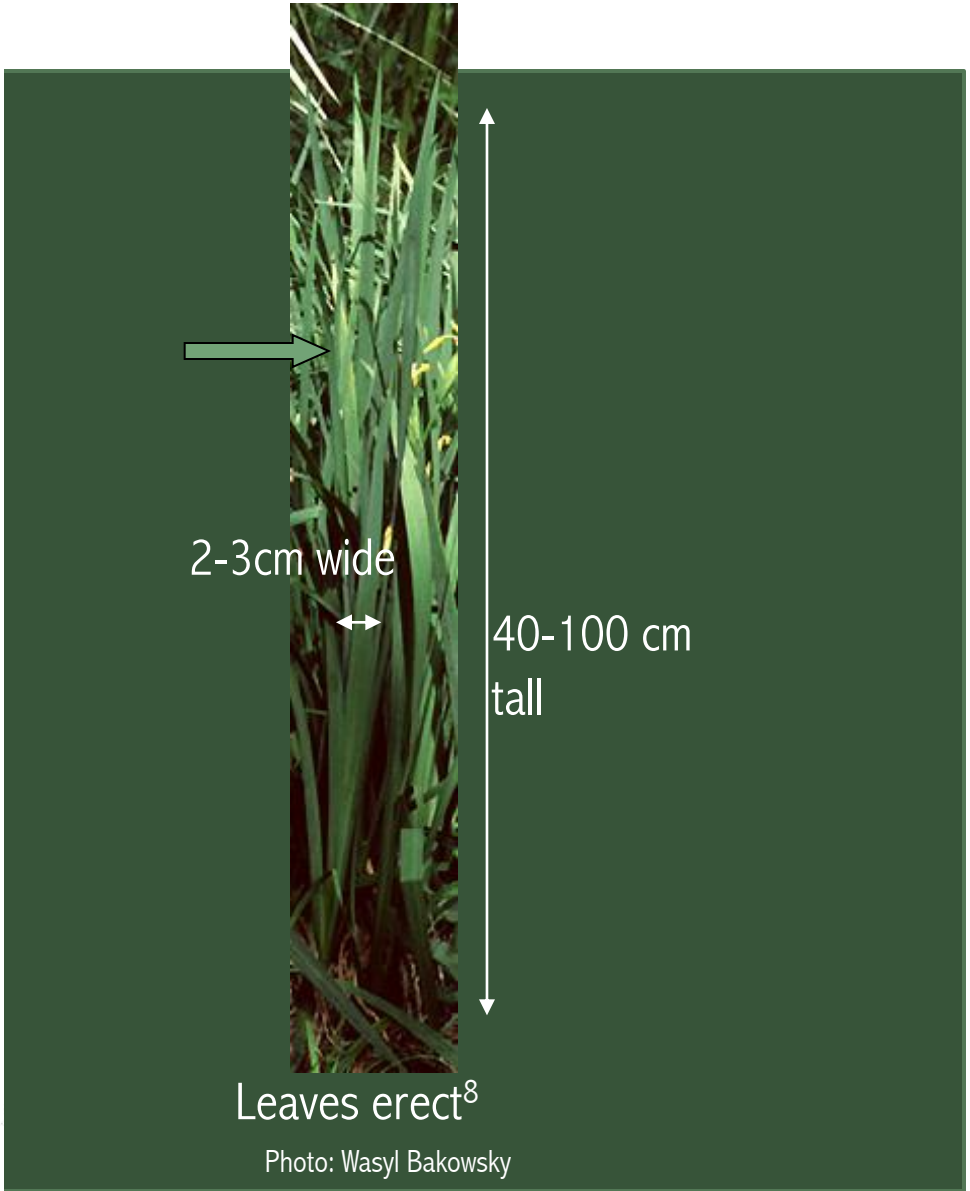
European Frog-Bit – Distribution



From EDDMapS. July 24th, 2014

Yellow Iris – Description

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



Leaves erect[8]

Photo: Wasyl Bakowsky

Yellow Iris – Description

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

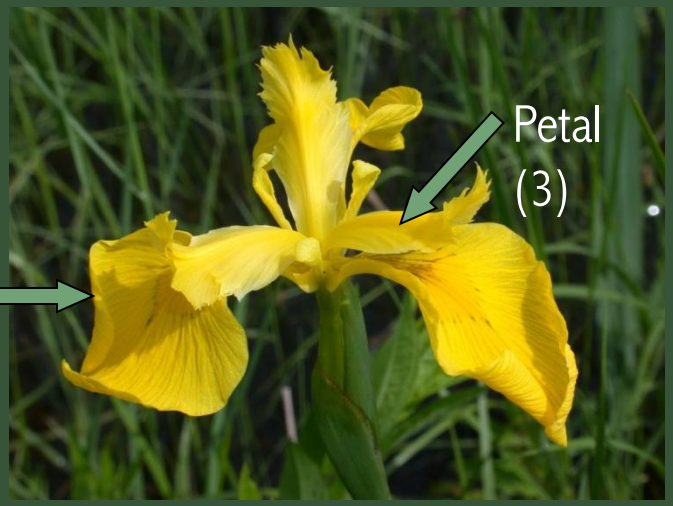


Photo: Wasyl Bakowsky

Emergent flower – bright yellow, 7-9cm wide
Flowers between April and July[8]

Yellow Iris – Similar Species

Photo: D. Kramb

Blue Flag

-Stems shorter (20-60cm)

-Leaves smaller (10-80cm by 1-3cm)

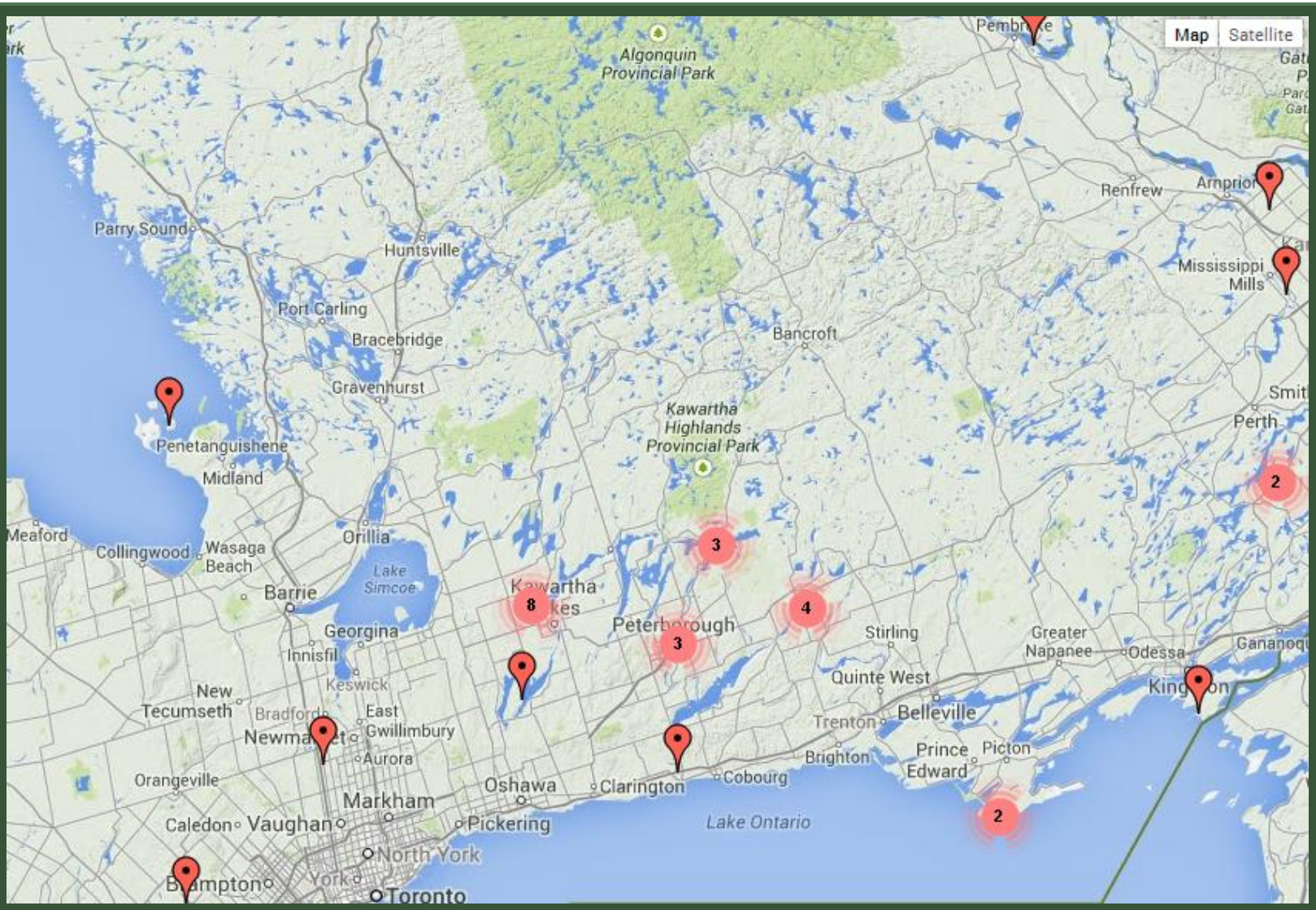
Photo: Wasyl Bakowsky

Yellow Iris

-Stems longer (70-150cm)

-Leaves larger (40-100cm by 2-3cm)[8]

Yellow Iris – Distribution



From EDDMapS. July 24th, 2014

Purple Loosestrife – *Lythrum salicaria*

What is it?

- Emergent, perennial wetland plant
- Native to Eurasia
- Arrived in Canada in the early 19th century

Pathway of Introduction and Spread

- Likely introduced by the dumping of contaminated solid ship ballast along the Atlantic Coast in the early 19th century
- Recreational Boating (roots, buds, and seeds)
- Water gardens

Habitat

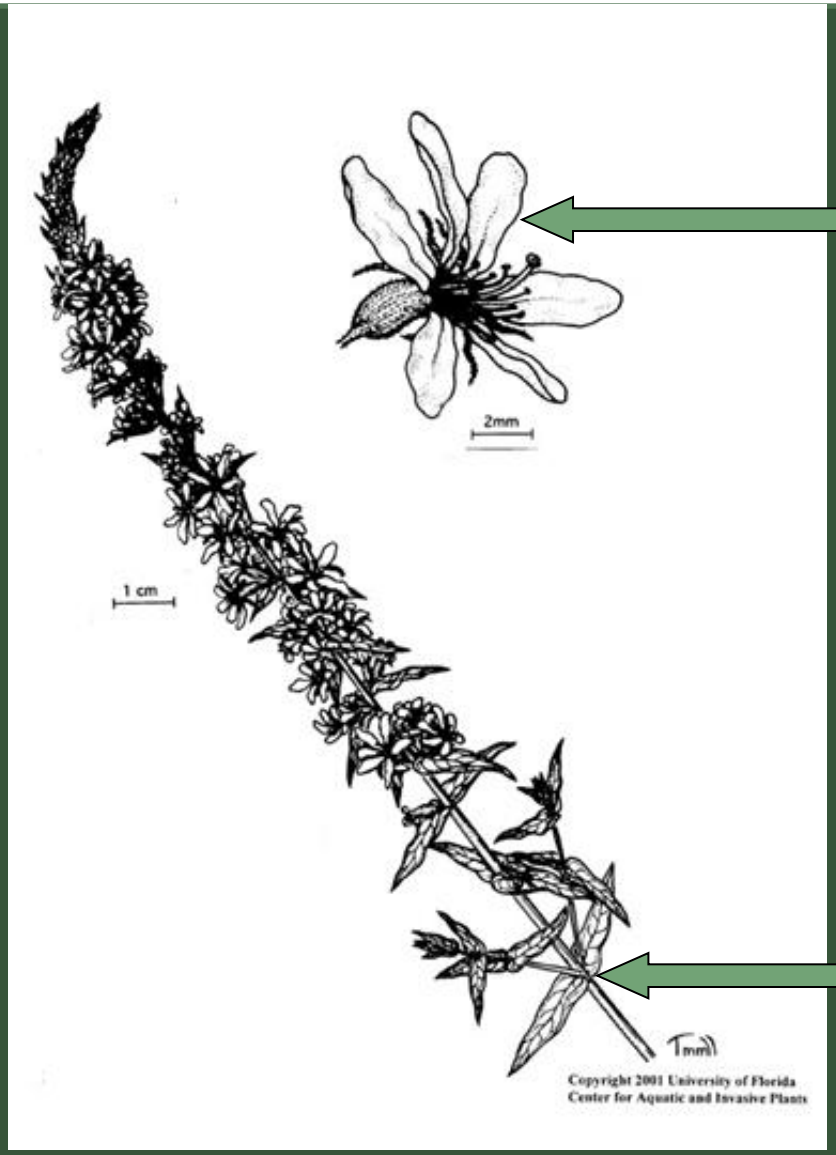
- Marshes, floodplains, river and stream margins, wet ditches and fields

Purple Loosestrife - *Lythrum salicaria*

Impacts

- Forms large monocultural stands over very large areas,
- Displaces native wetland vegetation,
- Threatens wetland habitat and communities,
- May affect decomposition rates and nutrient cycling
- Threatens habitat of rare species, species at risk and other wetland species

Purple Loosestrife - Description



5-7 petals

Leaves opposite or whorled

Purple Loosestrife – Similar Species

Swamp Loosestrife

Individual flowers ring the stem above leaf pairs. They do not form a flower spike like purple loosestrife

Winged Loosestrife

Leaves alternate with small stems attached to the main stem

Purple Loosestrife – Similar Species

Blue Vervain

Small purple flower spikes; edges of leaves are toothed

Fireweed

The conical flower spike is 10-13 cm wide at the base. Stem is round and leaves are alternate

Purple Loosestrife – Biocontrol

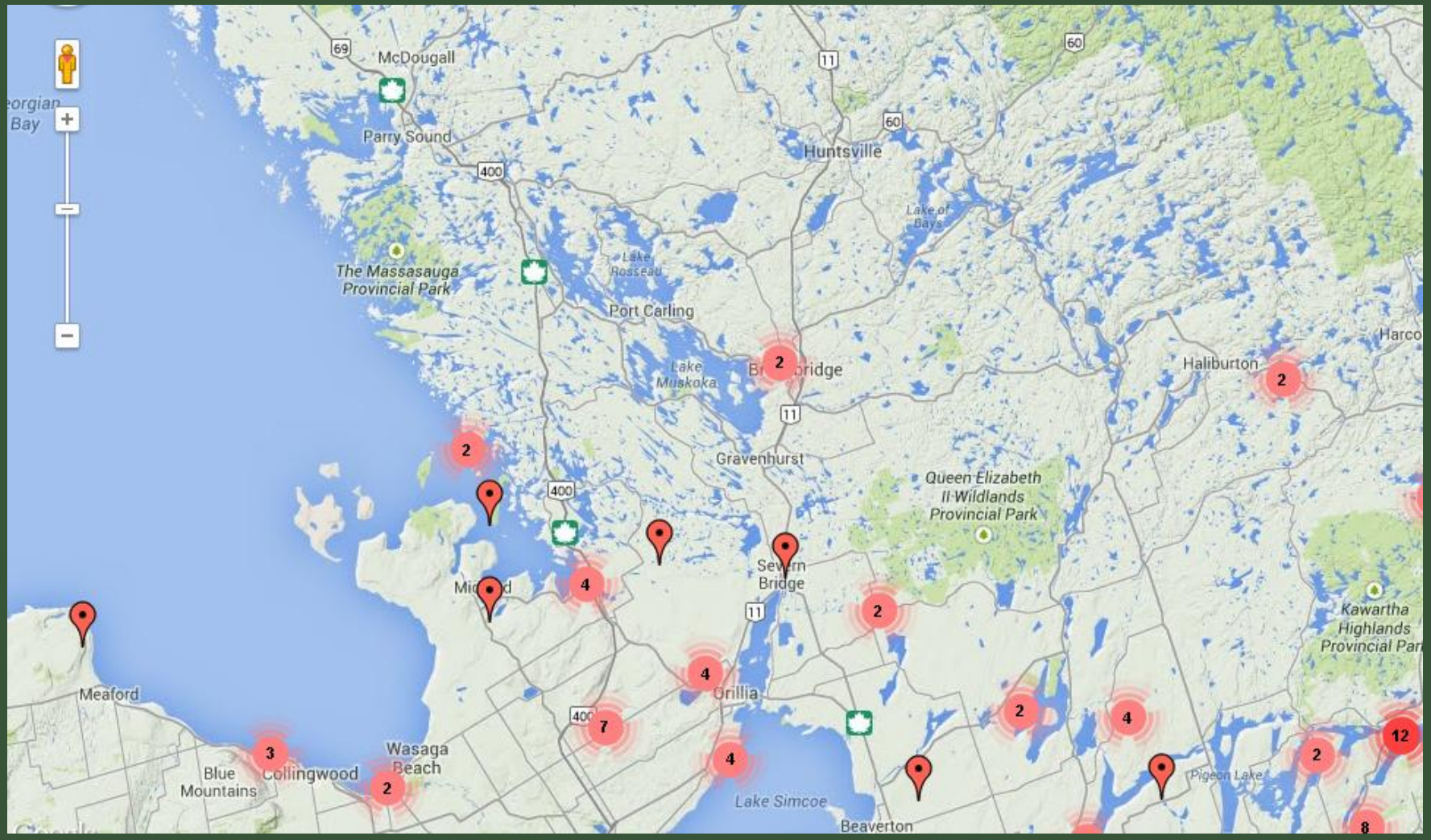
Photo Credit: Jim Corrigan

Beetle damage to Loosestrife plant

Photo Credit: MN DNR

Galerucella beetle larvae

Purple Loosestrife – Distribution



From EDDMapS. July 24th, 2014

AIS Species Identification - Invertebrates

We will cover the following species of AIS invertebrates in further detail

Rusty crayfish
Spiny waterflea
Quagga mussel and Zebra mussel

Rusty Crayfish – *Orconectes rusticus*

What is it?

- Large aggressive crustacean
- Native to the Ohio River system
- First documented in Ontario in the early 1960s


Photo: Dale Westaby

Pathway of Introduction and Spread

- Bait buckets and fishing gear
- Aquarium releases

Habitat

- Wide range including wetlands, ponds, lakes and rivers
- Reproduction occurs above 5 C

Rusty Crayfish – *Orconectes rusticus*

Photo: Bev Wigney

Photo: Jeff Gunderson, Minnesota Sea Grant.

Impacts

- Competition with native crayfish and fish for resources
- Feeds on aquatic plant beds, can destroy nursery and spawning habitats
- Reduction in local invertebrate abundance and macrophyte biomass, species richness

Rusty Crayfish – Description

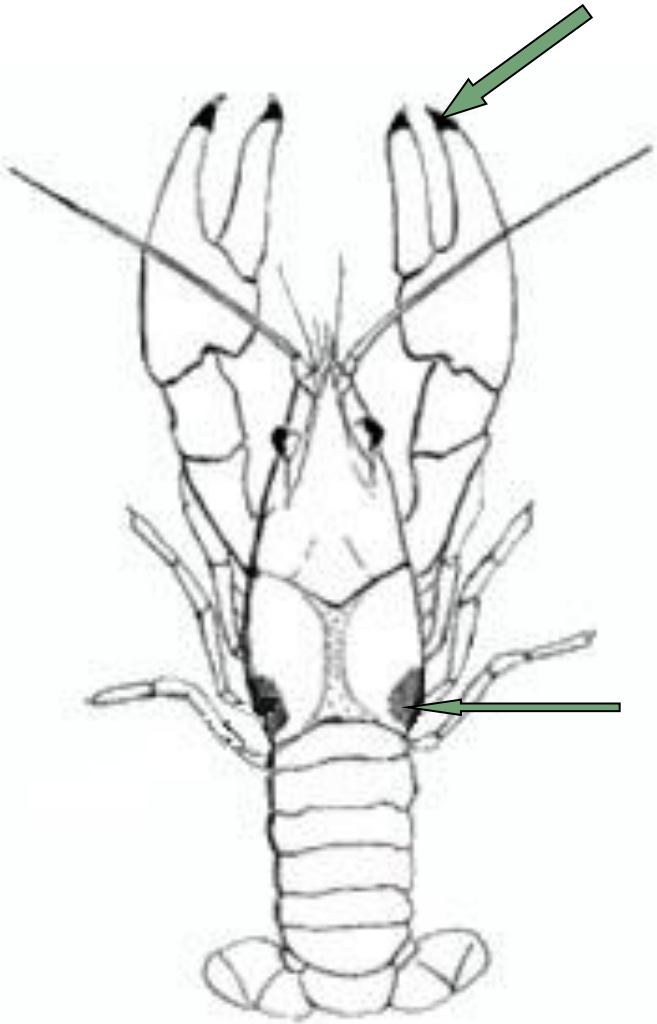


Illustration: Great Lakes Sea Grant Network and U.S. Fish and Wildlife Servicenderson, Minnesota Sea Grant.

Distinctive black bands
on claw tips

Rusty Crayfish – Description

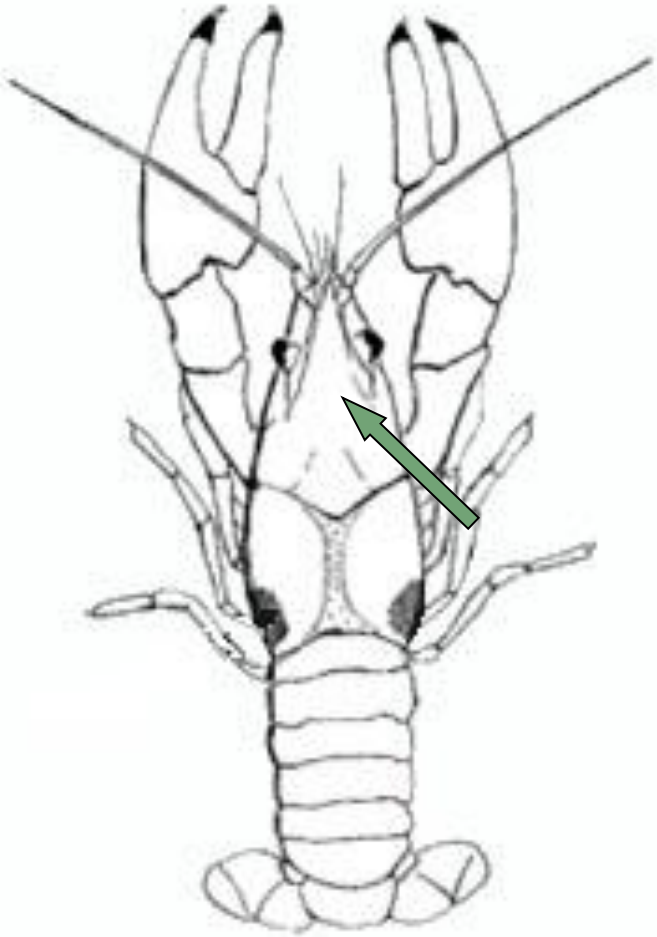
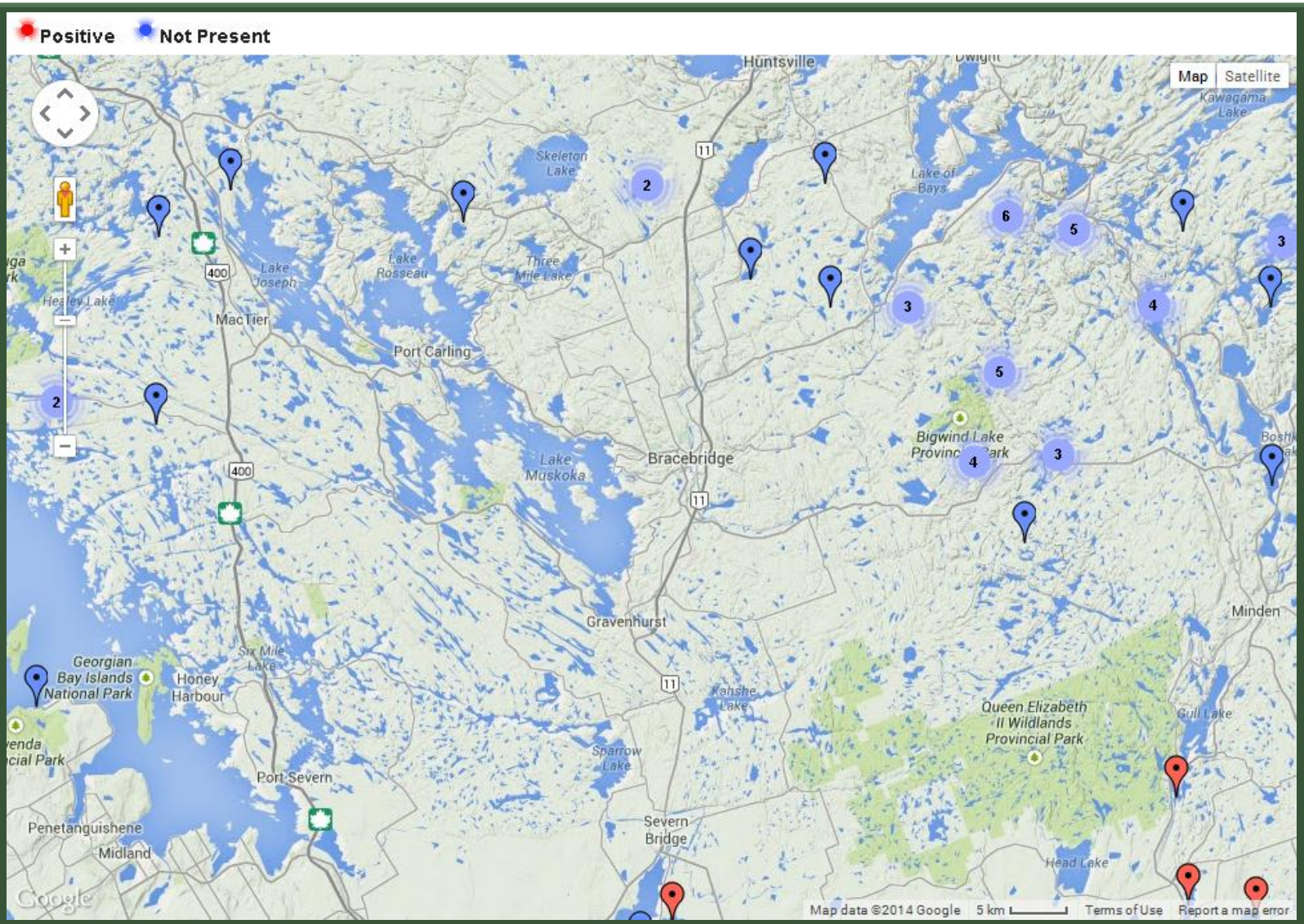


Illustration: Great Lakes Sea Grant Network and U.S. Fish and Wildlife Servicenderson, Minnesota Sea Grant.

Photo: Bev Wigney

Rostrum smooth,
pinched and concave

Rusty Crayfish – Distribution



From EDDMapS. July 24th, 2014

Spiny Waterflea – *Bythotrephes longimanus*

What is it?

- Predatory cladoceran
- Native to Eurasia
- Has the ability to reproduce parthenogenically so can colonize from a single female

Photo: Pieter Johnson

Pathway of Introduction and Spread

- Shipping
- Recreational Boating, and angling equipment
- Dumping of bait buckets

Photo: Minnesota Sea Grant Program

Habitat

- Prefers large clear nutrient poor lakes
- Tolerate warm temperatures (5-28 C)
- Migrates vertically throughout day

Spiny Waterflea – *Bythotrephes longimanus*

Impacts

- Have drastically changed zooplankton communities, reduced native zooplankton diversity, abundance, density, and biomass.
- Not a good food item because of its spine
- Fouls angling equipment by clumping to downrigger cables, fishing line, nets, etc.
- Causes 30% reduction in native zooplankton communities

Photo: Minnesota Sea Grant Program

Spiny Waterflea – Description

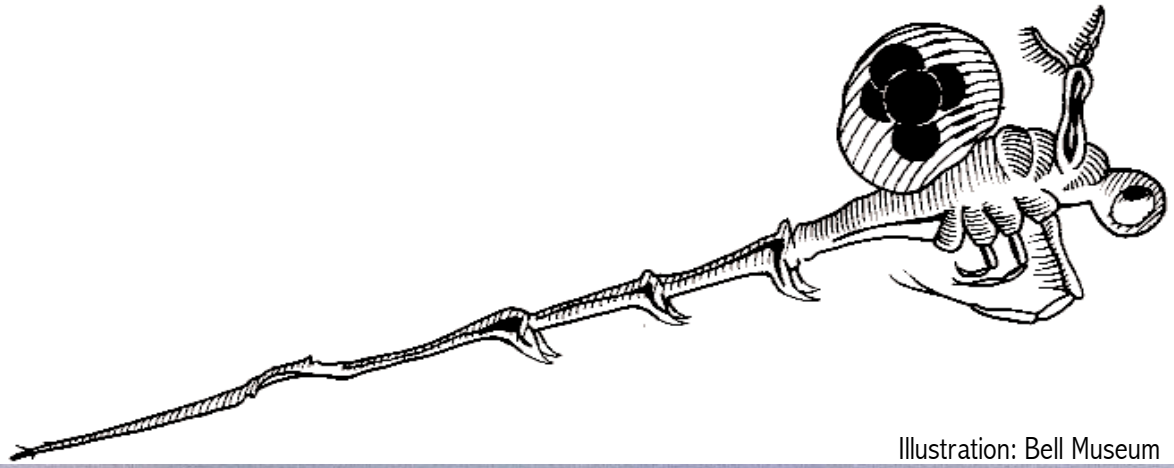


Illustration: Bell Museum

Photo: Bill O'Neill, Earthtones Art and Photography

Size – 1 – 1.5 cm

Spiny Waterflea – Description

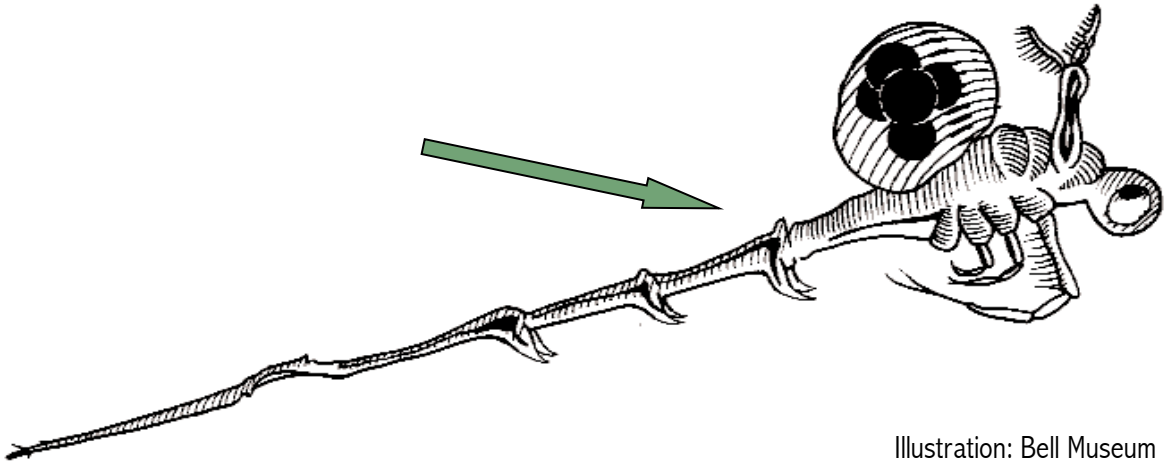


Illustration: Bell Museum

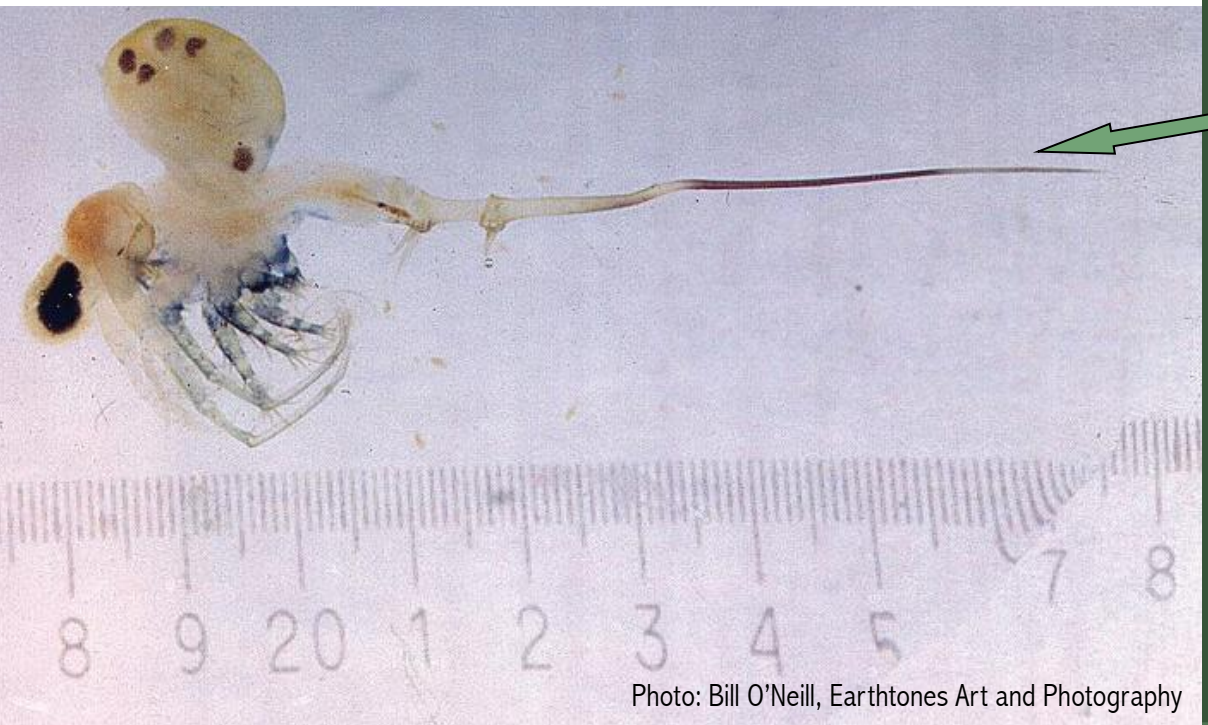


Photo: Bill O'Neill, Earthtones Art and Photography

Tail straight or slightly angled

Spiny Waterflea – Description

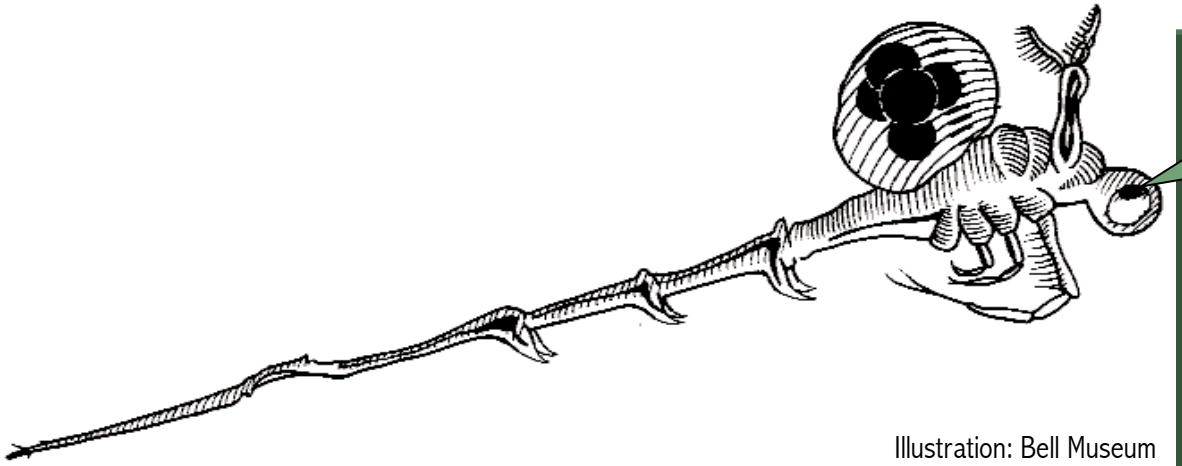


Illustration: Bell Museum

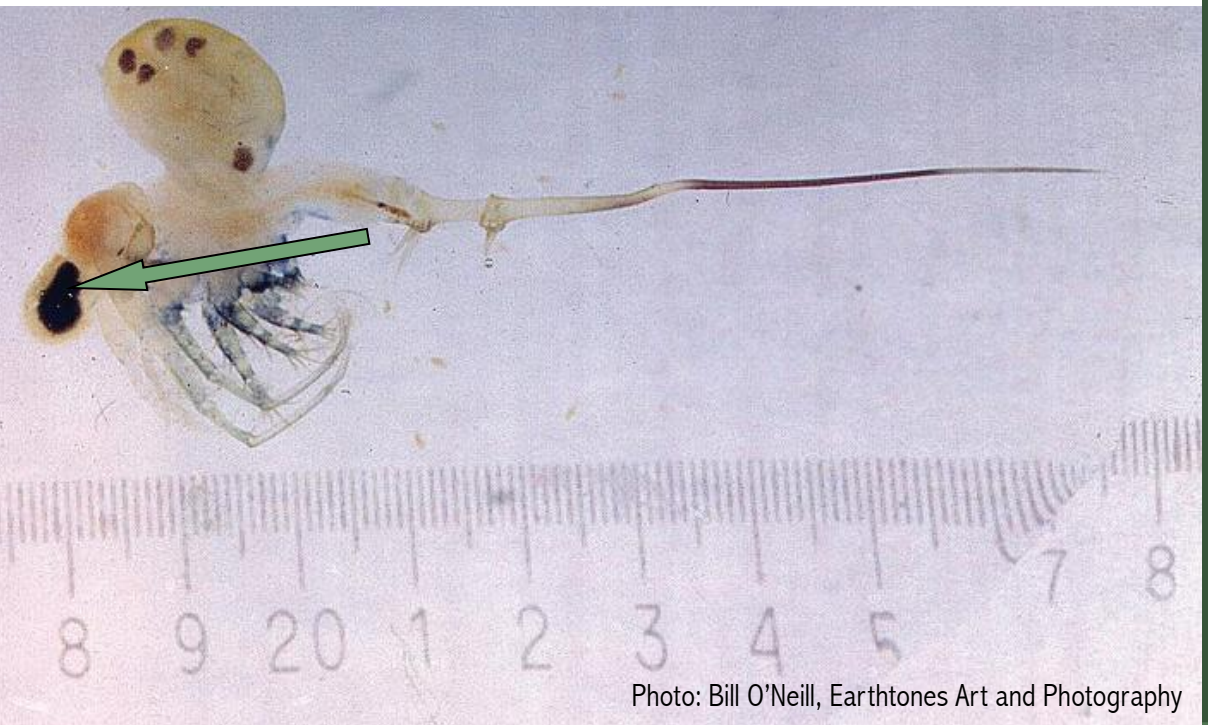


Photo: Bill O'Neill, Earthtones Art and Photography

Dark eye spot

Spiny Waterflea – Description

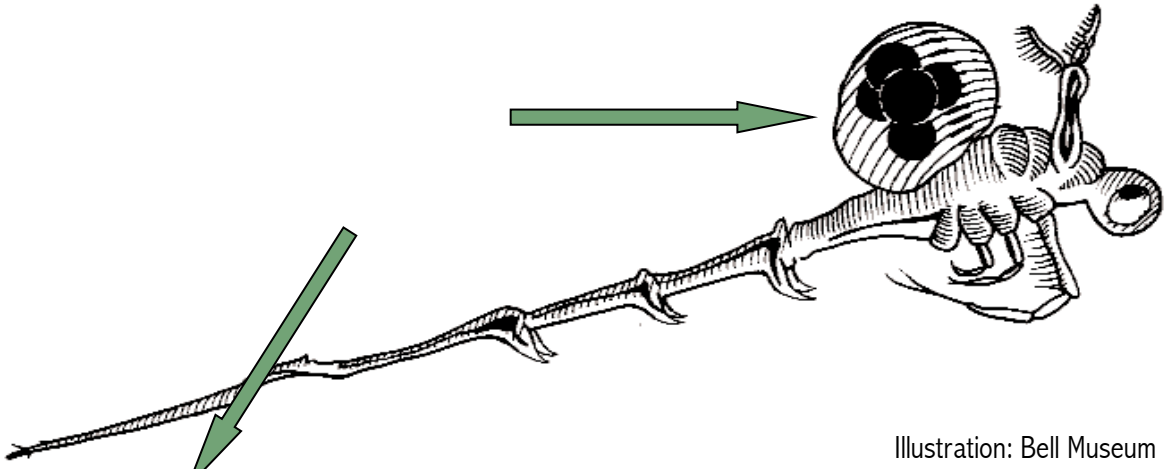


Illustration: Bell Museum

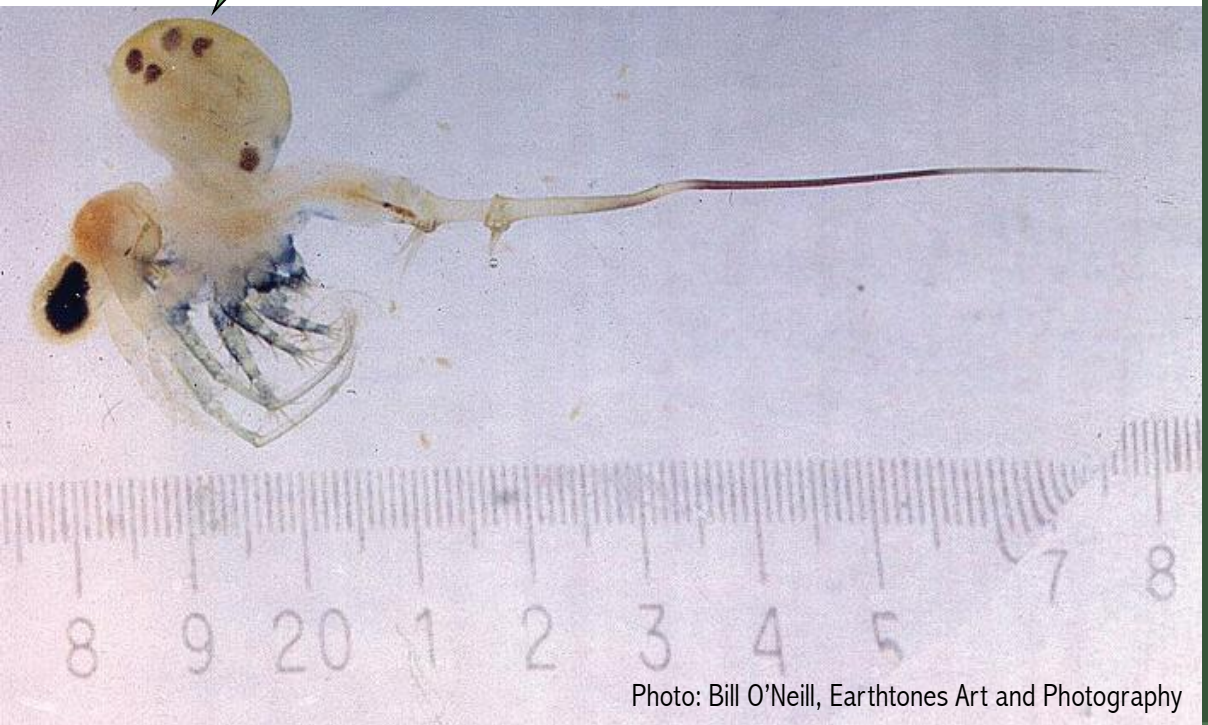


Photo: Bill O'Neill, Earthtones Art and Photography

Balloon-like egg pouch

Spiny Waterflea – Description

May appear as tiny pins with black dots

Spiny Waterflea – Similar Species

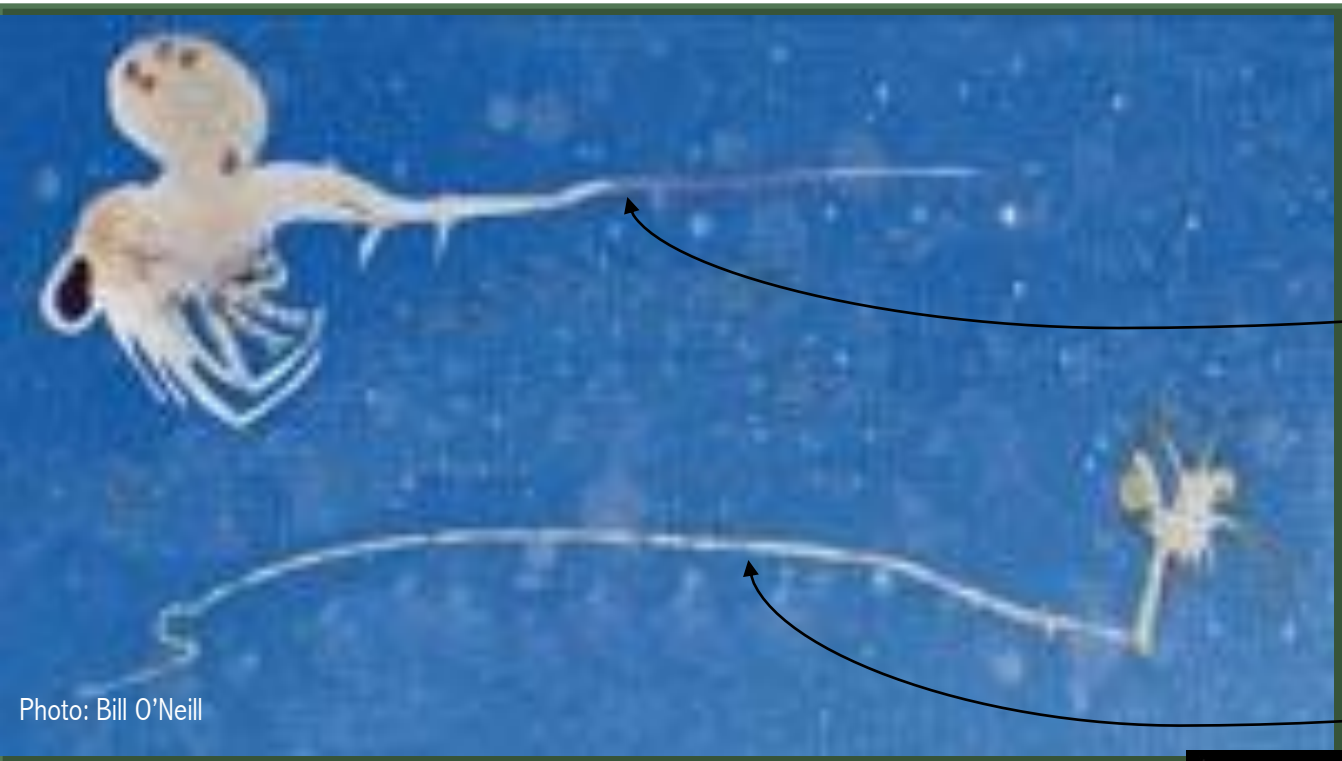


Photo: Bill O'Neill

Spiny Waterflea
Straight tail, 60% of total length

Fishhook Waterflea
Also invasive
Hooked tail, 80% of total length

Daphnia spp. **(Native)**
Much shorter tail, 25% of total length

Polyphemus pediculus **(Native)**
Much shorter tail, much larger eye spot

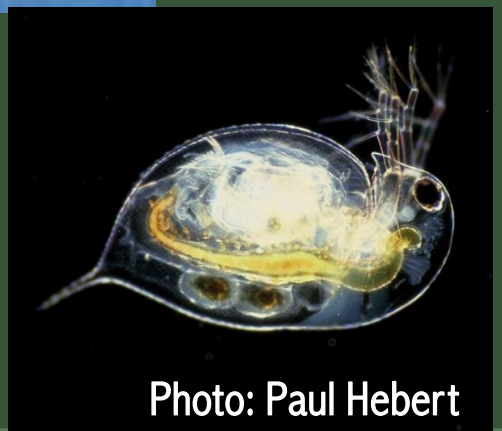
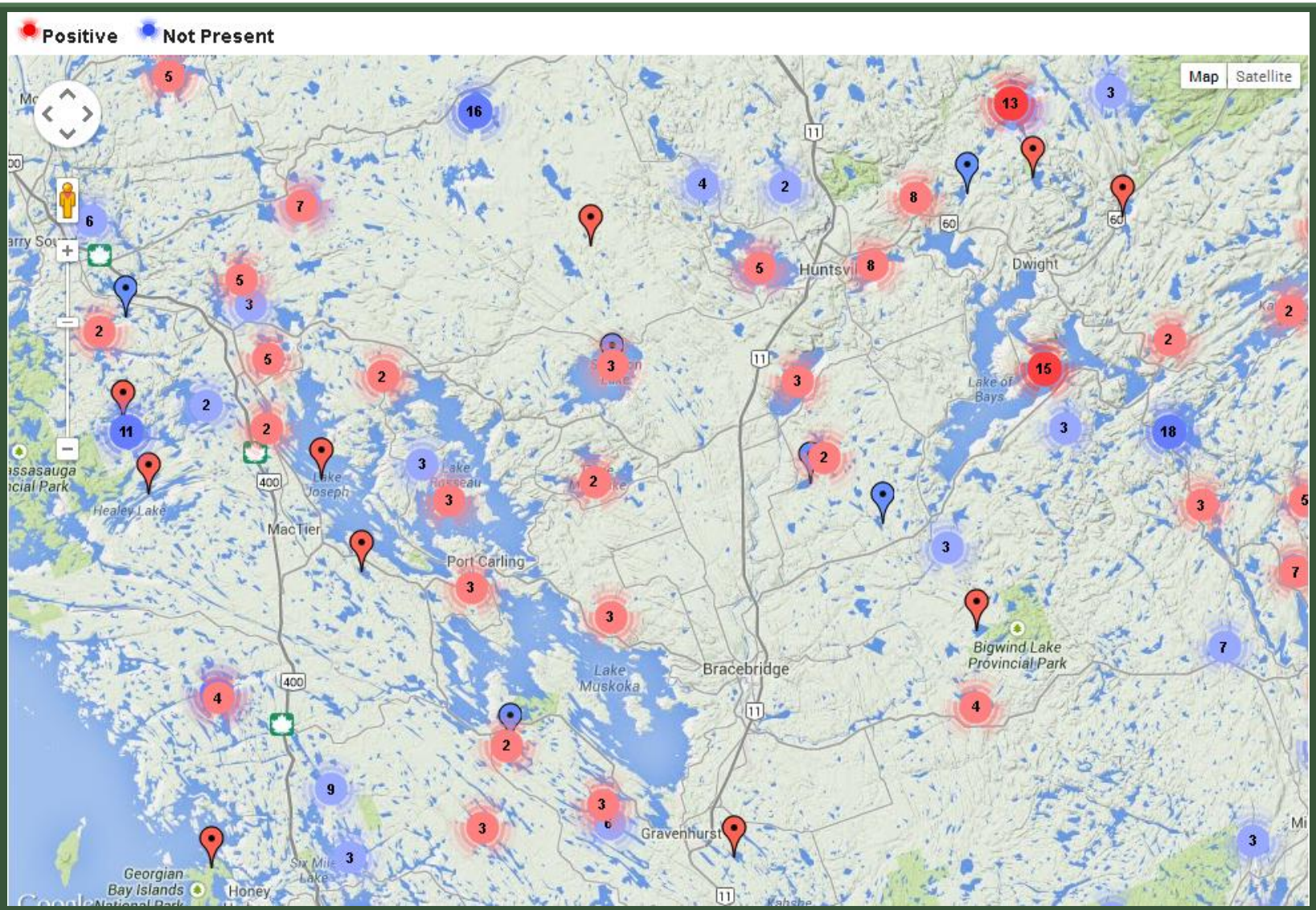


Photo: Paul Hebert

Spiny Waterflea – Distribution



From EDDMapS. July 24th, 2014

Zebra Mussel – *Dreissena polymorpha*, Quagga Mussel – *Dreissena bugensis*

What are they?

- Small freshwater mussels
- First reported in Ontario in the late 1980s
- Native to the Black Sea and the Ponto-Caspian region of Eurasia

Photo: Randy Westbrooks, USGS

Pathway of Introduction and Spread

- Originally introduced by shipping
- Recreational boats and gear
- Veligers spread between waterbodies by bait buckets

Photo: David Brenner, Michigan Sea Grant

Habitat

- Inhabits a very broad range of habitats - limiting factor: calcium availability
- Zebra mussel – more common in warmer shallower waters (reproduce in water >10 C)
- Quagga mussel – can occur in deeper cool waters (reproduce in water 4 - 9 C)

Zebra Mussel – *Dreissena polymorpha*, Quagga Mussel – *Dreissena bugensis*

Photo: Janice Smith, www.ec.gc.ca

Photo: Don Schloesser, Great Lakes Science Center, National Biological Services
Photo: Sean Rafferty, Pennsylvania Sea Grant

Impacts

- Increased water clarity
- Serious biofouler: clogs water intake pipes, pollutes swimming areas
- Declines or complete loss of native mussel populations
- Bioaccumulates high levels of contaminants, which are passed to species higher in the food chain (e.g. biomagnifies to Round Gobies that are then eaten by Yellow Perch)

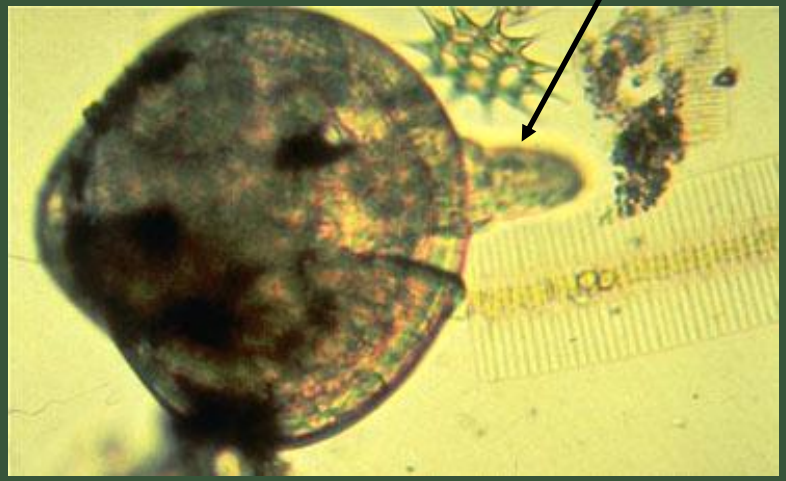
Zebra and Quagga Mussel– Description

In a laboratory, juvenile mussels can be identified using a microscope.

- microscopic larvae called **veligers**
- round and free float for up to 5 weeks

Photos: MNR

- during **post-veliger stage**, foot is formed to attach to substrate



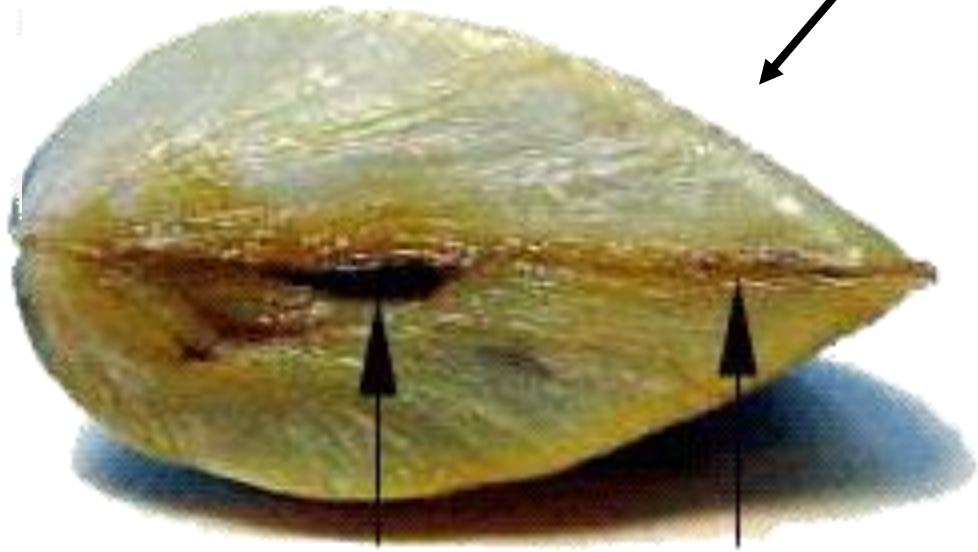
Comparison of Zebra and Quagga Mussels

Colour variable, pale, may have coloured bands, bars or few to no zigzagged stripes

Quagga mussel

Black or brown with white to yellow striped or zigzagged patterns;

Zebra mussel

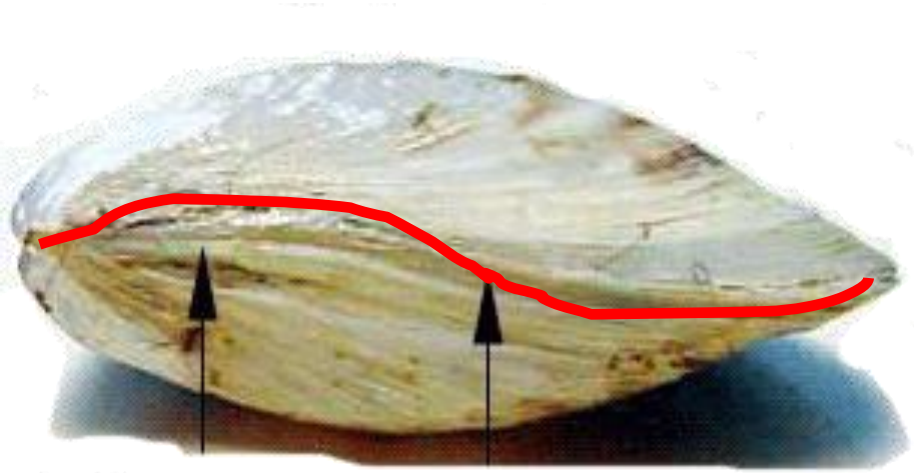


Comparison of Zebra and Quagga Mussels

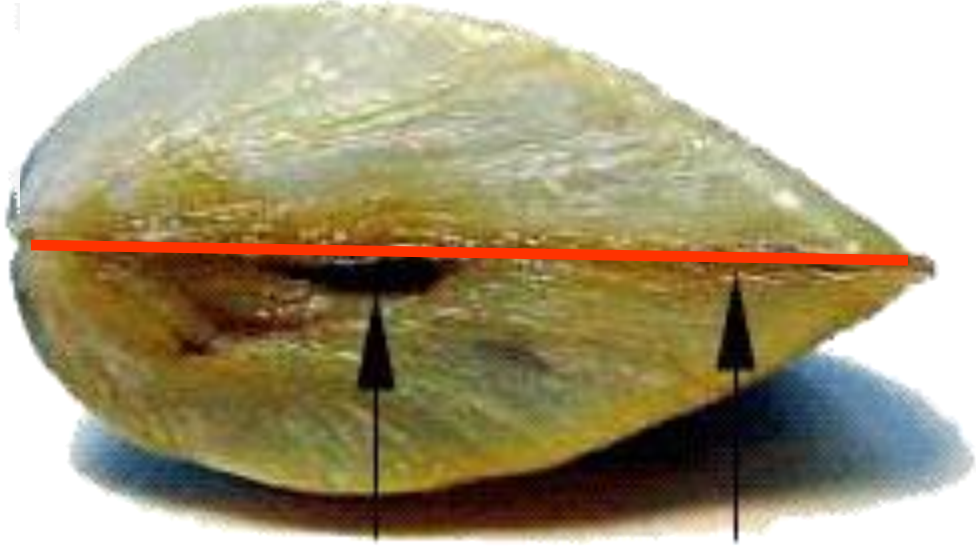
Curved midventral line

Straight midventral line

Quagga mussel



Zebra mussel



Comparison of Zebra and Quagga Mussels

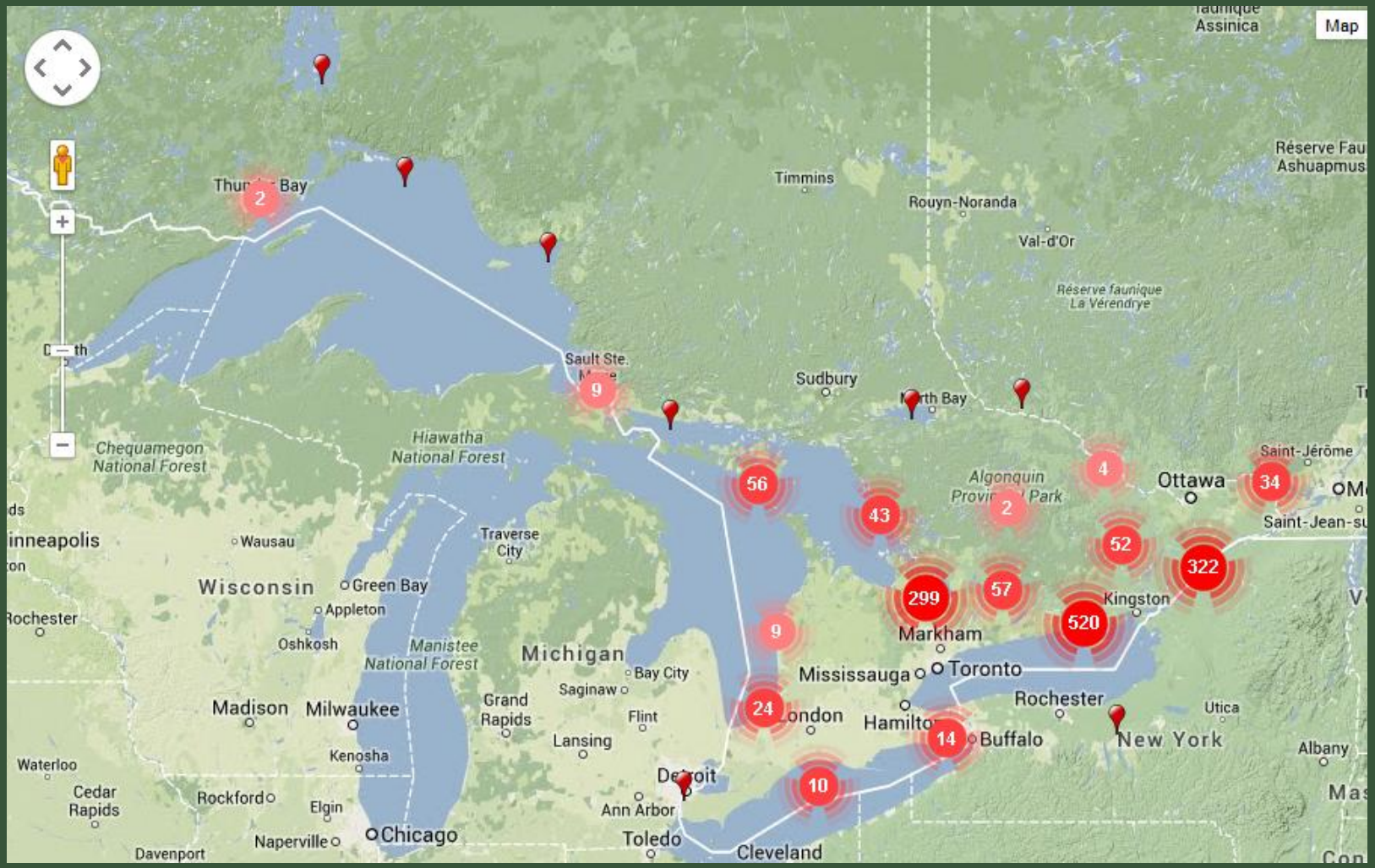
Round to Triangular

'D' Shaped

Quagga mussel

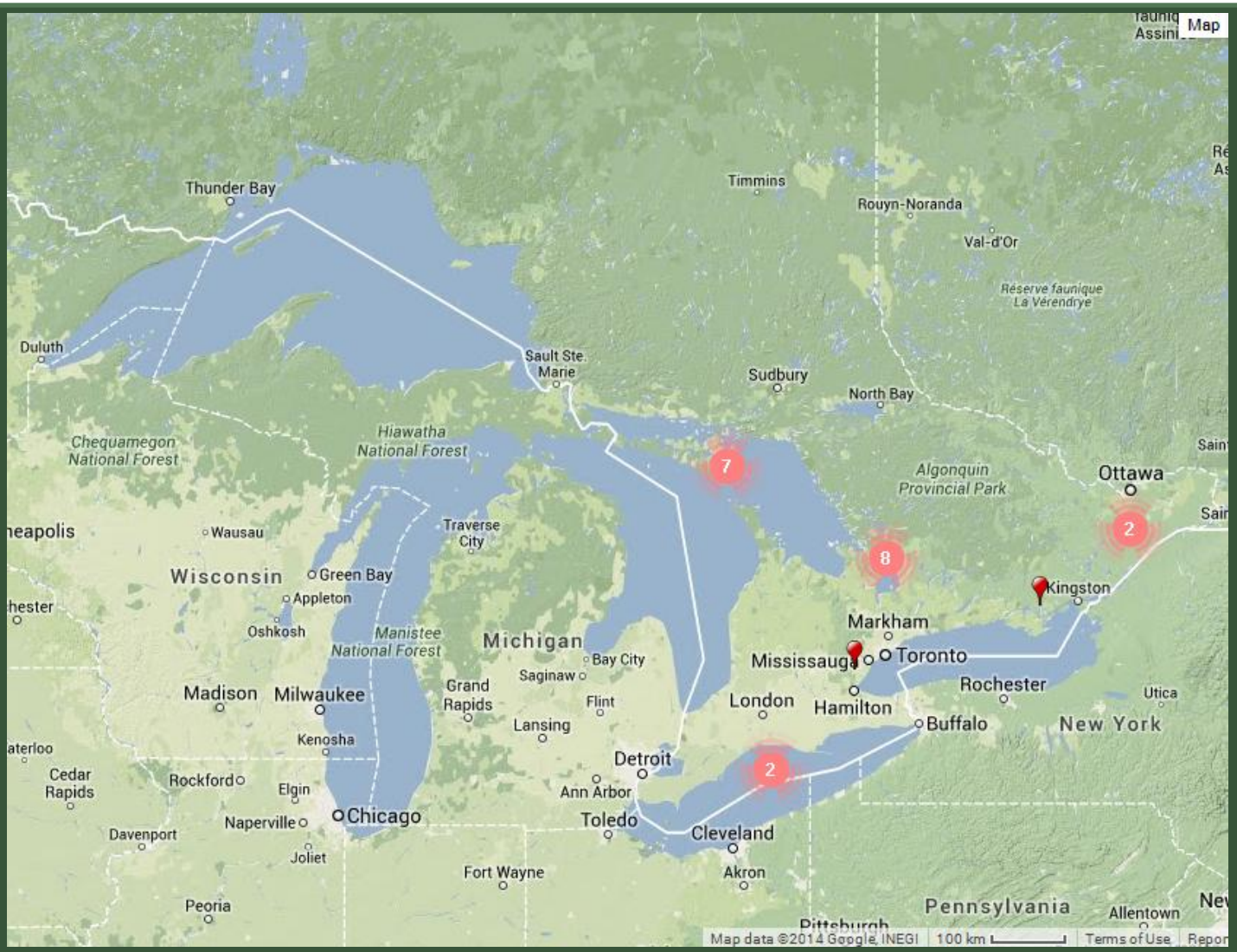
Zebra mussel

Zebra Mussel– Distribution



EDDMapS.org/ontario, As of May 2014

Quagga Mussel– Distribution



EDDMapS.org/ontario, As of May 2014

AIS Species Identification - Fish

We will cover the following species of AIS fish in further detail

Rudd
Round Goby
Rainbow Smelt


Photo: J.C. Schou


Photo: Dave Brenner, Michigan Seagrant

Rudd – *Scardinus erythropthalmus*

What is it?

- European member of the minnow family
- Believed to be spread by bait bucket releases
- Likely originated from U.S. as baitfish

Photo: USGS Nonindigenous Aquatic Species Web site

Pathway of Introduction and Spread

- Movement of live bait

**Not a legal bait fish (often mistaken for Golden Shiner).

Photo: Pennsylvania Sea Grant Program, Rudd Factsheet

Habitat

- Found in vegetated lakes, ponds and backwaters of rivers, tolerates low levels of dissolved oxygen and broad range of temperatures

Rudd – *Scardinius erythrophthalmus*

Photo: Royal Ontario Museum

Photo: Noel Burkhead, USGS

Impacts

- May compete with native fishes for invertebrate food sources
- Feeds on plants – changing structure of spawning and nursery sites
- Genetic compatibility between Rudd and Golden Shiner may pose a threat to the genetic integrity of the Golden Shiner

Rudd – Description

Photo: Royal Ontario Museum

Total length 100 – 250 mm (up to 360 mm)

Body robust, laterally compressed, elliptical in profile

Photo: Pennsylvania Sea Grant Program, Rudd Factsheet

Rudd – Description

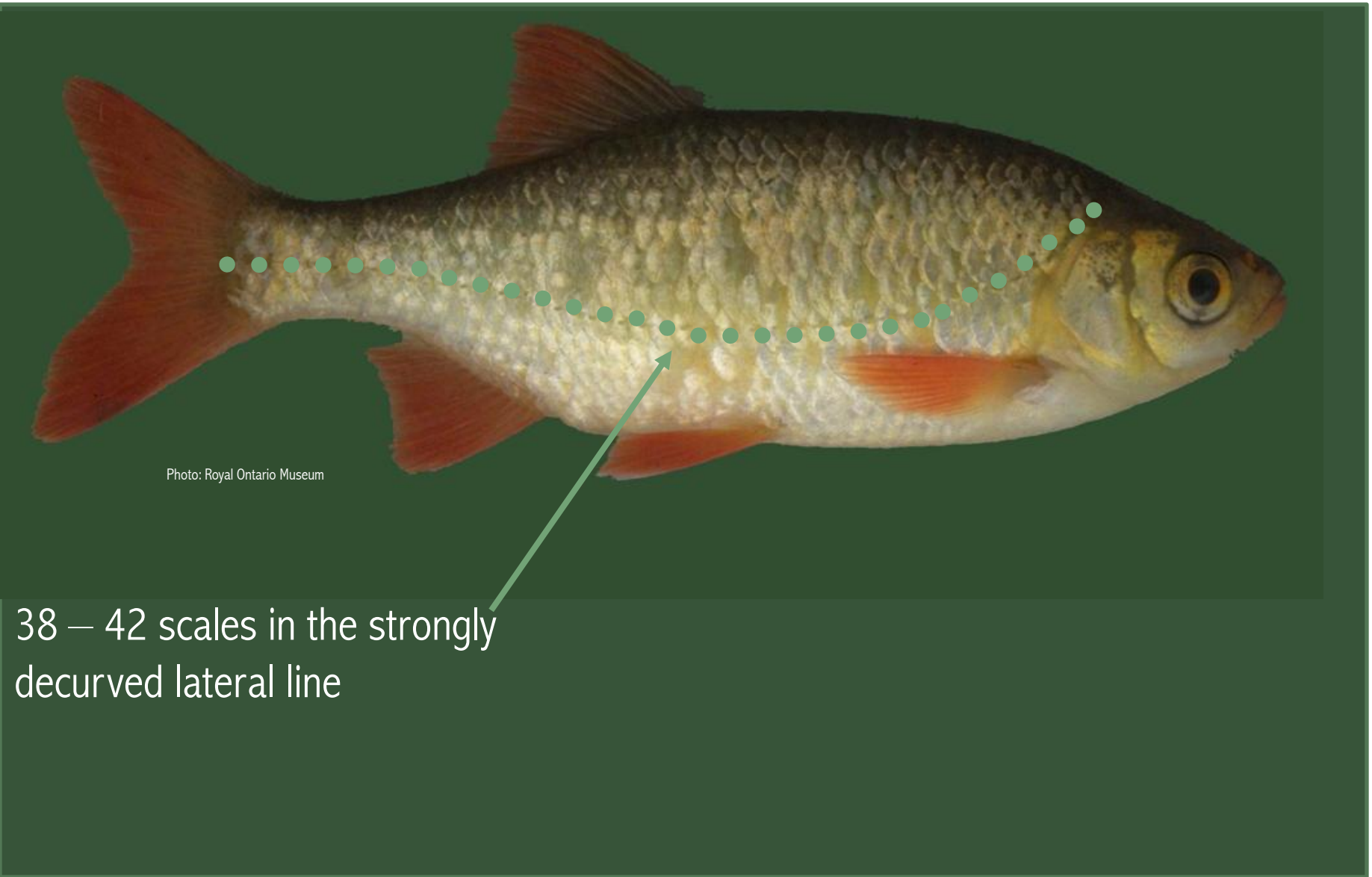


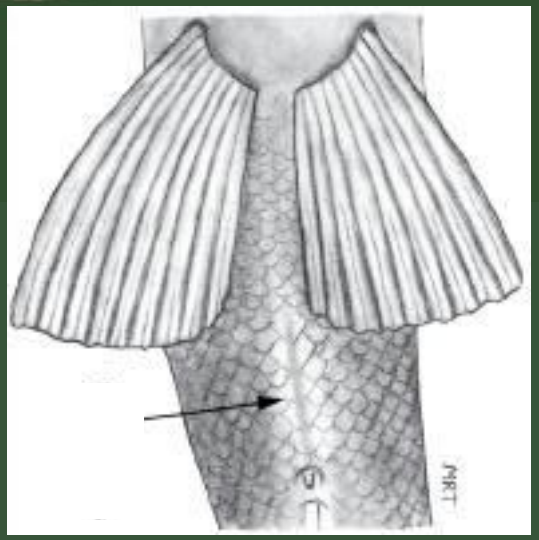
Photo: Royal Ontario Museum

38 – 42 scales in the strongly decurved lateral line

Rudd – Description

Photo: Royal Ontario Museum

scaled keel between pelvic fins and anus



Drawing: USGS, Florida Integrated Science Centre

Rudd – Description

Fins bright orange or red

Photo: Royal Ontario Museum

Photo: Jamie Antoine

Eyes: iris yellow to orange, often red spot over pupil

Rudd – Similar Species

Fins bright orange or red

Photo: Royal Ontario Museum

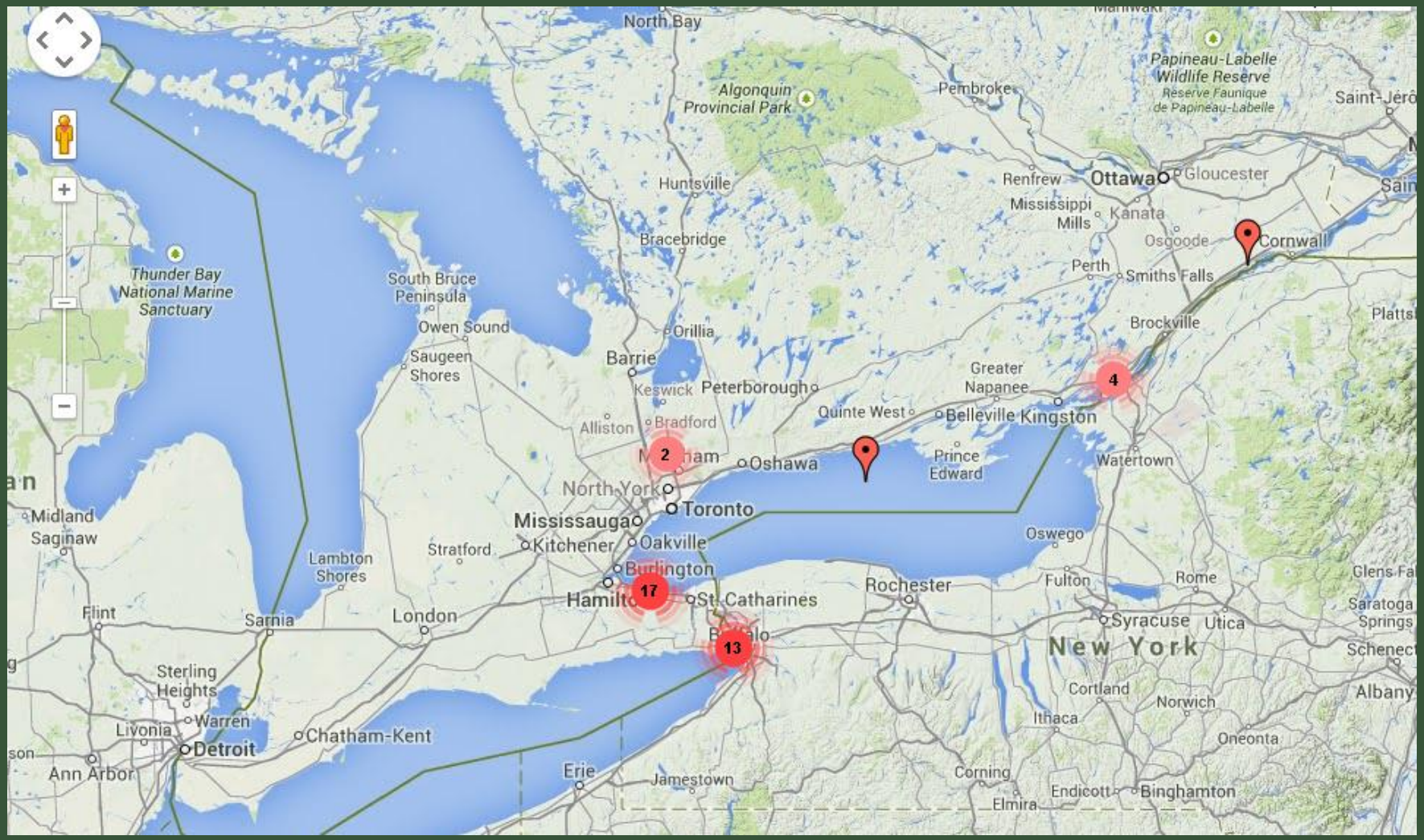
Rudd

Fins clear to pale orange (usually yellow)

Photo:Duane Raver, USFWS

Golden Shiner

Rudd – Distribution



From EDDMapS.org/ontario, As of July 25th,2014

Round Goby – *Neogobius melanostomus*

What is it?

- A small bottom-dwelling fish
- Native to Eastern Europe and first reported in the St. Clair River, Ontario in 1990

Pathway of Introduction and Spread

- Shipping
- Movement of live bait - Illegal to possess live in Ontario and to use as bait

Photo: Gary Blight

Habitat

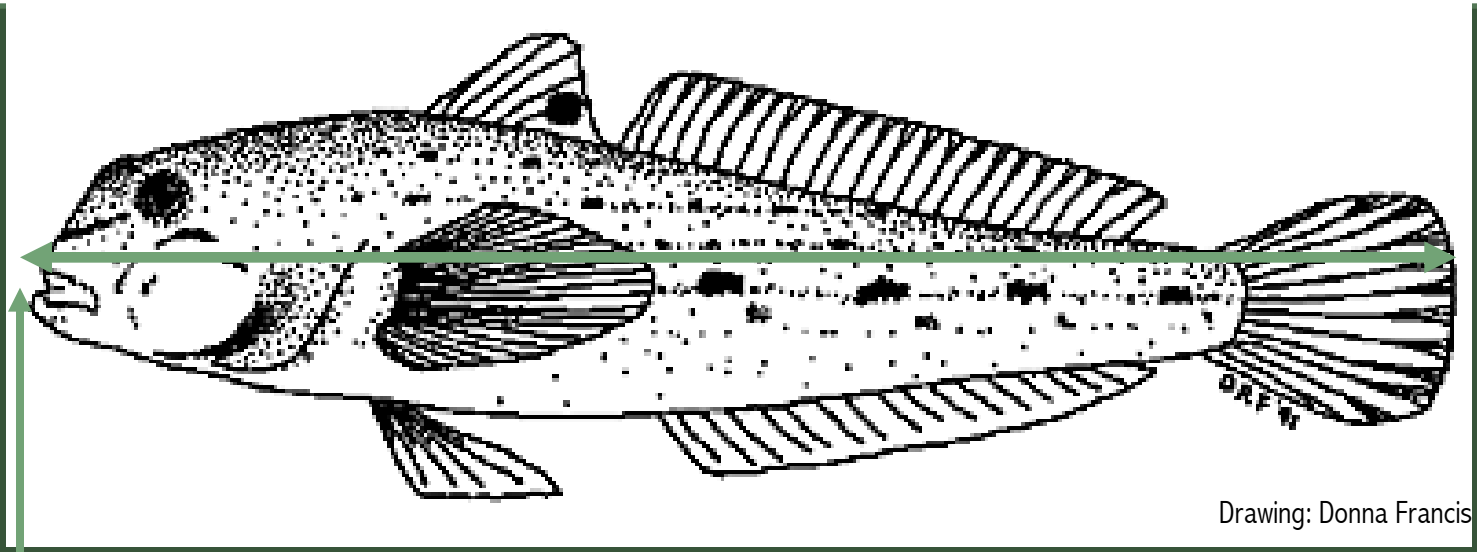
- Cobble, gravel, sandy substrates, with or without vegetation
- Nearshore and deep waters, in lakes and rivers
- Withstands low levels of dissolved oxygen.

Round Goby – *Neogobius melanostomus*

Impacts

- Competes with native benthic fishes
- Density can reach more than 125 per square metre
- Eats fish eggs and larvae, may pose a threat to sportfish populations
- Can alter energy-, contaminant-, & nutrient pathways of the Great Lakes

Round Goby – Description

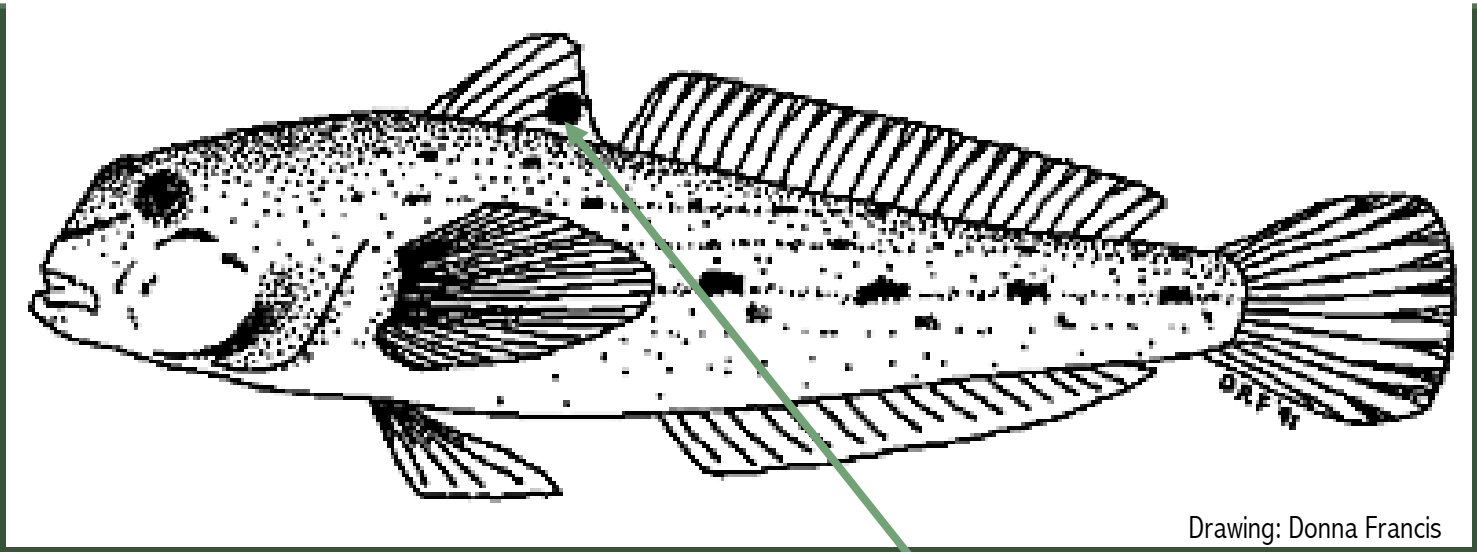


Drawing: Donna Francis

Snout rounded to blunt

Cylindrical,
Total length 60 – 160 mm
(up to 250 mm)

Round Goby – Description



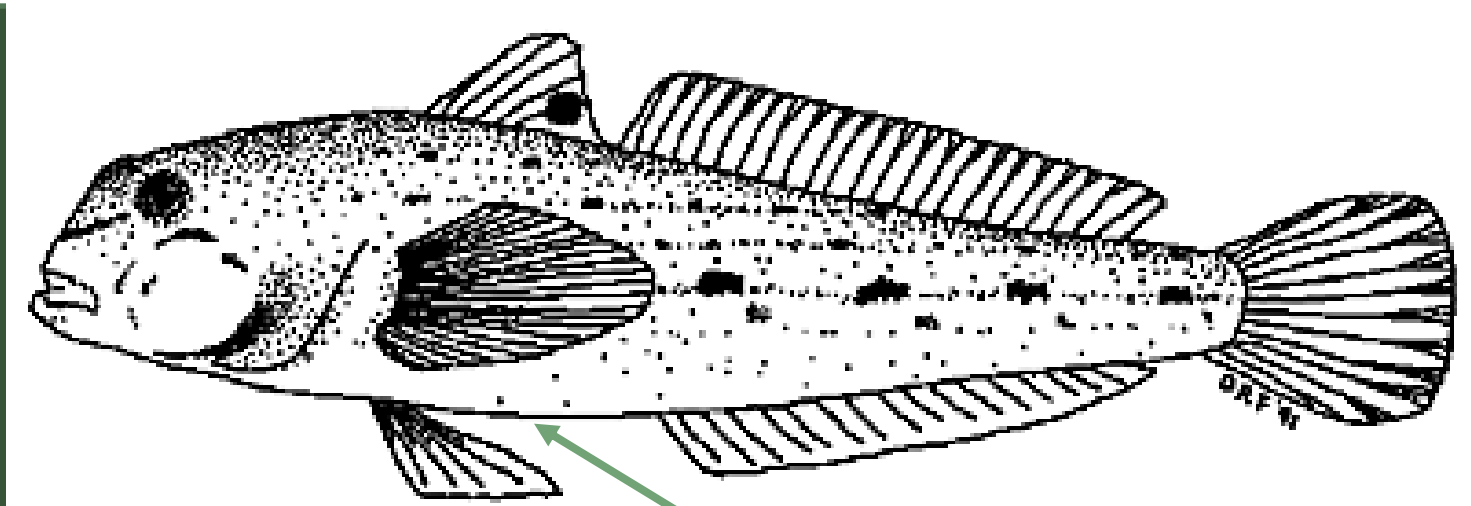
Drawing: Donna Francis

Photo: George Coker

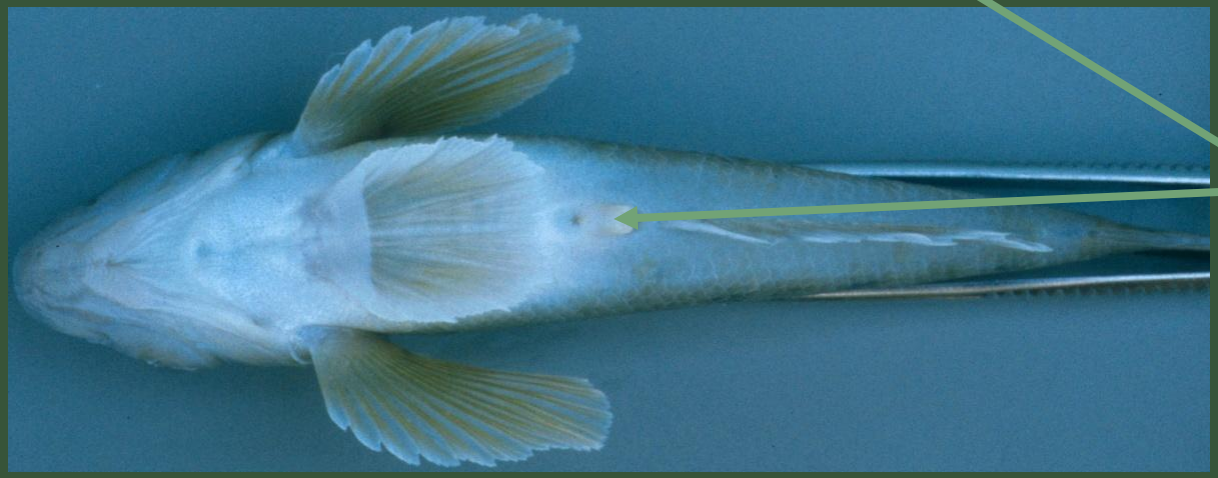
Black spot on 1st dorsal fin

Small scales covering most of body

Round Goby – Description



Drawing: Donna Francis



Fused pelvic fin forming disk

Photo: John Lyons, Wisconsin Department of Natural Resources

Round Goby – Similar Species

Tubenose Goby (also invasive)

No black spot on dorsal fin

Nostril tubes extends over upper lip

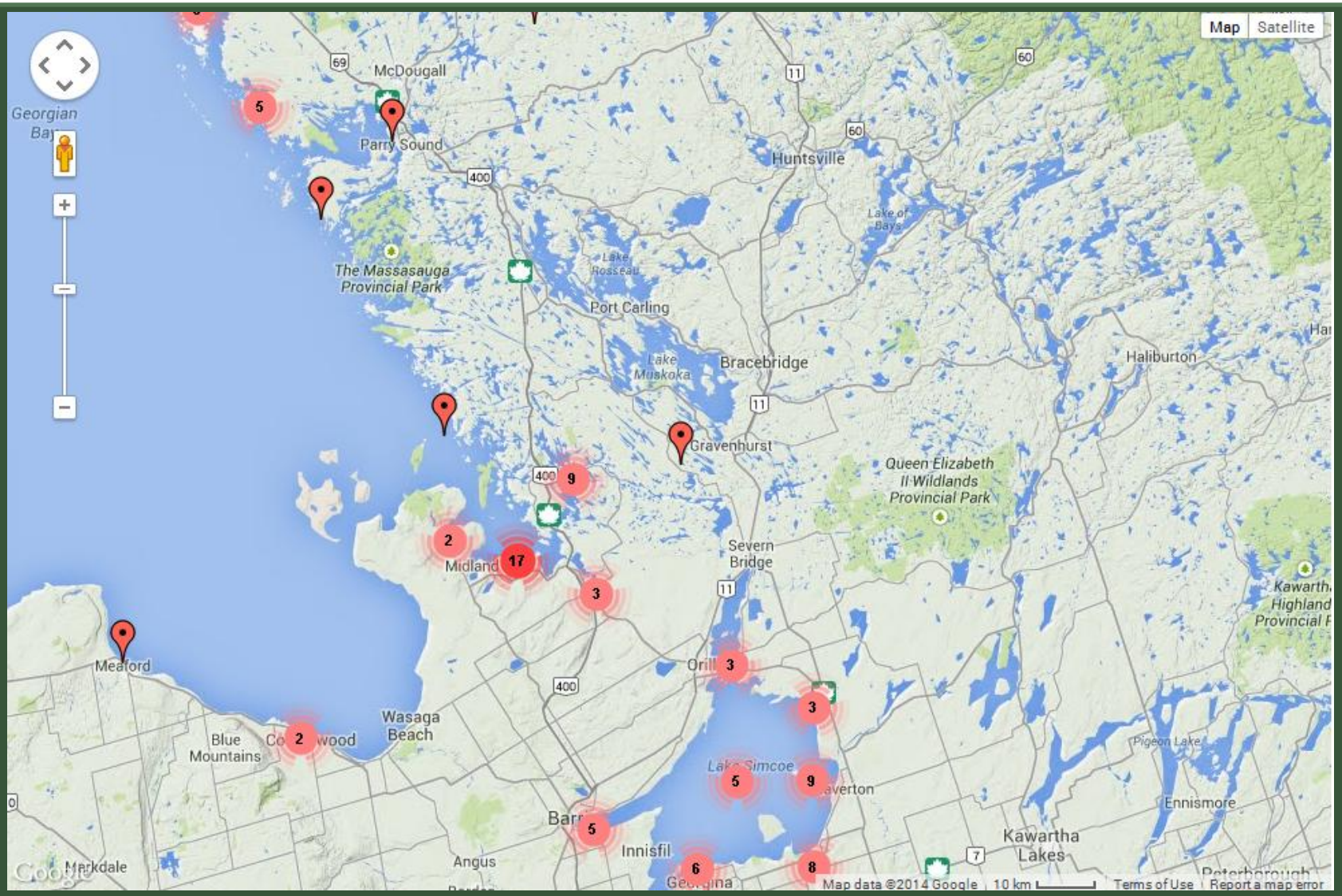
Photo: John Lyons, Wisconsin Department of Natural Resources

Round Goby

Nostril tubes does not extend over upper lip

Slimy Sculpin (Native)

Round Goby – Distribution

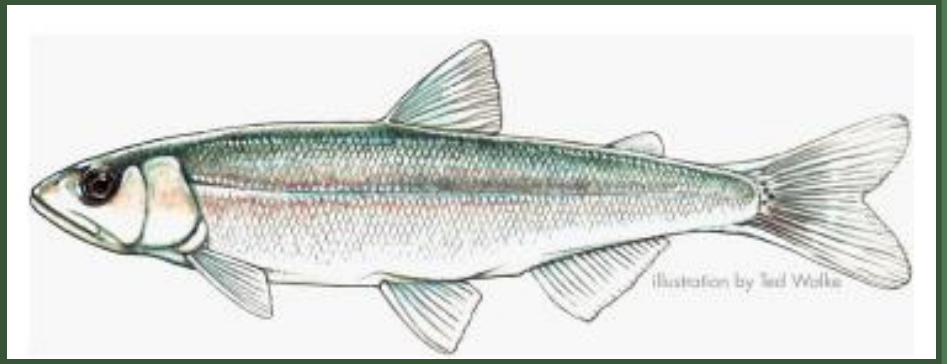


From EDDMapS.org/ontario, As of July 25th,2014

Rainbow Smelt – *Osmerus mordax*

What is it?

- A member of the Smelt family native to the northeast coast of North America



Pathway of Introduction and Spread

- Shipping
- Movement of live bait

Habitat

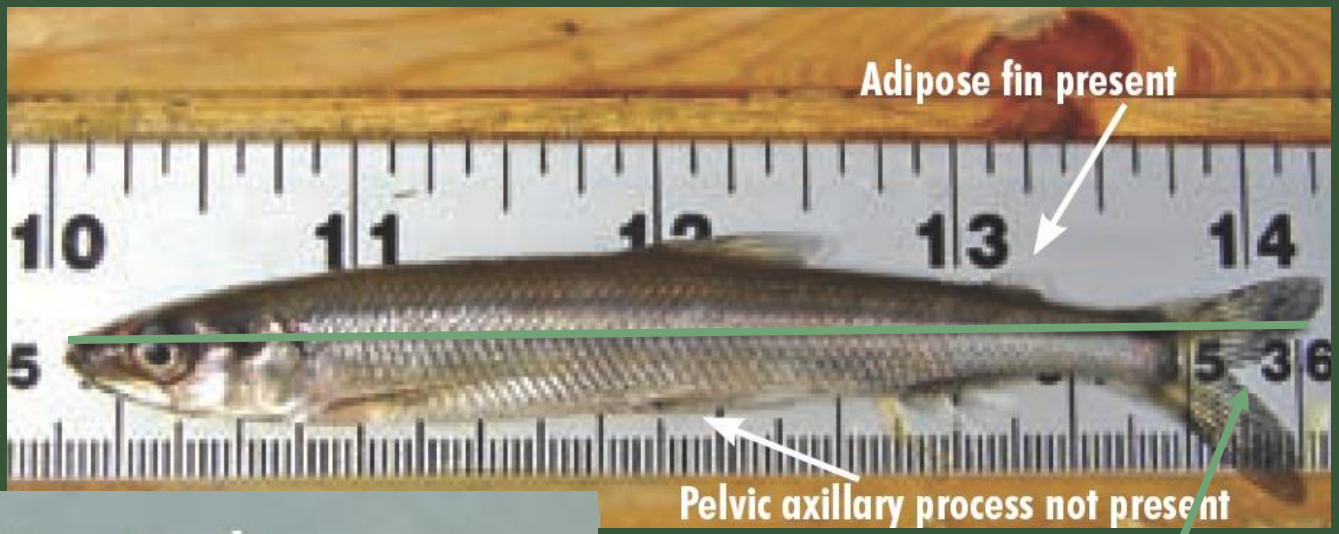
- Clear lakes and rivers
- Often seen schooling in open water and spawning in streams

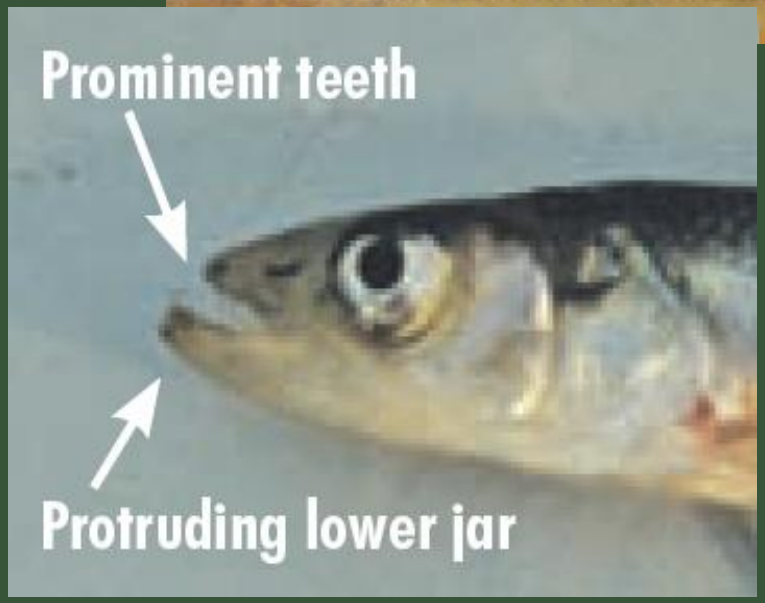
Rainbow Smelt – *Osmerus mordax*

Impacts

- Native fish are impacted through competition, and or, predation
- Disrupt food webs and may significantly alter zooplankton communities
- Impacted native fish include: Lake Trout, Lake Herring, Whitefish, Walleye, Yellow Perch, and Slimy Sculpin

Rainbow Smelt – Description

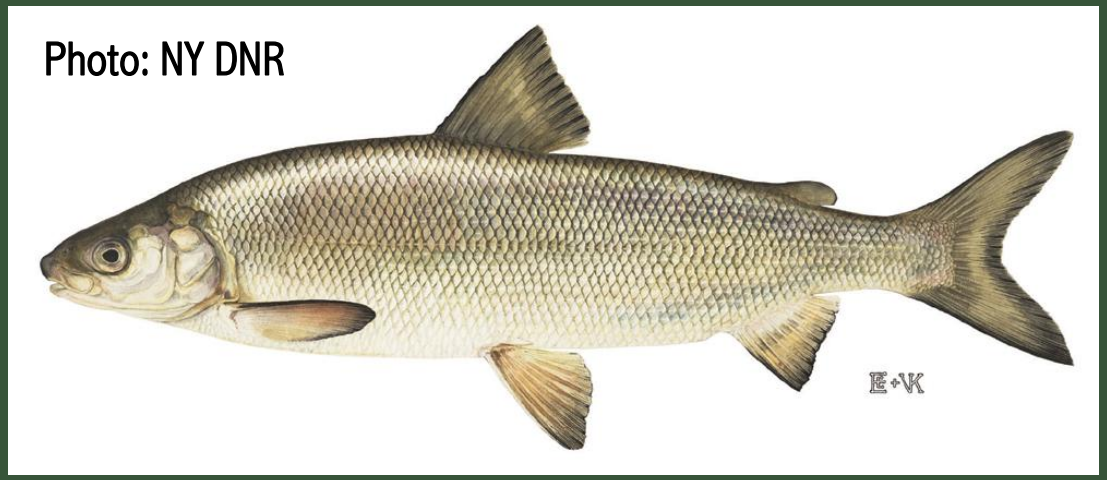




Long elongate body: Total length 178-203mm (can get up to 350mm)

Tail: Deeply forked

Rainbow Smelt – Similar Species



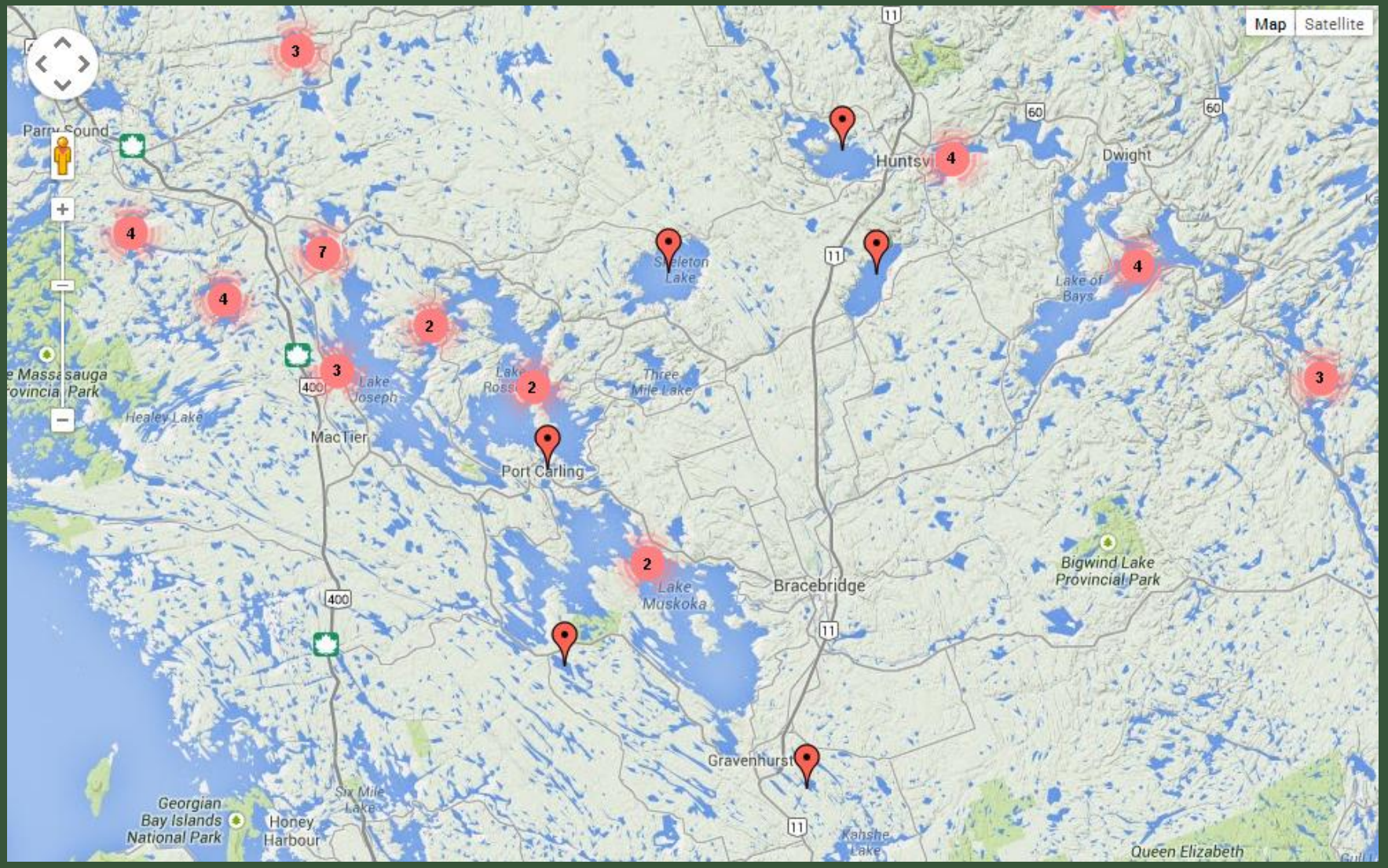
Lake Whitefish (Native)

Mouth is sub-terminal
Axillary process is present
Lacks teeth

Lake Herring (Cisco) - Native

Lateral line complete
Axillary process is present

Rainbow Smelt– Distribution



From EDDMapS.org/ontario, As of July 25th,2014

STOP THE SPREAD!

of invasive aquatics

- **Inspect** your boat, trailer and boating equipment and remove any visible plants or animals before leaving any waterbody.
- **Drain** water from motor, livewell, bilge and transom wells while on land before leaving the waterbody.
- **Empty** your bait bucket on land before leaving the waterbody. Never release animals from one waterbody to another.
- **Wash/Dry** your boat and equipment to kill harmful species that were not seen at the boat launch. Some species can survive for several days out of water so it is important to
- **Rinse** your boat and equipment with hot tap water (>50 C)or
- **Spray** your boat and equipment with high pressure water (250psi) or
- **Dry** your boat and equipment for at least 5 days before transporting to another waterbody.

Prevention and Decontamination Measures:

Best Management Practices (BMPs)

1. Assume every waterbody is infested
2. Boats and equipment should always be considered contaminated
3. Treat equipment after every use
4. Keep boats and equipment clean between trips and let dry for as long as possible
5. Visually Inspect: Inspect/ Clean / Drain

Questions?

Terrestrial Invasive Species

How do they get here?

- **Natural Pathways**
  - Wind
  - Water currents
  - Wild animals
- **Man-made Pathways**
  - Horticultural plantings
  - Firewood movement
  - Pets
  - Hiking gear/ATV's/Bikes

Invasive Plant Species in Ontario

- Ontario has more invasive species compared to any province or territory in Canada
- Ontario has 441 known invasive plant species
- Effect ~ 20% of Ontario's listed species at risk
- Alter landscapes, threaten native plant communities and disturb entire ecosystems.

Dog-strangling Vine – *C. rossicum, nigrum*

What is it?

- Twining perennial herbaceous vines
- Pale swallowwort & Black swallowwort
- Member of the milkweed family
- Native to Eurasia


Photo credit: Greg Bales

Pathway of Introduction and Spread

- Horticultural trade
- Recreational activities and machinery

Habitat

- Can thrive in a wide range of habitats, soil, light and temperatures
- Prefers open sunny areas but does well in partial sunlight

Dog-strangling Vine – *C. rossicum, nigrum*

Impacts

- Forms dense tangled stands, strangling native vegetation
- Can reproduce sexually and vegetatively
- Interferes with recreational activities
- In unfavourable conditions plants can produce up to 28,000 seeds per square metre
- Monarch larvae are unable to develop

Dog-strangling vine-*Description*

Leaves are yellowish-green to dark green, 5-10 cm long

Oval to oblong in shape with rounded bases and pointed tips

Oppositely arranged along stem

Dog-strangling vine -*Description*

Pale Swallowwort (C. rossicum) flowers are pink to maroon coloured

Form clusters of 5 to 20 flowers

Black Swallowwort (C. nigrum) flowers are purple brown to dark purple

Form clusters of 4 to 10 flowers

Dog-strangling vine -*Description*


Photo credit: Greg Bales

Seed pods (fruit) are 4-6 cm, long and thin

Seeds are connected to a tuft of white hairs – similar to native milkweed

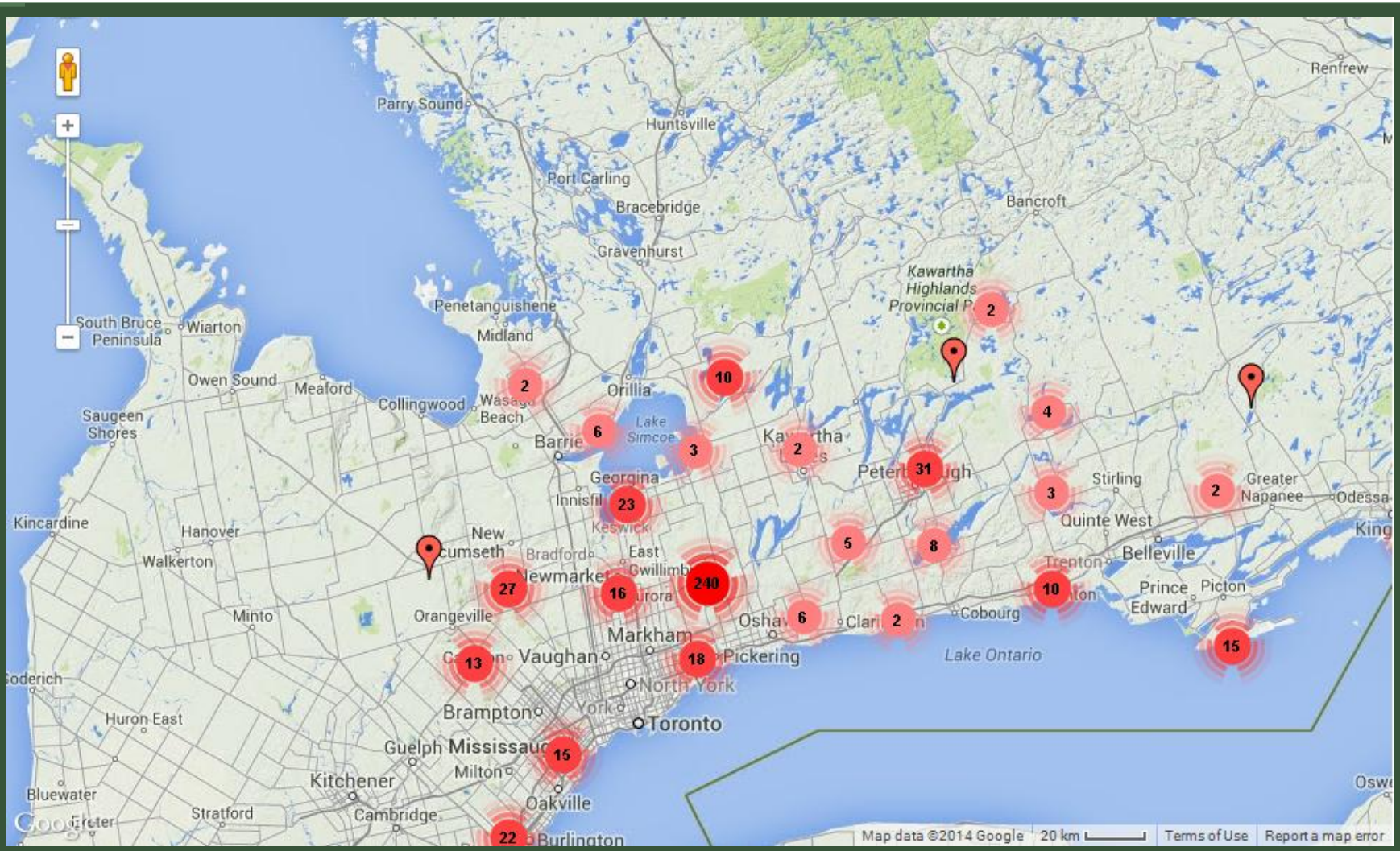
Up to 30 vines can grow from a single root mass, twining around each other for support

Dog-strangling Vine – Control

Extent of infestation	Small invasions and satellite populations	Large invasions and dense populations
Method of control	Manual	Chemical & manual
Timing	May – early June	Chemical – Spring Manual – late June
Disposal	Place all plants in a plastic bag and dispose of in an appropriate landfill	Place all plants in a plastic bag and dispose of in an appropriate landfill
Frequency of control	Several times per year. Collect any re-sprouting plants if root fragments were missed	Up to 5 years to ensure that all root systems have been filled and all seeds eliminated from the seed bank
Length of control	2-3 years	3-5 years
Required restoration	Fill in holes and replant with native vegetation	May require re-planting to fill in gaps where dense patches were removed

Reference: Derickx, L.M. & Antunes, P.M. 2013. A guide to the identification and control of exotic invasive species in Ontario's hardwood forests

Dog-strangling Vine – Distribution



From EDDMapS.org/ontario, As of July 25th,2014

Garlic Mustard – *Alliara petiolata*

What is it?

- Biennial herb
- Native to Europe
- First introduced in late 1800's

Pathway of Introduction and Spread

- Horticultural/Medicinal trade
- Recreational activities
- Contaminant in soil/mulch/nursery stock

Habitat

- prefers edge habitats and moist soils, bordering forests and rivers
- Prefers shady conditions but can also be found in full sun

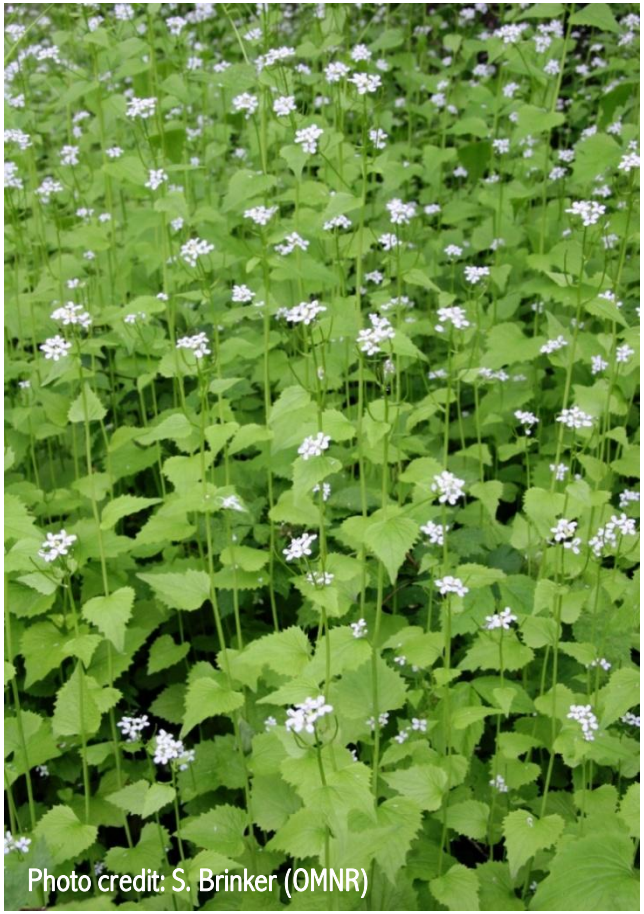


Photo credit: S. Brinker (OMNR)

Garlic Mustard – *Alliara petiolata*

Impacts

- Major threat to native woodland species such as trout lily and trillium
- Populations can double in size every 4 years
- Can enter and establish itself within a stable healthy forest site
- Allelopathic - produces chemicals that hinder the growth of other species

Garlic Mustard – First Year Description


Photo credit: Ken Towle

First year plants grow in basal rosette form (cluster of 3-4 leaves)

Leaves are dark green, kidney shaped with wavy edges


Rob Routledge, Sualt College, Bugwood.org


Photo credit: Hayley Anderson

Crushed leaves give off distinctive garlic odour

Leaves remain green throughout the winter

Garlic Mustard – Second Year Description

Second year plants can grow up to 1m in height

Leaves are triangular and sharply-toothed, 3-8 cm in diameter

Grow alternate along stem

Garlic Mustard –Second Year Description

Produces white flower clusters in the spring

Photo credit: Ken Towle

Photo credit: Credit Valley Conservation

Mature plants produce long , slender seedpods

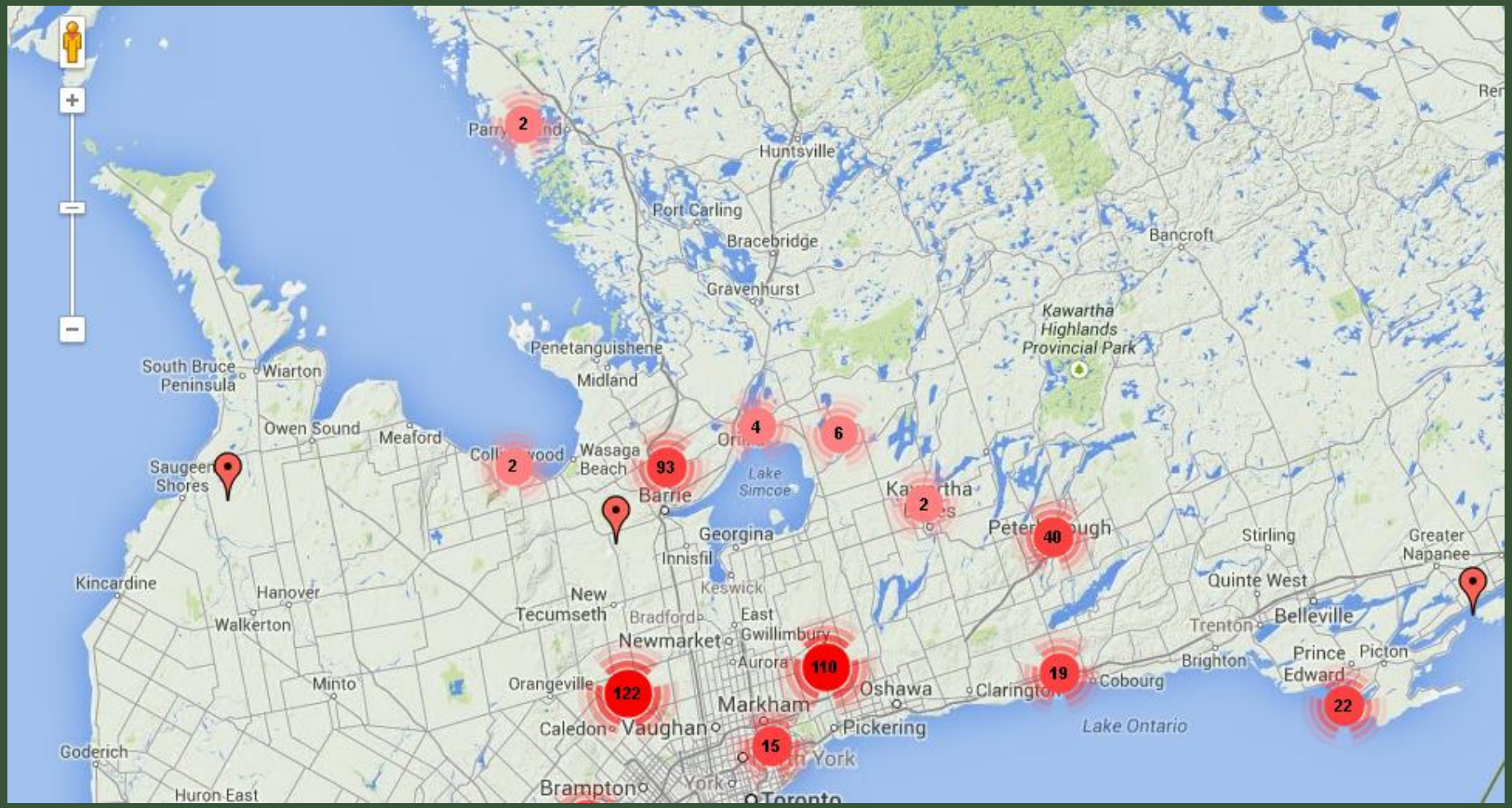
Each capsule holds 10-20 oblong black seeds

Garlic Mustard - Control

Extent of infestation	Small invasions and satellite populations	Large invasions and dense populations
Method of control	Hand pulling and flower head removal	Chemical & manual
Timing	Hand-pulling: Spring (April-May) Flower head removal: Spring and early Summer (April-June)	Chemical – Fall Manual – Spring and summer
Disposal	Place all plants in a plastic/paper bag and dispose of in an appropriate landfill	Place all plants in a plastic/paper bag and dispose of in an appropriate landfill
Frequency of control	Hand-pulling: several times per year, up to five years or until seed bank is exhausted. Flower head removal: Every few days until no more flowers are produced	Manual removal in the spring and chemical in the fall may be required for up to 5 years or until seed bank is exhausted
Length of control	2-5 years	5+ years
Required restoration	Plant native species in areas where hand-pulling creates soil disturbance	Plant native species once seed bank has nearly been exhausted. Monitoring and hand-pulling will be needed

Reference: Derickx, L.M. & Antunes, P.M. 2013. A guide to the identification and control of exotic invasive species in Ontario's hardwood forests.

Garlic Mustard – Distribution



From EDDMapS.org/ontario, As of July 25th,2014

European Common Reed – Phragmites australis

What is it?

- Perennial grass, native to Eurasia
- In 2005 agriculture and Agri-food Canada – 'worst invasive plant species'

Pathway of Introduction and Spread

- Horticultural trade
- Dispersing seeds, rhizomes and stolon fragments
- Recreational activities and machinery

Habitat

- Prefers wet areas, but roots can reach long distances into the soil, allowing it to survive in dry areas

European Common Reed – Phragmites australis

Impacts

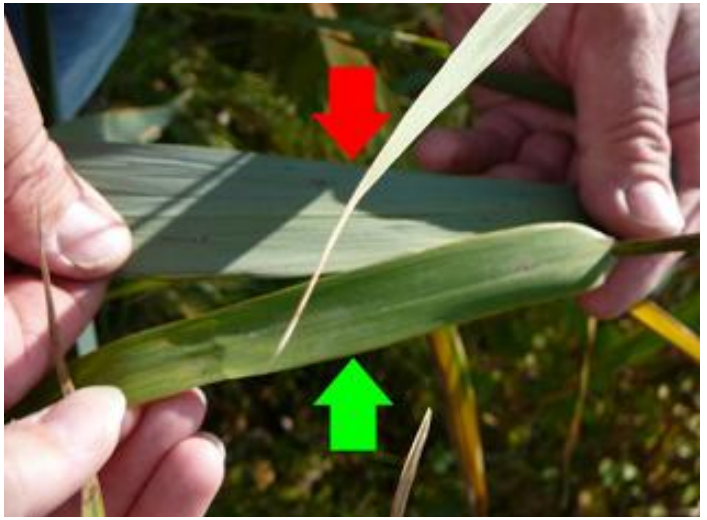
- Release toxins from roots, affecting neighboring plants
- Creates large monoculture stands
- Can grow to several metres high and produces about 2000 seeds per year
- Provides poor habitat and food for wildlife
- Increases fire hazards

European Common Reed – Phragmites australis

	Native Phragmites	Invasive Phragmites
Height	No taller than 2 m	Up to 5 m (15 ft)
Density	Sparse, other native vegetation present	Dense monoculture, up to 100% invasive
Stem Colour	Reddish-brown	Beige, tan
Stem texture	Smooth and shiny	Rough and dull

European Common Reed – Phragmites australis

	Native Phragmites	Invasive Phragmites
Flexibility	High flexibility	Rigid
Leaf colour	Yellow-green	Blue-green
Flower timing	Early (July-August)	Intermediate (August – September)
Seedhead density	Sparse, small	Dense, large

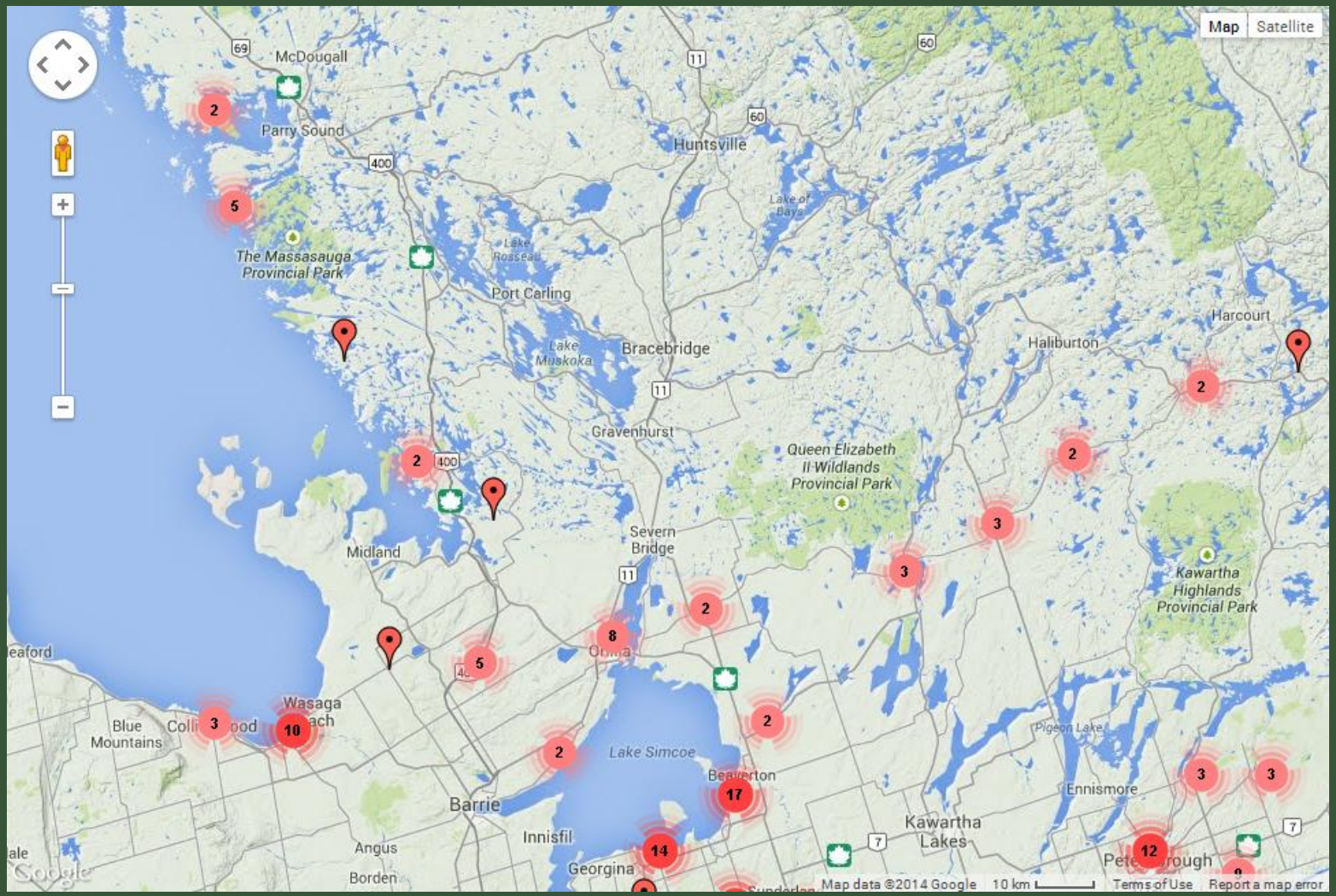


European Common Reed– Control

Method	Pros	Cons
Compression/Rolling	Low cost	Non-specific
Mowing/Cutting	Low cost	Can be labour intensive Not effective when used as a standalone method
Hand-pulling/Mechanical excavation	Can easily target specific plants More effective on small, isolated stands of plants less than 2 years old	Very labour intensive Not effective for large stands
Flooding	Minimal effects on wildlife	Can be used in areas where water levels can be controlled or are prone to floods Non specific
Tarping	Minimal effects on wildlife	Not always effective Large impact on soil flora Non-specific

Invasive Phragmites Best Management Practices. 2012. Ontario Invasive Plant Council

European Common Reed – Distribution



From EDDMapS.org/ontario, As of July 24th,2014

Giant Hogweed – *Heracleum mantegazzianum*

What is it?

- Biennial or perennial member of the parsley family
- Native to Caucasus region of Europe/Southwest Asia
- First introduced in late 1800's. First record in Ontario in 1949

Pathway of Introduction and Spread

- Horticultural trade – as a garden curiosity
- Water spread

Habitat

- Moist, rich soil – along riverbanks and stream sides
- Roadsides, trail sides, forest edges, agricultural land

Giant Hogweed – *Heracleum mantegazzianum*

Impacts

- Threat to human health – sap contains toxins that cause photodermatitis and can result in severe burns
- Out competes native vegetation by shading it out and forming dense stands
- Hinders recreational activities

Giant Hogweed – First Year Description

First year plants grow in a large basal rosette form

Leaves are deeply incised and serrated

Leaves can reach widths of 1.5m across

Giant Hogweed – Second/Third Year Description

The white flowers grow in umbels – each umbel can produce up to 20,000 seeds

Photo credit: Joe Ferreira, City of Brampton

Photo credit: MVC

Second or third year plants grow large flowering stalk reaching heights of 5m (15 ft)

Stem is hollow, and bristly with purple splotches

Giant Hogweed – Similar Species


Photo credit: Stephen Lea


Photo credit: B. Douglas


Photo credit: DEC NY

Cow Parsnip (*Heracleum maximum*)

- No purple splotches on the stem
- Hair on stem is downy, not bristly
- Leaves are not as sharply serrated
- Native to Ontario

Angelica (*Angelica sinensis*)

- Globular flower umbels
- Purple Stem
- Compound leaves
- Native to Ontario

Giant Hogweed – Control

Method	Population Size	Purpose of Control	Notes
Digging	Small number of plants Most effective on 1st and 2nd year plants	Eradication	Entire root must be removed to prevent re-growth
Mowing	Small to medium populations in accessible location	Reduce seed production	Start early in the growing season, while plans are still small Repeat every two weeks
Tilling	Medium populations, located in accessible locations (agricultural)	Reduce growth and seed production	
Flower removal (not recommended)	Individual to small populations	Reduce seed production	Requires extreme caution to avoid contact with sap Cutting must be repeated to remove new flower heads
Chemical	Small to large populations	Eradication or to control population size	

Giant Hogweed Best Management Practices. 2012. Ontario Invasive Plant Council

Giant Hogweed – Distribution

From EDDMapS.org/ontario, As of July 25th,2014

Common Buckthorn – *Rhamnus cathartica*

What is it?

- Perennial tree/shrub
- Native to Europe
- Introduced in 1880's as an ornamental shrub

Pathway of Introduction and Spread

- Widely planted for fencerows and windbreaks
- Spread by birds & mice through seed

Habitat

- Wide variety of habitats: open woods, mature forests, abandoned fields, road edges


Photo credit : Patrick Hodge

Common Buckthorn – *Rhamnus cathartica*

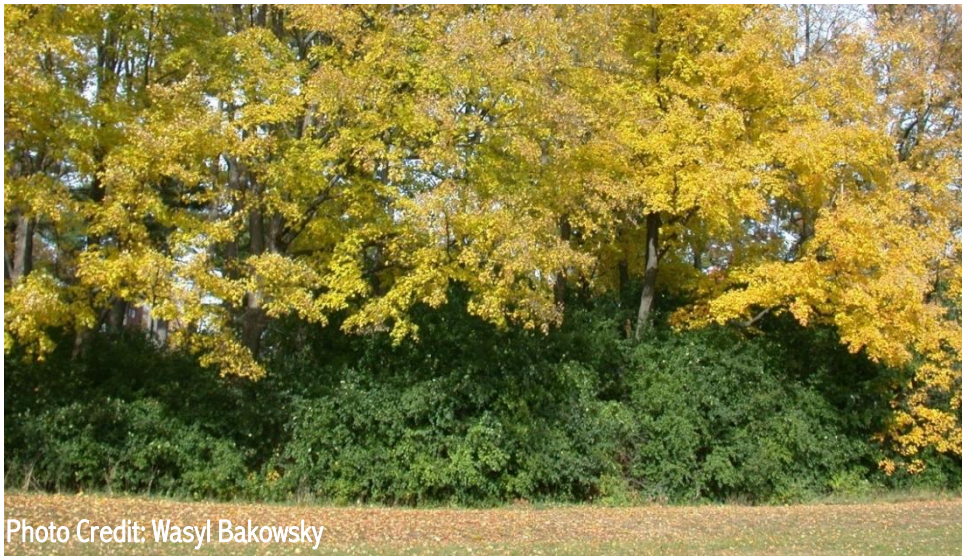


Photo Credit: Wasyl Bakowsky


Photo: Willow House Chronicles

Impacts

- Once established, can spread quickly & create a monoculture
- Create thick cover which shades out native vegetation
- Possibly allelopathic, produce chemicals which prevent other species from growing nearby
- Common Buckthorn is the alternate host of oat rust

Common Buckthorn – Description

Leaves are dark green, shiny, and oppositely arranged

Leaves are finely-toothed and egg-shaped.

Leaves have distinct veins that curve towards the leaf tip

Photo: Credit Valley Conservation

Greenish yellow flowers are produced in late spring/early summer

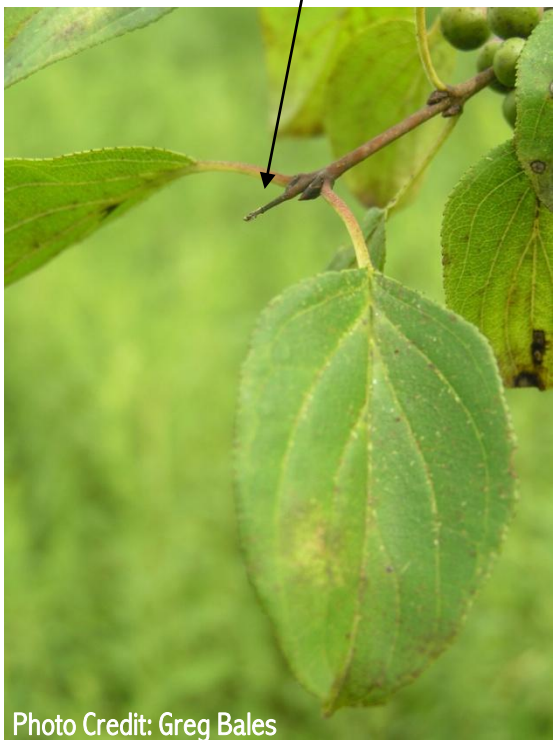
Photo: Minnesota DNR

Bark has characteristic spots called lenticels

Inner bark is yellow and heartwood is orange

Common Buckthorn – Description

Pointed, sharp thorns grow at the end of the twigs between the terminal leaves



Pollinated flowers ripen to 0.5 cm black berries by late summer

Common buckthorn is dioecious – it has separate male and female plants – the female trees produce the flowers and berries

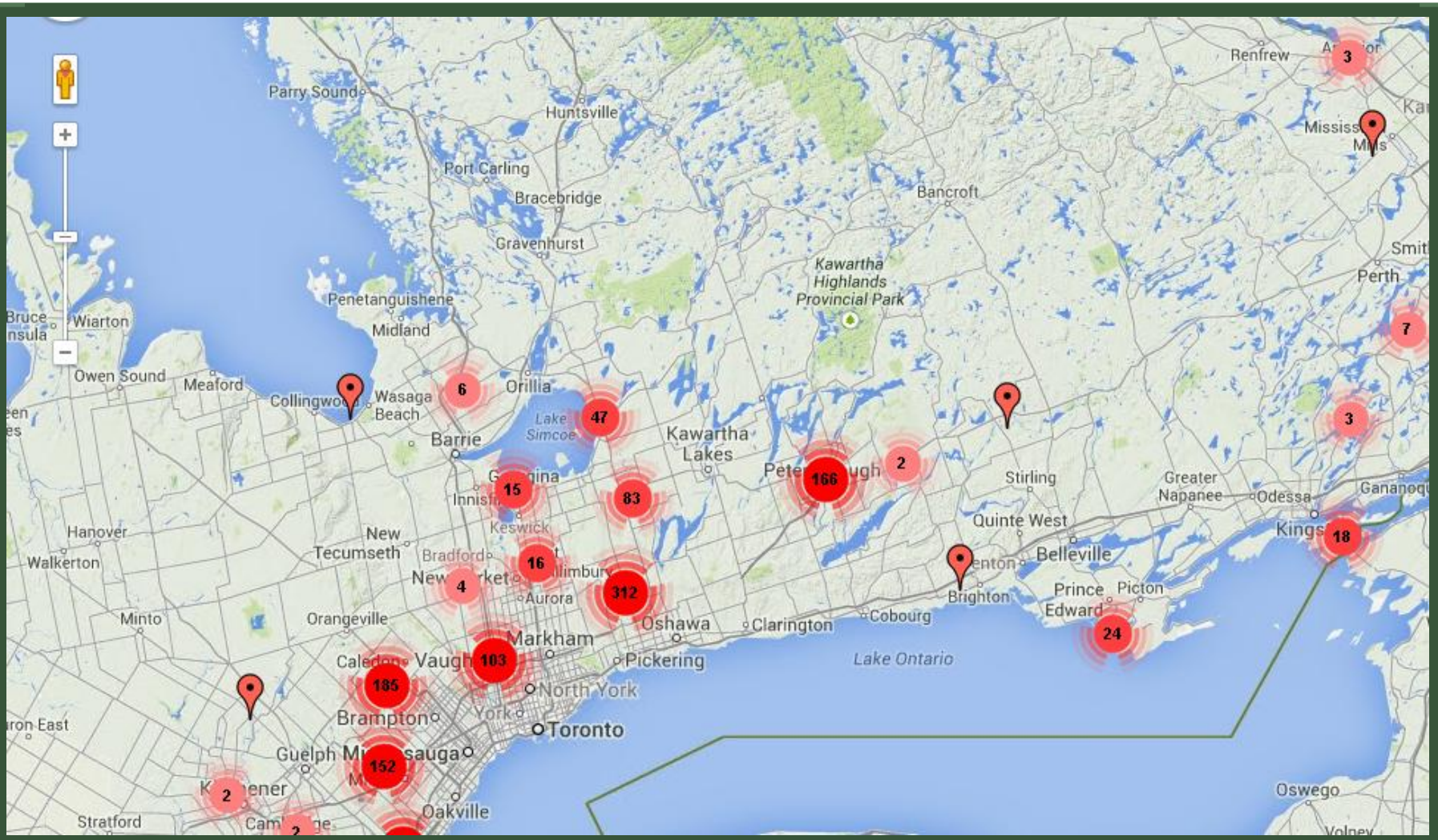
Berries persist on the tree until late winter

Common Buckthorn- Control

Extent of infestation	Small invasions and satellite populations	Large invasions and dense populations
Method of control	Manual and mechanical control: hand-pulling and excavation	Integrated control: hand-pulling and herbicide application
Timing	Spring, Summer and Fall	Fall herbicide application. Hand-pulling can occur in Spring, Summer or Fall
Disposal	Woody debris may be left on site or removed to a brush pile or burned	Dead shrubs and woody debris may be left on site or removed to a brush pile or burned
Frequency of control	Remove as many trees and shrubs as possible Return several times per year to pull any missed plants or new sprouts	Remove as many trees and shrubs as possible Return several times per year to pull any missed plants or new sprouts.
Length of control	2-3 years	2-5 years
Required restoration	Plant native species in areas where hand-pulling and excavating creates soil disturbance	Plant native species in areas where hand-pulling and excavating creates soil disturbance

Reference: Derickx, L.M. & Antunes, P.M. 2013. A guide to the identification and control of exotic invasive species in Ontario's hardwood forests

Common Buckthorn – Distribution



From EDDMapS.org/ontario, As of July 25th,2014

Japanese Knotweed – *Polygonum cuspidatum*

What is it?

- Semi-woody perennial plant
- Native to Asia
- Introduced as a garden ornamental in the late 19th century


Photo: Francine MacDonald

Pathway of Introduction and Spread

- Spreads via rhizomes, root fragments and seeds
- Horticultural trade


Photo: Credit Valley Conservation

Habitat

- Requires sun
- Often found growing along roadsides, rail-beds, stream-banks, and woodland edges

Japanese Knotweed – *Polygonum cuspidatum*


Invasive species council of metro Vancouver

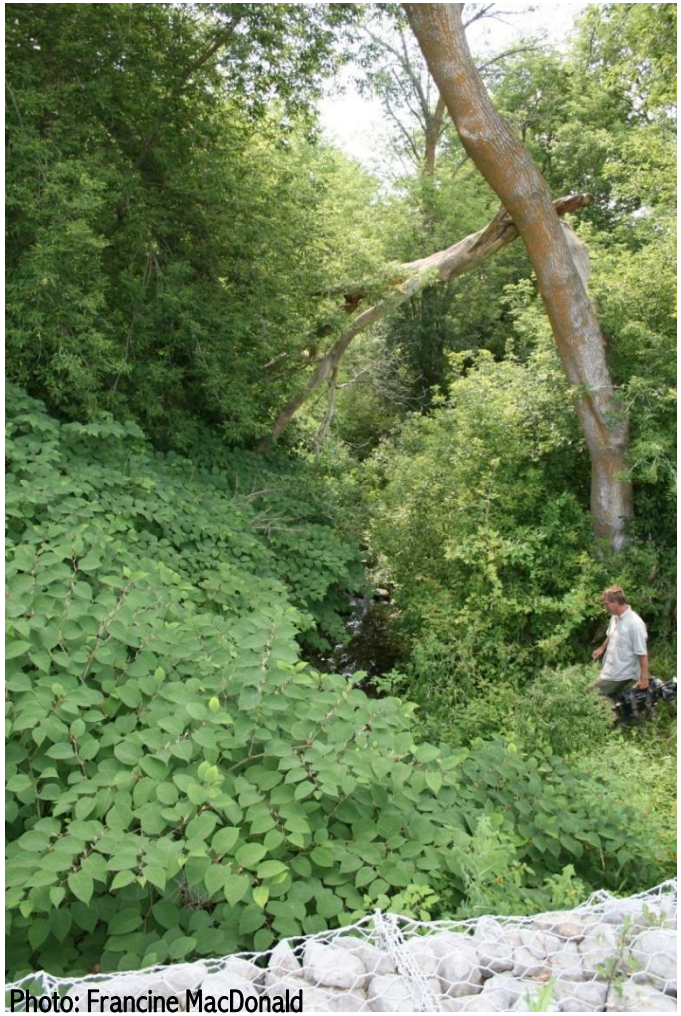


Photo: Francine MacDonald

Impacts

- Forms dense monocultural stands
- Displaces native species and threatens habitat
- Shoots and roots can break through asphalt and concrete
- Aggressive and persistent, very difficult to control

Japanese Knotweed – Description

Stands can reach 4 m in height

Photo: Credit Valley Conservation

Young shoots are purple or reddish

Stems are hollow and bamboo-like with reddish nodes

Japanese Knotweed – Description

Bunches of small white flowers are produced in long clusters along the stem in late summer/early fall

Leaves are broad ovals with a flat base, alternately arranged

Produce a very large and extensive rhizome

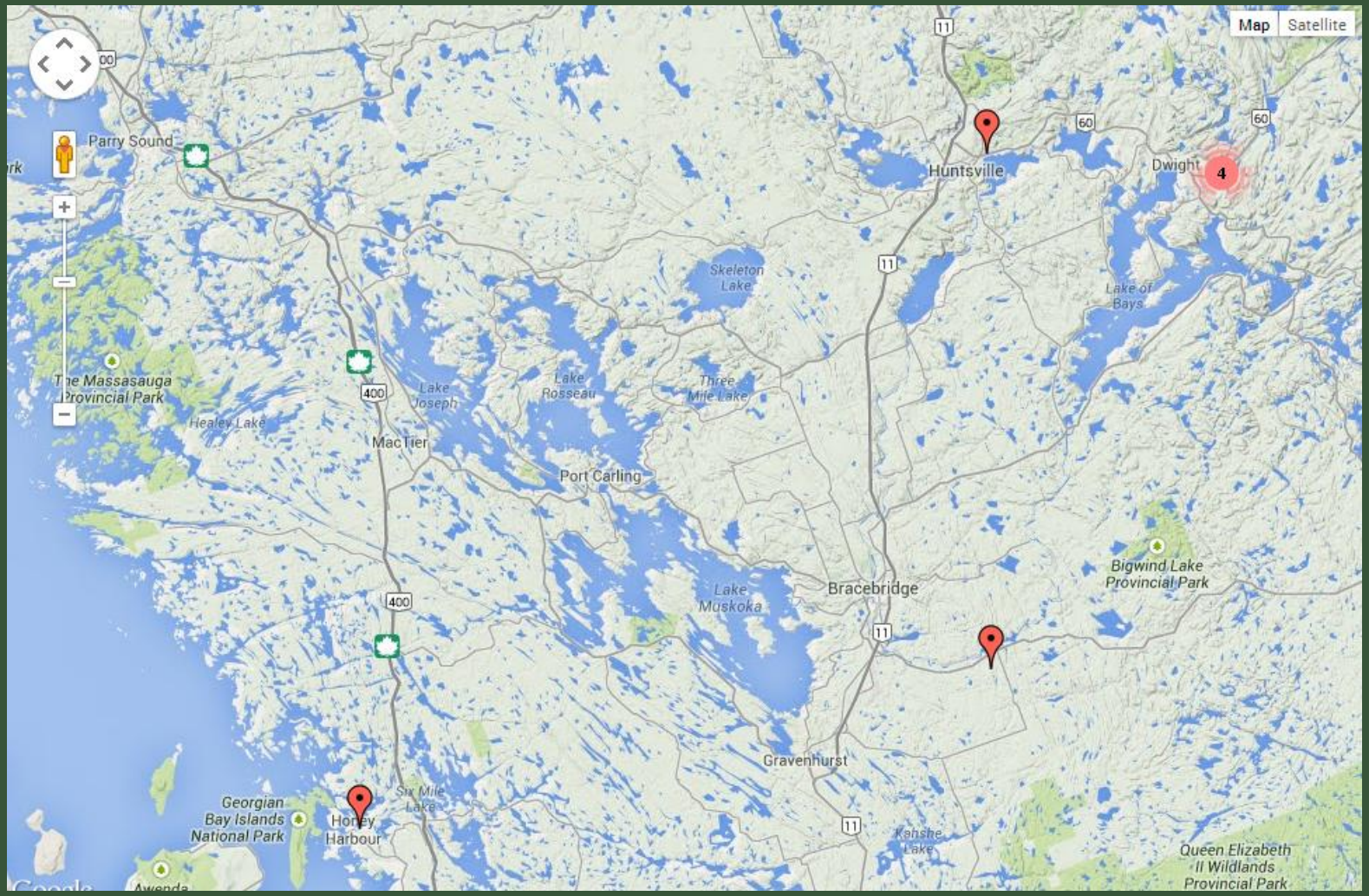
Dense patches consist of a single individual

Japanese Knotweed - Control

Extent of infestation	Small invasions and satellite populations	Large invasions and dense populations
Method of control	Excavation and cutting	Chemical & manual
Timing	Spring, summer & fall	Cutting and hand-pulling can be done any time in the spring, summer and fall. Chemical should be done in the spring or fall while other native plants are dormant
Disposal	Place all plants in a plastic/paper bag and dispose of in an appropriate landfill	Place all plants in a plastic/paper bag and dispose of in an appropriate landfill
Frequency of control	Cutting should be done every few weeks from spring to fall	Cut stems will likely re-sprout and require frequent clipping. Plan to control every couple of weeks.
Length of control	2-3 years	5+ years
Required restoration	Excavation causes soil disturbance that benefits exotic species. Consider planting native vegetation	Restoration is not feasible until the invasive is under control.

Reference: Derickx, L.M. & Antunes, P.M. 2013. A guide to the identification and control of exotic invasive species in Ontario's hardwood forests

Japanese Knotweed – Distribution



From EDDMapS.org/ontario, As of July 25th,2014

Emerald Ash Borer – (*Agrilus planipennis*)

What is it?

- Bark Beetle
- Native to Asia
- First discovered in North America in 2002 in Michigan


Ed Czerwinski, MNR

Pathway of Introduction and Spread

- International trade – wood packaging materials
- Movement of firewood


Francine Macdonald, MNR

Habitat

- Attack and kill all species of Ash trees, except Mountain Ash (not a true Ash)

Emerald Ash Borer – (*Agrilus planipennis*)

Impacts

- Larvae feed on inner sapwood
- Mortality usually occurs within 2-4 years after establishment
- Saplings may be 1 year
- Reduced forest biodiversity and wildlife habitat
- Important lumber and pulp species
- Mortality is 100%

Patrick Hodge, MNR

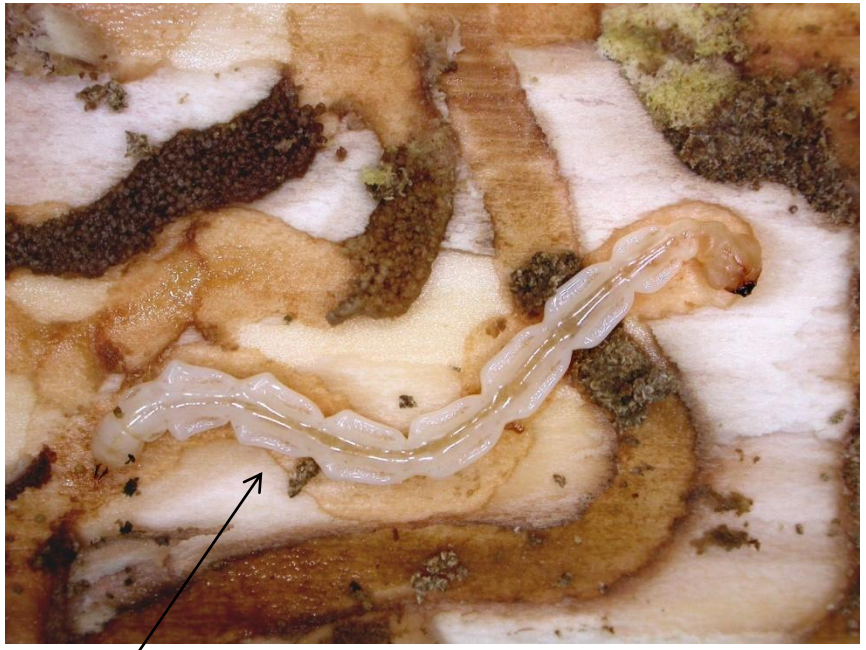
Patrick Hodge, MNR

Emerald Ash Borer – Description

Emerald green, metallic copper colour

Large black or copper eyes

Top of abdomen is bright metallic red (seen when flying)



Larvae 26-32 mm long

Creamy white

Body is flat with 10 segments

Emerald Ash Borer – Description

D shaped exit holes

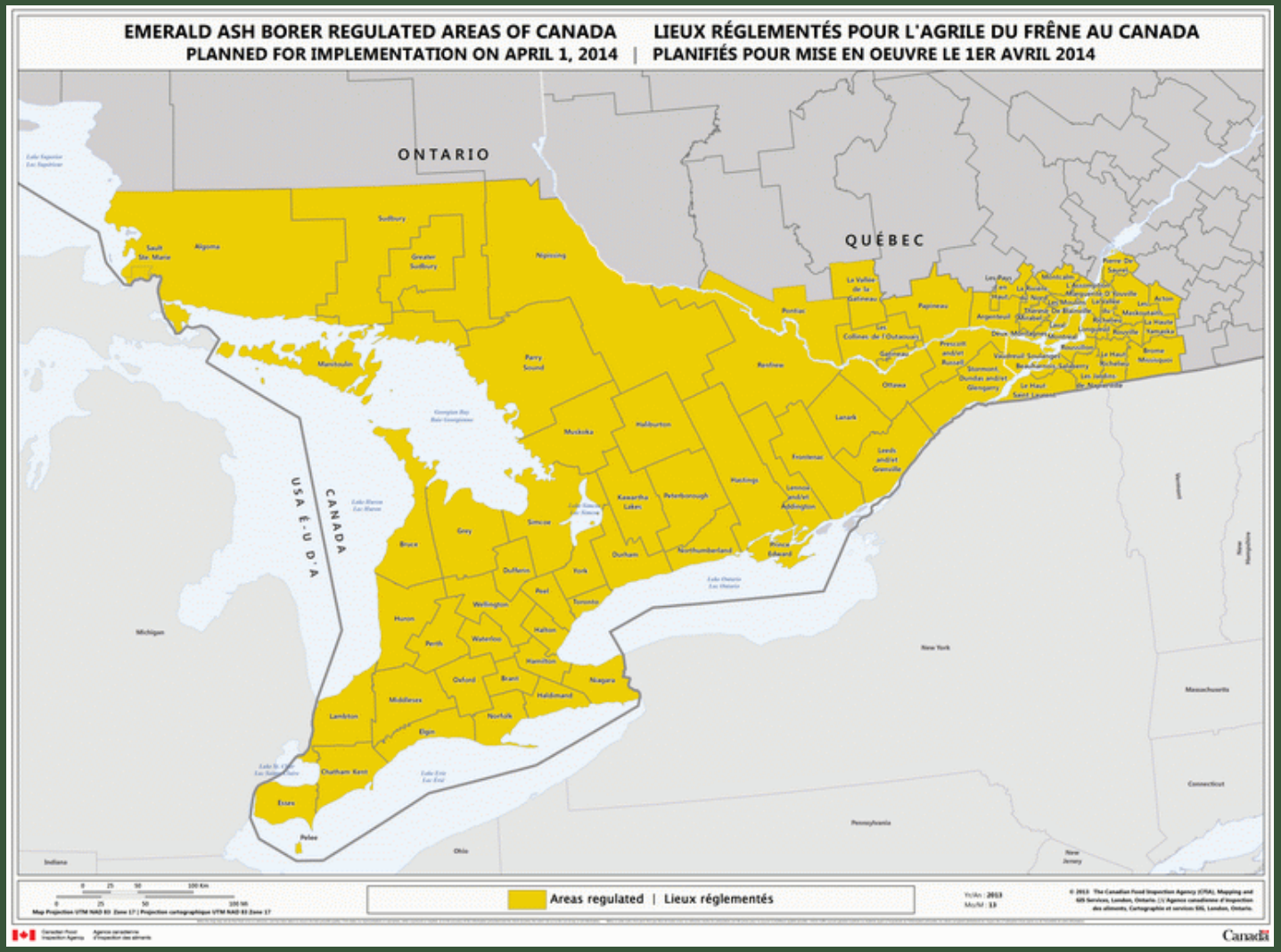
Trees produce new shoots along lower trunk – Epicormic shoots

Top branches first to wilt

S-shaped feeding galleries

Cause vertical cracks in the trunk

Emerald Ash Borer - Distribution



What You Can Do . . .

"Look Before You Leave"

Plants – Garden with non-invasive plants. Ask your local providers for native species

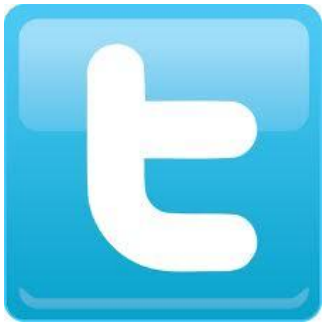
Pets – Keep pets on a leash and groom them after hiking

Hiking Gear / ATV's / Bikes – Remove mud, seeds & plant materials before transport

Firewood – Buy firewood locally

Questions?

Like us on Facebook/invspecies



Follow us on Twitter @invspecies

www.invadingspecies.com

1-800-563-7711

I ♥ Invasive Species

www.invadingspecies.com

Partners

ONTARIO'S INVADING SPECIES AWARENESS PROGRAM

www.invadingspecies.com

Ontario Invasive Plant Council

www.ontarioinvasiveplants.ca

1-800-563-7711

Ontario

Invasive Species Centre

Catalyst for research and response

ONTARIO FEDERATION OF ANGLERS AND HUNTERS


COFFEE
BREAK